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An eco-systemic framework for business sustainability

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Abstract This article introduces an eco-systemic framework to foster innovation for business sustainability. We emphasize the idea of systemic thinking in which the business operates as a system similar to a living organism. In this framework, businesses impact the environment in which they operate in a fluid, dynamic, and interdependent way. This approach contrasts with the linear approach commonly used in business and other disciplines, which tries to explain what might cause an action or reaction but ignores any feedback effect between the subsequent action and its cause. This article offers practical solutions and guidance for business leaders to incorporate complexity science into creating sustainable businesses.

1. Fostering innovation for business sustainability

Business theories often are based on linear deterministic assumptions: frameworks that seek to understand cause-and-effect actions. However, this deterministic approach often fails to account for the innumerable multiplicity of variables that affect businesses, the contexts in which they operate, and the effects of time on all those factors. Linear theory, commonly used within most disciplines, is mechanistic and attempts to explain what causes actions and reactions (Loftus, Oberg, & Dillon, 2004). Thus, it ignores any feedback between the subsequent action and its cause. There is an assumption, often validated in the historical applications of logical positivism (e.g., Newton's law of universal gravitation), that the effect is an expected outcome and has no further relationship with the cause. This type of linear focus has long been the cornerstone of scientific thinking. However, in the late 20th and early 21st century, an evolving study of business operations focused increasingly on systems that produce feedback loops rather than end points. In these cases, the effect feeds back to

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the cause, and these types of non-linear operations aggregate throughout business operations, producing complex systems.

The purpose of this article is to introduce a different way of thinking about business sustainability that emphasizes the notion of eco-systemic thinking, in which the business itself operates as a complex system similar to a living organism. In this context, businesses impact variables within the environment in which they operate in a fluid, dynamic, and interdependent way. Eco-systemic thinking encourages us to understand businesses as complex systems that have many variables, are sensitive to initial conditions, and are unpredictable. Additionally, an eco-systemic approach recognizes that businesses experience continual change, both internally and externally, depending on their environments, across time and space. As such, linear cause-and-effect approaches may not be adequate in fostering innovation to create sustainable businesses that survive new and unpredictable challenges. Taking these difficulties under consideration, in this article we argue that in order for businesses to survive, they must become adaptive, innovatory/emergent, self-determined and self-aware (without externalities), and resource-led.

This argument is necessary and significant for two primary reasons. First, we live in a moment in which the world needs, more than ever, businesses that are sustainable. In the past several decades, global financial crises—in addition to broader issues such as "climate change, ecosystem degradation, and poverty, embedded in globally interdependent social and economic institutions"—have become increasingly devastating, with long-range and little understood effects (Hahn, Kolk, & Winn, 2010, p. 386). In response, innovative understandings of business practices and sustainability are necessary in order to create novel and complex models for businesses to continue responding to contemporary and future challenges.

In addition, this article contributes to the literature on business sustainability not only from a theoretical point of view, but also from a practical one. For example, we explore business sustainability practices, including the triple bottom line—a framework involving three elements of performance: social, environmental, and financial (Slaper & Hall, 2011)—and life cycle management analysis as applied in industrial and service sectors aimed at improving products and enhancing the sustainability of the business (Pascual et al., 2010; Sonnemann, Gemechu, Remmen, Frydendal, & Jensen, 2015). Eco-systemic thinking provides managers insight into how to manage a balanced scorecard approach, which uses four elements (translating the vision, communicating and linking, business planning, and feedback and learning) to link short-term activities with long-term sustainability goals (Kaplan & Norton, 1996).

This article also contributes to efforts to introduce complex systems approaches into economics and business sustainability (e.g., Durlauf, 2005; Markose, 2005) and theorize on businesses as living organisms (e.g., Peltoniemi & Vuori, 2004; Robson, 2005; Rothschild, 1990), extending the nascent literature on complexity applications to businesses (Paraskevas, 2006). For example, eco-systemic thinking has been applied to a range of topics including competition-community ecosystems (Almirall, Lee, & Majchrzak, 2014); consumer ecosystems (Dass & Kumar, 2014) and financial profitability (Kumar, Dass, & Kumar, 2015); strategic thinking (Zahra & Nambisan, 2012); social media (Hanna, Rohm, & Crittenden, 2011); and other industries, including healthcare (Anderson & McDaniel, 2000; McDaniel & Driebe, 2001).Collectively, this research agenda provides an important blueprint for innovation, novelty, and nimble system responses to any number of rapid economic global shifts.

This article begins with a discussion of systems theory and a theoretical discussion of fostering innovation. We follow by offering actions for managers and business practitioners to consider taking an eco-systemic approach to fostering innovation and building business sustainability. Next, we discuss in detail the qualities of businesses as complex systems, comparing linear (or, bureaucratic) approaches to the one forwarded in this article, using a variety of examples on how this can be accomplished. The final section presents our conclusions and areas for future thinking and applications of eco-systemic thinking.

2. Introduction to systems theory

Systems theory is suited to enabling understanding of the complex interdependent relationships investigated in the natural and social sciences. In contrast to linear thinking, systems theory recognizes the interconnections and interventions between events or entities, as opposed to a singular view of these relationships as proceeding in a direct cause and effect pattern. Von Bertalanffy (1972) proposed a General Systems Theory, which describes systems as being open rather than closed. In other words, systems exchange matter with the environment, as any living system does. Notably, this wide-ranging philosophical explanation of systems theory was first published in the *Academy*

of Management Journal, thus underlining its pragmatic relevance to business and economics. By viewing complex processes as interdependent and intertwined systems rather than separate, single closed problems to be solved, it is possible to shed light on the way businesses can learn, grow, and sustain themselves.

Using Von Bertalanffy's conceptualization of the living organism—an element that exchanges matter with the environment—we see how complex and differentiating ecosystems can be, thus permitting insights into its operations. We can also interrogate this model by examining the Darwinian imperative that a living organism is driven by its need to survive and grow. Therefore, it is useful to look at the issue of business development, growth, and, above all, business sustainability, through the lens of how living things ensure their sustainability.

The need for an eco-systemic approach is forwarded by those who argue that economic changes cannot be predicted with traditional linear models, as recently demonstrated with the global financial crisis of 2008. According to Prokhorov (2001), economic changes contain, within their dynamic and interacting causation, far too many variables to allow for accurate prediction. He likens the theories that most accurately govern trajectories of economic climates to the non-linear theories underlying chaos theory, in which apparently random and stochastic interactions appear to challenge the accepted notions of predictable cyclical movements towards equilibrium. While Prokhorov's alignment of the nature of economic behavior with chaos theory is, as he himself argued, not entirely accepted in modern financial economics, it does involve a more useful approach to studying dynamic non-linear processes involving interactions between human behavior and the environments in which it is played out. Complexity science, which embraces chaos theory in its many models, theories, and approaches, is the study of interdisciplinary cognitive-based and innovative ways to view complex interactive processes and the way we can more adequately conceptualize them as opposed to reducing them by attempting to employ simple linear thinking.

Extending this analysis, Bronfenbrenner (2005) forwarded a bioecological theory based on the social constructivism theories of Vygotsky known as the Process, Person, Context, and Time (PPCT) model. This model shows the relationships on how *process* (development) impacts the *person*, and how the person has an impact upon the process. These interactions take place in a variety of *contexts* and are complexified by changes over *time*. The idea that these four elements are open, enmeshed, and affect each other constantly and fluidly throughout their existence is a crucial and central element of ecological systems that can be transferred, creatively, to all aspects of open ecological systems, specifically those in which anthropogenic activity (processes) interact dynamically with their environments (contexts) over time. The model is therefore well-suited to examine business and economics issues, which involve human artifacts and have a similar operating system that is far more complex than simple cause-and-effect relationships.

The PPCT model allows us to understand business problems by interpreting the person as a business entity that functions in a similar way developmentally. In this view, business activity then becomes the combination of interrelated factors that produce, each time, something new and different, just as the sum of process, person, context, and time produces in each case something new, different, and greater than the sum of its parts or elements (see Durkheim, 1938).

In each of these approaches, in order to ensure sustainability, an organism—or business—must wind its way through its containing ecosystem. Many scholars believe that environment in eco-systemic discussions applies solely to physical environments or the natural or built world. However, in this context, environment also applies to other living organisms, the social network in which the person or business exists, and less tangible elements like culture and beliefs. Environment is not static or passive, but is an agent within the interactive, contextual ecosystem and should be clearly understood as such. In addition, sustainability should not be used in the narrow view of this word, which has been distanced from its basic meaning used here as the capability to survive. This definition guides the main argument of this article: In order to survive, businesses would do well to employ eco-systemic thinking to be adaptive, innovative/emergent, self-determined and self-aware (without externalities), and resource-led. Following this logic, managers can harness the power of this framework to foster innovation in order to create sustainable businesses.

The following sections examine each of these concepts in detail and explain the main argument to provide actionable, concrete examples of how an eco-systemic approach can be useful for managers and businesses.

3. Business sustainability through innovation: Theoretical approaches

Modern theories of the process of technological advancement can be traced back to the ideas of

Schumpeter (1942), who saw technology as creative destruction. For him, capitalism represented a dynamic change in economic thought that was both necessary to and complexly involved in the advancement of production and society. Schumpeter viewed society and the economy as comprised of innumerable variables, and technology as offering a means of addressing these variables and of directing the evolutionary process of the capitalist machine. According to Schumpeter, this machine had to be fed constantly with new products and new methods of production in order to propel social and economic development. Creative destruction, in his view, was necessary in order to create these new products and methods of production, which would in turn destroy the products and processes they had replaced. For example, technological change enabled the movement from manual to automated manufacturing processes, which increased the speed and complexity of production. Other examples include the transition from typewriter to word processor, from posted letters to fax to email, and from fixed to mobile telephones. Each new technology alters how work is done and thereby has an impact on the state of the economy. For example, technological shifts in many developed countries have created demand and increased wages for skilled workers, relative to unskilled workers who face depressed demand and wages (Berman, Bound, & Machin, 1998).

In the wake of Schumpeter's theories on technology, a similar economic thread has run through much conceptual work on technological change. For example, Solow (1957) also regarded technological change and advancement in product design as the engine for long-term economic growth, rather than labor growth or capital accumulation, which had been the focus of previous theories, such as the Harrod-Domar model (Domar, 1946; Harrod, 1939). Solow argued that economic growth in the long term relies upon the creation of more efficient means of production, as well as the design of products and processes to stimulate purchasing (Solow, 1957). Other scholars added to the theoretical framework for technological change by identifying market demand as an impetus driving the rate and adoption of technology among industries and organizations, rather than a mere consequence of the availability of new technological products and services (Mansfield, 1961; Rosenberg, 1974; Schmookler, 1962).

Furthering the understanding of technological change as an economic process, Griliches (1957) theorized that the adoption of a new technology by organizations does not occur as a single event, but is rather an act of diffusion occurring at various rates, across different industries and regions, and is dependent on individual perspectives on technological change. The decision to adopt a new technology, he claimed, relies upon specific economic calculations tailored to each particular technology (Griliches, 1957). Following Griliches's findings, organizational theorists focus on technological change in relation to economics to understand more fully how organizations both respond to and modify economic and social demands. Similarly, but as part of a hybrid argument, Rosenberg (1994) theorized technological change as a reaction to changes in market demand and also a result of innovation through scientific development, which in turn stimulates the market to demand further technology. The consequence, Rosenberg argued, was to generate a continuous and simultaneous push and pull for technological change. For instance, Mowery and Rosenberg (1979) noted the development of applied sciences at the educational level, along with a growing focus within organizations on advancing their own research and development structures. Together, these factors stimulated rapid technological change, which in turn stimulated economic growth. Such growth was perceived by some theorists as a competitive advantage. In leading technological change, organizations were said to be responsible for stimulating consumer purchases and creating further incentives to innovate new routes towards economic wealth (Mowery & Rosenberg, 1979).

Also taking up Schumpeter's theories, Peter Drucker (1985) wrote *Innovation and Entrepreneurship*, the groundbreaking book that has become a hallmark for understanding how increasing complexity must be addressed head-on or, quite simply, businesses will perish. Drucker's clarion call for change forwarded innovation and entrepreneurship as a way forward out of complexity: "In order to impart stability and leadership in a transition of this magnitude, existing businesses will have to learn how to survive, indeed, how to prosper. And that they can only do if they learn to be successful entrepreneurs" (Drucker, 1985, p. 136). Drucker forwarded a prescient framework for innovation that has become a guiding light for scholars studying complexity and practitioners seeking to avoid becoming business dinosaurs. It is within this spirit that this article tackles fostering innovation as a goal for eco-systemic thinking and its practitioners.

4. Managing complexity: Guiding principles for managers

As growing complexity increasingly overwhelms older business and management models, new methods for managing complexity within business ecosystems will

be required. At a recent annual forum held by the Peter Drucker Society of Europe, innovation leaders across industries offered five dimensions for managers to practice new ways of thinking about innovation and sustainability. The lessons from this meeting reveal that "older organizations that cling to traditional management will not be able to keep up" (Swenson, 2013). More forcefully, one presenter argued that "older organizations that remain in denial of the need to change will become extinct."

4.1. Goals beyond profit

First, businesses must evolve to be driven by goals beyond profit in an ecosystem that is increasingly complex. To this end, businesses might consider a triple-bottom line approach or look toward business models that specifically incorporate goals beyond money. For example, B-Corps are a new type of for-profit, purpose-driven company structure designed to meet financial goals in addition to meeting social and environmental standards of performance, accountability, and transparency. In short, these companies are beholden to stakeholders rather than shareholders and may provide new models for building a values-driven set of business goals.

4.2. Structure

Second, managers must rethink the structure of their businesses, asking if linear, hierarchical organizational structures are most appropriate when communication and feedback flows do not mirror these dynamics. Such restructuring might require managers to relinquish control or to decentralize power in order to provide greater autonomy and creativity in meeting the shared goals. Of course, such forms of self-management require that businesses have a core set of values and the necessary culture to help uphold those values. For example, Google's distinctive commitment to fostering innovation led leadership to restructure engineers' availability through a 20% time policy that encouraged them to spend 20% of their working time on creative side projects that "they think will most benefit Google" (Townsend, 2013). Three of the company's most successful products, Gmail, Google Talk, and AdSense, famously were developed in this structured approach to fostering innovation (Ross, 2015). Of course, rethinking structure is easier to do when it is guided by the company's core values.

4.3. Core values

Related to structure, a business's core values serve as a critical guidepost for creating a purpose-driven mission beyond the bottom line. Values-driven companies can inspire purpose and drive motivation at all levels. For example, a commitment to innovation can permit employees to take acceptable risks when given the opportunity. Additionally, a value-driven organization permits nimble decisions because the value (e.g., innovation, transparency, sustainability) serves as the measuring stick by which all decisions are made.

4.4. Coordination

Coordination is a fourth dimension managers must pay attention to in order to foster innovation for sustainability. For example, agile projects (or, agile process management)—an iterative, highly flexible, and interactive method for project or software development—are increasingly replacing sequential processes. Agile management favors communication and collaboration over standards and an incremental approach that can be leveraged to save time, money, or materials (e.g., 3-D printing prototyping or rapid prototyping). A dedication to agility—what innovation firm IDEO's CEO Tim Brown would refer to as design thinking—can foster innovation through careful study of variables, mitigation of risk, and avoidance of expensive disasters by catching issues early on. For example, Google later scrapped the 20% rule policy in favor of a more targeted and top-down innovation process that focused on a handful of personnel as the company grew into a $62 billion behemoth (Ross, 2015). It is this type of agility that enables Google to remain a global leader in fostering innovation.

4.5. Communications

Last, a fifth dimension related to managing complexity is communications. Complex systems involve many actors and their relationships are not always perfectly clear. Further, how they interact in their environments is not always clear. Managers would do well to study the flow of information between individuals, teams, and networks. As in any system, there are "optimal levels of connectedness" (SFWORK, 2015). In systems where information moves too slowly, gridlocks and bottlenecks can occur, which slows the adaptation required to foster innovation and sustainability. The networked nature of business communication provides ample analytics on the flow of information within a complex system and managers can use the data to adapt and optimize the flow of information. Examples of this include everything from analyzing "digital breadcrumbs" (Noguchi, 2011) in order to understand patterns in employees' communication

networks to issuing "digital badges" that record employees' every interaction, even collecting heart rate and voice data (Weller, 2016). These big data analytics provide insights into communication and information flows in increasingly complex systems. Businesses committed to innovation must be willing to learn and adapt from these insights in order to build successful and sustainable futures. These practices are described in the following sections from an eco-systemic framework for building business sustainability.

5. Eco-systemic thinking: Managerial strategies for innovation and business sustainability

An eco-systemic approach to ensure business sustainability views the business as a living organism (an example of a complex adaptive system). This view invites us to look at how businesses can operate to sustain themselves and thrive through adaptation, emergence, self-determination, and becoming resource-led.

5.1. Sustainability through adaptation

To build business sustainability through innovation, business leaders must embrace adaptation. Adaptation involves learning from and responding to changes within a dynamic system. It is a natural human cognitive/emotive process, involving flexibility in response to contextual issues, through which that response may also produce environmental change. Adaptation is life-sustaining and often creative. Adaptation to new technologies is a business-sustaining response that can be economically sustaining as well. Typically, technological advancement and its adoption are viewed as progress. However, in a dynamic system, there may be negative consequences, even of adaptive behaviors. An eco-systemic approach based on understanding complexity permits a more nuanced view. For example, against a background of praise for technology's capacity to drive economic growth and efficiency, researchers have explored the adverse impact of technological change on the environment (Jaffe, Newell, & Stavins, 2003) in addition to social and economic problems, which require further technological change to overcome (Spence, 1984). An eco-systemic view also understands that businesses face significant financial costs in adopting new technologies. Businesses' existing uses of technology may be fixed, and businesses may not see the incentive to continue with technological change simply for its social value (Grossman & Helpman, 1994; Jorgenson, 1990; Romer, 1990). Despite the clear advantages of adopting new technologies outlined in Schumpeter's theories, any change in one part of the system will inevitably trigger further adaptive measures.

Beyond adopting new technologies, business leaders can also adopt new managerial strategies for fostering innovation and building sustainable businesses through adaptation. Given its significance, in this section we take a comparative approach in illustrating how eco-systemic thinking can be employed by examining a linear/bureaucratic approach versus a dynamic, nonlinear complexity-oriented approach. Specifically, this section looks at the qualities of businesses as complex adaptive systems while weaving in examples and actionable applications for managers to foster innovation and build sustainable futures through examining differences between linear (or, bureaucratically organized) businesses versus those viewed as complex adaptive systems. Adaptation can be difficult, but the rewards—success, growth, and longevity—make a compelling case for its adoption.

Adaptation, which is business-sustaining, usually leads to the imperative to make further adaptive changes. Therefore, business sustainability depends on a flexible learning curve that allows for the follow through of any apparently negative feedback it may encounter. This feedback loop is critical to sustainability. In order to meet these challenges, businesses will need to continue to embrace adaptive processes in order to remain sustainable in an increasingly complex system. We can begin by looking at complexity science; its focus on complex adaptive systems (CAS) will permit businesses to remain dynamic in their evolution. The features of complex adaptive systems are outlined below.

5.2. Emergent business development

In addition to being adaptive, an eco-systemic model requires that businesses become emergent. Emergent business development describes business initiatives that may not have been planned, but emerge from random interactions within a broader system (rather than from linear predictions based on planning and control). These emergent qualities are theorized as being a search for new coherence and order when a system is far from equilibrium (Nicolis & Prigogine, 1989). The 'far from equilibrium' description has also been used in computer science and described as the edge of chaos, yet this concept is often misinterpreted (Lewin, 1993). It is a descriptive use of the principles of chaos theory, as previously cited, in that stochastic events

appear to dominate outcomes. It is important to recognize, as Schumpeter (1942) presciently noted, that destruction or near destruction can operate creatively to produce emergence.

However, we have yet to understand how these behaviors (involving so many co-occurring variables) can produce new, alternate forms of homeostasis or equilibrium via innovative development, and therefore can be described as random. This emergent new order possesses the quality proposed by Durkheim because it is different in its process from the inputting factors, but also is greater than the sum of its parts might suggest (Mitleton-Kelly, 2003). These factors—eco-systemic approaches to building sustainable business models—are described in greater detail in the following.

5.2.1. The importance of uncertainty

Business behavioral theorists believe that decision making in times of uncertainty differs from decision making during periods of apparent equilibrium. Uncertainty increases the likelihood that the ideal will not be met, resulting in a detrimental or adverse outcome (Arrow, 1962). To minimize risk, one must gauge the probability of occurrence of various outcomes, thereby narrowing choices and winnowing down a pathway to a certain decision (Keynes, 1921). If only minimal information is available to determine probabilities or to narrow choices, other mechanisms must be relied upon to lower the level of uncertainty and, in turn, the risk involved in the decision-making process.

Complexity is one way to explain the existence of incomplete information, thereby signaling a greater risk to decision makers (Koch, Eisend, & Petermann, 2008). Complexity detracts from the ability to make rational decisions due to the large number of potential pathways involved and the tendency for the parts of a complex system to become ever more interrelated, eventually becoming too entwined to separate easily. As a result, drawing decisive conclusions about any one pathway becomes increasingly difficult (Knight, 1921; Koch et al., 2008; Simon, 1978). Here, emergent approaches have an advantage over linear responses to uncertainty, considering that the diversity of pathways available necessitates innovation in decision making.

Failure is also critical to fostering innovation and leaders must encourage improvisation through uncertainty. In bureaucratic organizations, such thinking is shunned. However, eco-systemic thinking suggests that (Paraskevas, 2006, p. 898):

> By allowing a number of diverse responses—depending on the situation each time and provided that the various actors will assume full responsibility of their actions and will not put at risk the well being of the organization—the organization will explore its 'space of possibilities.'

In this case then, structured failure prevails over failure born of recklessness.

5.2.2. The effect of uncertainty on decision makers: Promoting innovation

Some individuals make decisions despite uncertainty. Such decisions rely wholly on the decision makers' personal knowledge and intuition due to insufficient external information needed to form a rational decision (Damghani, Taghavifard, & Moghaddam, 2009). Certain individuals make risky decisions without full knowledge, which may be based on false assumptions, forecasting errors, and past experiences that do not match the current environment. More simply, their willingness to make decisions based on limited knowledge could just as easily deliver accurate assumptions and multiple paths of future returns (Hodgkinson & Starbuck, 2008; Soane & Nicholson, 2008). Entrepreneurs show signs of "highly adaptive risk-taking behavior that can result in positive outcomes during stressful economic circumstances," which allows them to make "quick decisions under stress" due to a higher cognitive flexibility ("Risky Decision-Making," 2008, p. 1). The necessity for rapid response decision making in adaptive systems is one of their salient factors and a significant factor in emergence.

5.2.3. Fast and frugal entrepreneurship

Whatever the psychological makeup of these types of individuals, who are often described as entrepreneurial ("Risky Decision-Making," 2008), their decisions appear to be both fast and frugal within the time and information constraints set for decision making (Clark, 2009). Speeding up the decision-making process is vital for organizations that must make quick decisions about adopting a particular technology due to, for example, external competition or stakeholder pressures (Freeman & Perez, 1988; Rosenberg, 1982, 1994). It is vital that in these situations, the decision-making groups are small-scale, not over-encumbered by regulations or bureaucracy, able to communicate fluidly, and able to remain flexible (McMillan, 2008). They may rely on what they consider intuitive thought or fall back on habits and past patterns that simplify the process and ensure that decisions are made more quickly. The more trust and collective action there is between decision makers, the greater the potential for emergence in times of uncertainty. Such decisions are, however, also made with a short-term

or otherwise narrow scope (Clark, 2009). In other words, decision makers take a localized approach based on what they already know or, rather, on what they think they know. Such an approach is the keystone of emergent business practices.

5.2.4. Necessary infrastructure for innovation

In addition to the previous subsections (i.e., quick and innovative decision making born from uncertainty) the broader structure must also facilitate emergence to prevail in business practices. Mitleton-Kelly (2003) referred to these factors as "enabling infrastructures" that combine to produce a specific set of cultural, social, and technical conditions that permit emergence. Some examples of these infrastructural factors that managers can foster to support innovation, emergence, and sustainability include:

- *Small-scale operating groups using participatory teamwork as a facilitating tool*. For example, managers can "curate rather than command" (Swenson, 2013) and draw attention of the expertise and values of their team members (Anderson & McDaniel, 2000). Innovation can be developed further by increasing the diversity of experiences and expertise to create a more robust organization and a wealth of ideas through these patterned interactions.

- *De-emphasizing formal planning in organizational success*. Companies that run bureaucratically stress formal planning as a managerial strategy to build cohesion. For complex systems, however, this is less useful as they are adaptive and emergent. Managers can recognize that unpredictability not only in order to plan for the future but also because they "must think about future in new ways" (Anderson & McDaniel, 2000, p. 10). This can be accomplished through scenario planning (McDaniel & Driebe, 2001; Paraskevas, 2006).

- *Rapid decision making based on best evidence but perhaps incomplete and intuitive views*. Bureaucratic management styles favor everything being under control. However when the system is rocked, a nonlinear approach would help managers to foster "intuition guiding action in a spontaneous way" through improvisation (Crossan & Sorrenti, 1997, p. 156). Eco-systemic thinking suggests that "[i]mprovisation is a necessary condition when the unfolding of the world is uncertain and the organization must have the capacity to respond to unanticipated circumstances" (Anderson & McDaniel, 2000, p. 9). Developing the skills to improvise under pressure is described as bricolage: "the ability to create what is needed at the moment out of whatever materials at hand" (Anderson & McDaniel, 2000, p. 10).

From this discussion, we can see that emergence is required for businesses to continue to sustain themselves in a rapidly shifting global economy. Emergence is the result of uncertainty (or chaos, depending on one's view), making it difficult to ascertain their ability to shine in uncertainty by creating happy accidents through complexity (Sherman & Schultz, 1998). However, businesses that strive to create enabling infrastructures to foster quick and innovative decision making, especially in times of duress, will be able to sustain themselves through unexpected small- and large-scale social, economic, and environmental challenges (Kuratko, Covin, & Hornsby, 2014). Adaptive systems and emergent innovation are two factors of a coherent eco-systemic approach. In Section 5.3. and Section 5.4., we describe two other qualities businesses should embrace for sustainability.

5.3. Self-determining, reflexive businesses without externalities

Sustainable, systems-based approaches recognize that a business is its own system, a co-evolutionary growth between all components of the system. In this sense, business is best viewed as a living (human) organism whose purpose is to thrive, grow, and develop within its natural, built, and social environments, given its own unique innate qualities. Elements that may be seen as control mechanisms and even externally-imposed are therefore not actually externalities, but are subsumed by the system and used to adapt.

5.3.1. Externalities

Roberts (2007) described externalities as situations in which an individual's actions affect the welfare of others, yet the actor has no incentive to recognize the decision's impact. Externalities therefore arise when economic actors do not account for all of the costs and benefits of certain choices. Identifying businesses as systems that can and should always adapt to and co-develop with all contained sub-systems adds depth to Roberts' limited view. Coase (1937) adopted an alternative perspective that is closer to a systems-based understanding of externalities. His model of efficiency argued that organizations develop and operate to lower transaction costs, basing decisions on informational inequality and market opportunities (Coase, 1937).

5.3.2. Artificial equity

Coase (1960) suggested that restraining a given corporation would ultimately involve reciprocity of harm, whereby protecting the welfare of others results in negative impacts for the organization. He focused on a form of artificial equity in which social costs are offset through the purposeful, non-liable actions of the organization. Such an idealistic approach rejects the constructs of responsibility and consequence developed by Pigou (1932) and focuses instead on economic efficiency and organizational sustainability. These arguments are incorporated by the Porter/Kramer belief that corporate shared value should replace the idea of corporate responsibility (Porter & Kramer, 2006). Business systems should understand their own ecological survival in terms of enlightened self-interest (Keim, 1978).

5.3.3. Enlightened self-interest, self-preservation

Self-determining evolving systems, just like living organisms, are self-preserving. It can be argued that the entire capitalist macrosystem, as originally conceptualized in Adam Smith's *Wealth of Nations*, is a self-organized and self-determined system created to maintain its own ecological development. This understanding, ironically, fails to account for the stochastic nature of complex systems and their imperative to adapt. Even Keynesian economic solutions do not account for this limitation.

Some scholars have argued that positive feedback in the form of growth may cause ripples and perturbations (Kauffman, 1995; Mitleton-Kelly, 2004) that lead to adaptation and innovation. These are typically called 'edge of chaos' or 'far-from-equilibrium' states. However, these scholars tend to adopt a metaphorical use of computational processes rather than the simplicity of human growth.

5.3.4. Self-organizing, understanding possibilities, dissolving boundaries

Some of these conceptualizations have already been predated or paralleled in the study of child development, psychology, education, and other social sciences. Bateson's (1987) ecological theories and Von Bertalanffy's (1972) General Systems Theory are cases in point. Further, Mitleton-Kelly's (2003) space of possibilities describes the self-organizing elements of businesses' development within their systems. These spaces of possibility also echo Vygotsky's (1967) Zone of Proximal Development (ZPD), a concept that shows that social interaction is the basis for cognitive growth. In this context, proximal distance will foster businesses' interactions with their environments, thus facilitating growth through similar learning experiences.

In bureaucratic or linear organizations, a top-down approach positions leaders as all-knowing but this model does not recognize the built-in feedback loop that can be provided from clear, respected, and welcomed communication from all members. An eco-systemic approach recognizes that everyone within an organization can contribute uniquely. Fostering a learning organization in a complex system means that people's knowledge is less important than what they can learn and contribute to benefit the business (Anderson & McDaniel, 2000; Wartzman, 2013).

Arthur (1994) argued that businesses contain within them the irreversible path of their own historicity. Boundaries that divide academic disciplines (such as economics, physical sciences, neuroscience, and computational science) create their own learning curves and produce findings that are limited by academic path dependence and historicity, or in Simon's (1979) expression, their bounded rationality. Further, "professional expertise and values are powerful inhibitors of innovation because of the vested interest they create in the status quo" (Anderson & McDaniel, 2000, p. 9). Sustainable business systems should conceptualize the dissolution of boundaries and employ meta-cognitive strategies—thinking about thinking—in a reflexive and all-encompassing manner in order to ensure business survival. In creating learning organizations, innovation is fostered from a growth mindset and resists resting on one's laurels.

5.4. Resource-led businesses

In addition to adaptive, emergent, and self-determining qualities, sustainable businesses must also be resource-led. Using the ecosystem analogy, we can consider a range of resources (such as natural or environmental) however, in this sense, resource-led focuses on capital as a resource. In a traditional sense, capital indicates financial or economic resources. However, this definition reduces complex data and social facts to simple quantifications. Bourdieu (1986) argued that capital is far more expansive than this singular view. He introduced two forms of capital—social and intellectual (or cultural)—to demonstrate how other forms of capital are significant but often less tangible or measurable in economic terms. Social capital refers to capital that exists within relationships among individuals, often embraced to further their own goals. Intellectual or cultural capital refers to non-economic capital that also promotes mobility or growth, but is difficult to calculate. Bourdieu's work on capital has proven to be a widely useful concept for scholars and theorists in multiple fields of study.

Table 1. Forms of resources/capital available to sustain business development

TYPE OF CAPITAL	CAN IT BE QUANTIFIED?	CAN IT BE DEPLETED?	KEYWORDS	POSITIVES	NEGATIVES	IS IT SUSTAINING?
FINANCIAL	Yes	Yes	Markets/Property	Profits	Loss	When all other factors are in place
HUMAN/WORKFORCE	Yes	Yes	Labor	Large numbers	Market variability may cause job loss. There may be low productivity.	While the labor force is stable
SOCIAL	No	Yes	Reputation/Face	Works in those cultures where reputation or networking is a cultural imperative, or where reputation is a media issue. Encourages stability but not innovation.	Cannot see outside its inward view of benefits. Cuts out 'outsiders' and cannot share knowledge/power with them. Closed system.	To those cultures that hold it culturally in high regard, and in media/reputational protection where this is not the case
MATERIAL/NATURAL	Yes, but with difficulty	Yes	Climate change/Pollution/Environmental destruction	Energy and production capabilities	Destructive to global human/natural sustainability	No longer
INTELLECTUAL	Not easily	No	Intellectual property	Energizes cognitive growth	Litigation/Plagiarism/Counterfeit	Yes

In the following, we adopt Bourdieu's understanding of capital to demonstrate how different forms of capital are available to eco-systemic businesses.

There is a tendency within business development to reduce all resources to that which is most easily quantified: financial profits and losses. Table 1 illustrates how businesses quantify only what can be counted, money and available labor. Exchanges are produced by simple transactions and contracts, a process developed over 2 centuries ago. In the early days of industrialization, linearity and a limited view of mutuality mimicked (in a more sophisticated manner) the principles of the earlier bartering of the agricultural communities. In eco-systemic businesses, non-economic forms of capital may prove exceedingly valuable in facing social, economic, and environmental challenges.

5.4.1. Rethinking capital as systemic resources

Smith's (1776) solution to the emergence of industrialization—property owners compensating a previously rural workforce struggling to supply its own food—was pragmatic and bounded by its historical context. However, this resolution does not adequately cater to the fragmentation of industry and production in the contemporary technological world. Smith's Enlightenment-based theory of the invisible hand must be understood within its socio-historical context. Ethical principles of benevolent paternalism and a shared religious belief informed the idea that exchanging labor for wages was mutually beneficial. Any contestation of the theory's simplistic and outdated nature has taken a linear route, assuming that capital is defined only by currency.

As Bourdieu (1986) suggested, other forms of capital exist that are not accounted for in traditional practices. They lie at a deeper level of the system, yet every one of those contributes to and is translated into the dominant and simplest of exchange mechanisms: profit and loss. Table 1 is presented here as a first step to discovering where the drivers may be within the business system, indicating that superficial perceptions may not be fully informative of how a business system operates. In fact, even the briefest of logical overviews of this model demonstrates that there is only one resource that cannot be depleted: intellectual capital. Once intellectual capital is in place, the system will continually regenerate because the resource cannot be taken away. All other resources are subject to potential losses.

Table 1 also highlights the limited nature of our understanding of business systems—particularly what sustains them. What could perhaps ensure sustainability, and be translated into profit is the nurture of and true respect given to the generation of ideas. We need to generate thinking businesses that will survive, self-determine, adapt to market changes, and respond to emergent developments. These ideas are similar to the considerations we are by our very nature disposed to offer to our children, a natural imperative true to all living organisms. Business system thinking can and must be aligned to what we instinctively know about the sustainability of living organisms: crucial interdependence and self-preservation.

5.4.2. The dangers of depletion

What is most worrying when looking at Table 1 is the fragile nature of an integrated system if any of its dependent sub-systems is depleted. Some losses, like a loss of face or social standing, can be made good. Social errors can be, and usually are, rectified. Forms of social capital create net positives, so it would be unlikely that it could or would be destroyed. Yet some depletion of resources is totally destructive to the business, just as to life itself. If we use something from the system that is irreplaceable, like the materials we use to provide energy for growth, we begin to place our lives—and the life of our business system that operates on the same principles—at serious risk of destruction. We need to realize that system sustainability is the only real option in existence and is not a choice.

6. Conclusion

Rothschild (1990) drew an early parallel between businesses and living ecosystems, concluding that business efficiency would be rewarded by survival. In contrast, inefficient businesses would face extinction. While this may hold true, in this article we introduce a more complex, non-linear approach in understanding sustainability by introducing an eco-systemic framework.

We argue that systems theory can offer new insights on business sustainability based on the idea that business development constitutes a symbiotic, intertwined relationship with the time, space, and place in which the business operates. This article additionally argues that businesses have their own individualized environments, which consist of social, material, built, intellectual, and temporally-constructed personal contexts. These ideas are congruent with the most current thinking in academic and experiential interdisciplinary studies in complexity science, and raise important questions about how sustainable businesses can thrive when facing economic, social, and environmental challenges.

We provide new insights for business sustainability and the discussed specific tools and techniques for managers. However, further research into the efficacy of these practical solutions would be welcome, including looking further into the promise of self-sustaining organizations working together in creating broader, sustainable business ecosystems. Such an agenda raises additional questions about the need for interventions or predictions in complex systems that are self-sustaining. Lastly, another area of future research should examine the exact nature of the relationship between businesses and environments, and determine which business environments foster innovation and sustainability—along with how the two interplay in mutually beneficial ways.

One of the most promising features of using an eco-systemic approach is that the adaptive capacity makes it resilient to disruption. The study of systems—which focuses on the non-linear existence of everything we are, encounter, or create—recognizes that in order to sustain those resources that are within an eco-systemic relationship with ourselves, a sustainable system should be able to adapt, emerge, and be self-determinant with respect to all resources as capital, or the entire system will fail. This imperative, we hold, applies to business growth and sustainability as well.

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