Isn't It Time We Transitioned to Integrated Sustainability? De-Codifying the *Hard-Soft* Divide from a Systems-Theoretic Perspective

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Abstract

Purpose: The instrumental-normative divide that has historically characterized approaches to societal sustainability has also resulted in a rift between underlying mental models and methods destined to address the issue. This separation makes our understanding and tackling of the present global ecological problems only limited and ineffective. The present work draws on theoretical background to develop a conceptual framework for transitioning to integrated corporate sustainability.

Design/Methodology/Approach: Drawing inspiration from Luhmann's (1995) theory of social systems, we consider the instrumental (*hard*) and normative (*soft*) methods (Jackson 2019) for corporate sustainability as 'conceptual systems' that derive much of traditional social systems' attributes. These systems are autopoietic, complexity-reducing, and functionally differentiated. Following Luhmann's philosophical grounding, we suggest that integrating the two systems of *hard* and *soft* methods boils down to constraining both systems' internal complexity by imposing limitations on their operational structures. This translates into a *decodification-recodification* process whereby new methods emerge as a combination of initially disconnected structures.

Findings: The proposed conceptual integration framework is applied to the case of the Sustainability Balanced Scorecard (SBSC) which has been recently subject to inconclusive controversy. Our work demonstrates that redesigning the SBSC's architecture following the presented framework leads to embracing complexity, tensions, and conflict all the while offering a systematic approach for properly identifying and quantifying cause-effect relationships. Moreover, the proposed framework scores high in Complexity and Systemicity measures, making it both durable and practically useful. More generally, this work drives home the point that an integrated approach to sustainability management is not only important but also feasible and theoretically durable.

Research limitations/implications (optional): Theoretically, the present work underscores the contribution of systems theory, and particularly the Luhmannian perspective, to transcending some of the most salient 'divides' in approaches to societal sustainability. The decodification-recodification process not only enables integrating two distinct conceptual systems, but it also transforms the divide into an opportunity to gain a fresher perspective on one of the most challenging issues of our time. This process may demand, however, some adjustments as we move across various function systems, which requires solid knowledge and understanding of the underlying ‘codes’ that define the systems subject to integration.

Practical implications: This work implies that integration of varied, and sometimes outwardly opposed function systems, can and must be carried out to achieve larger societal impact. With respect to the illustrated case, the emerging dynamic SBSC offers a viable strategic planning platform whereby managers and stakeholders can concurrently define, forecast, and adjust the societal strategy that maximizes triple bottom-line indicators and sustainable development impact.

Social implications: Providing decision and policy makers with integrated sustainability management approaches and instruments will have a direct benefit on enhancing the way systems, and large corporations in particular, treat and deal with nature and human beings.

Originality/value: We propose that proper integration of multiple function systems, employing integrative, unbiased, and structured methodologies, can be decisive in challenging current practices in sustainability management and in providing informed guidance for making the high-stake decisions needed in the transition towards sustainable development of business and society.

Keywords: Luhmann; Systems thinking; Sustainability management; System dynamics; Sustainability Balanced Scorecard.

Introduction

Approaches to corporate sustainability management have grown in variety and complexity. Historically however, they have been subsumed under the classic instrumental-normative spectrum which reflects the core strands of the stakeholder theory of the firm (Donaldson and Preston 1995, Freeman 2010). On one end, instrumental approaches have been concerned with "identify(ing) the connections, or lack of connections, between stakeholder management and the achievement of traditional corporate objectives (e.g. profitability, growth)" (Donaldson and Preston 1995, p. 71) such that "adherence to stakeholder principles and practices achieves conventional corporate performance objectives as well or better than rival approaches." (p. 72). This set of approaches have generally relied on operational methods, labelled here '*hard'* methods, such as "conventional statistical methodologies" (p. 71), systems engineering and analysis, and individual or combined decision-aid techniques (Ananda and Herath 2009, Mardani et al. 2016, Diaz-Balteiro et al. 2017). These methods "concentrate(ing) on how to efficiently organize components and sub-systems to reach a pre-defined purpose" (Jackson and Sambo 2020, p. 16). On the other side, normative approaches have sought the "identification of moral or philosophical guidelines for the operation and management of corporations." (Donaldson and Preston 1995, p. 72). Under the normative approach, managers "have a moral responsibility to regard the interests of certain corporate constituent groups, including shareholders, as legitimate" (Jones and Felps 2013, p. 214 et seq.) Such guidelines have crystallized into various contributions including feminist ethics, Kantian ethics, norms of sociality, stakeholder rights, and principles of fairness (Jones and Felps 2013). More practically, for their implementation, these approaches have been classically underpinned by varied systems-thinking methods, labelled here as '*soft'* methods, that act toward "facilitating a shared view of a problematic situation" (Jackson and Sambo 2020, p. 9). Such *soft* methods include agent-based modeling, emergence and self-organization models, feedback and system dynamics (Schelling 1971, Sterman 2001, Onat et al. 2017, Williams et al. 2017, Rebs et al. 2019).

Of interest to this paper is the investigation of whether and how these two paradigms, with their respective underlying technologies – the *hard* and *soft* methods – could 'talk' to each other in ways that transcend the historic dichotomy. This task has been laboriously undertaken by multiple scholars who have presented various forms of integration (e.g., Donaldson 1999, Scherer and Palazzo 2007, Valentinov and Hajdu 2019). Indeed, managers in the modern corporation are continuously faced with the classic complexity-sustainability trade-off (Valentinov 2014, Wannags and Gold 2020) which they are required to handle in the most practical terms. As part of a system, firms that fail to appreciate this complexity-sustainability trade-off pose a danger to themselves; a focus on one (e.g., complexity reducing function) leads to disregard for the other (e.g., critical environmental dependencies), thereby undermining their own sustainability (Thompson and Valentinov 2017, p. 1078).

The failure to comprehend and internalize external complexity is most probably explained by the social system's operational closure (Luhmann et al. 2013, Thompson and Valentinov 2017) which is determined and shaped by organizational "codes" (Valentinov and Hajdu 2019, p. 3). The codification processes developed and maintained by the business firm influences the choice of instruments used to account for the interests of its stakeholders. These codes translate into methods that can similarly be abstracted as 'conceptual systems' drawing on Wallis' science of conceptual systems (Wallis 2015b, 2016, Wallis and Valentinov 2017a). Thus, since the firm system is described as operationally-closed and complexity-reducing (Thompson and Valentinov 2017), we could argue that its underlying and internally reproduced methods, being themselves considered as conceptual systems, are also operationally-closed and complexity-reducing, based on the autopoiesis principle of social systems (Luhmann et al. 2013, p. 70). This corollary strikes a chord with the observation that the decision-aid methods employed in corporate sustainability –or triple bottom line (TBL)– management processes are overwhelmingly operational, siloed, and restricted to punctual managerial problems (e.g. selection, prioritization, and optimization problems as in Kannan et al. 2013, Govindan et al. 2015, Wu and Chang 2015, Sedady and Beheshtinia 2019). Regrettably, these conceptual methods, while commended for their strong analytical stance, fail most of the time to consider the systemic nature of environmental sustainability, and consequently, to appropriately integrate environmental complexity through wider modelling perspectives (e.g., Abdelkafi and Täuscher 2016, Roth and Valentinov 2020).

Against this backdrop, it appears that investigating a 'reconciliation' route in the instrumental-normative divide, assuming the divide is real (Roth et al. 2019), boils down to excavating pathways for devising adapted *de-codification* mechanisms that would defy the presumed chasm separating instrumental/hard methods and normative/soft ones. In other terms, could an 'augmented use' of these methods, enclose within the necessary and sufficient de-codification mechanisms needed to make both ends conveniently 'meet and talk'?

We argue that this de-codification process is not only desirable and useful for ensuring the sustainability of systems, including environmental sustainability, but it is also practically feasible and theoretically sustainable (Wallis and Valentinov 2017b). We illustrate and appraise the efficacy of such a de-codification process with the example of a hybrid framework for a dynamic and integrative sustainability balanced scorecard.

Luhmann's Systems Theory

Luhmann (1995) posited that modern society can be described as a collection of multiple systems constituting each other's environments. While the range of possible human actions and experiences are infinite, in the system they are limited to a selection of actualized possibilities. This is because the individual mind, overwhelmed by human civilizational complexity, tends to simplify reality through the process of "complexity reduction" (Valentinov 2014). In this process, "Systems compensate for their inferior complexity by becoming insensitive to the complexity of the environment (Valentivov 2014, p. 4). In other terms, systems "increase complexity by reducing complexity" (ibid., p. 6). This 'complexity-reduction principle' is doubled with the 'critical-dependence principle' whereby systems develop insensitivity to environmental factors on which they critically depend, thereby undermining their own sustainability.

A preliminary corollary of the precarious system-environment relationship in the Luhmannian perspective is the autopoiesis of systems (Valentinov 2015), or their tendency to self-reproduce by means of continuous regeneration of their own components. Autopoietic systems are operationally closed, but maintain a connection to their environment through "structural couplings" (Valentinov 2014, p. 16, 2015) which enable systems to adapt to their environments and to develop internal "degrees of freedom" (Valentinov 2014, p. 16) that help them maintain their own complexity and carry out their autopoiesis. As systems overutilize this freedom, they exacerbate their environment, and with it, the critical conditions upon which their subsistence depends. This paradoxical contingency is described as the “complexity-sustainability trade-off”, which Luhmann proposed as a reason for the contemporary societal sustainability crisis.

Luhmann also explicates the current ecological degradation by another phenomenon, the “paradox of functional differentiation” (Valentinov 2015, p. 6). Functional differentiation references the diversity of functional areas that define society (economy, politics, law, etc.). While ensuring increased societal complexity, this functional distinctiveness makes inter-systemic communication “erratic, unpredictable and ungovernable” (Valentinov 2014, p. 17), in such a way as to preclude “the coordination […] required to halt the process of ecological destruction” (Valentinov 2015, p. 7).

Against the above theoretical grounding, we seek in the following to propose a systems-theory-based approach that attempts to explicate and to resolve existing tensions precluding the realization of integrated corporate sustainability in the business firm.

Corporate Sustainability through Corporate Eyes: The *hard* methods

Corporations are social systems in themselves that seek to reduce the environmental complexity on which they critically depend (Thompson and Valentinov 2017). To maintain their own continuity, these corporations devise self-controlling mechanisms that constrain their intra-systemic complexity to ensure a proper level of internalization of environmental complexity (Valentinov 2014). These mechanisms have materialized into various TBL management instruments and tools ranging from operational decision-making (e.g., Strantzali and Aravossis 2016, Kumar et al. 2017, Xia et al. 2017, Haffar and Searcy 2019) to performance assessment and monitoring (e.g., Searcy 2009, Searcy 2012, Tajbakhsh and Hassini 2015, Hahn et al. 2016, Pislaru et al. 2019), to sustainability reporting (UN Global Compact 2019, Global Reporting Initiative 2020).

Acting as competence-reinforcing mechanisms, these instruments have contributed to safeguarding the sustainability of modern corporations within their external environment. However, the highly mechanistic accounting for internal firm variables linked through intricate correlations and equations has left little space for the holistic integration of environmental parameters in the operational day-to-day decision-making. This complexity-reducing function undertaken by *hard* methods, as distinct conceptual systems, mirrors the ineptitude of neoclassical models to “do justice to the complexities and interdependencies found in real-world economic life." (Valentinov 2015, p. 3). These models fail to capture the non-linearities of interacting components including feedback, self-organization, emergence, and unexpected side effects (Helbing and Kirman 2013), running the risk, thus, of dwarfing the role of associated *hard* methods to serving the mere actualization of the firm's bottom line (e.g., Hahn et al. 2010, Hahn and Figge 2016). In fact, the autopoietic feature of these methods allow them to reduce environmental complexities (Thompson and Valentinov 2017).

Hard methods reduce environmental complexity for multiple reasons. First, managers are often ill-equipped to fully grasp the scope and depth of ecological and social sustainability and to readily propose efficient mechanisms for tackling such complexity. Functional specialization of managers within siloed organizational business units often translates into vertical managerial approaches and techniques focused on specific operational or situational problems, which hinders the development of holistic perspectives toward comprehending and properly prioritizing the requirements of societal sustainability. Secondly, sustainability is multidimensional (Whiteman et al. 2013, Williams et al. 2017) and involves "wicked" dynamics that surpass human mental models (Plous 1993, Hayek 1998, Vázquez and Liz 2011). Firms ability to acquire the required technologies to ensure integration of and coordination among the different societal functional systems is less realistic than hoped (Valentinov 2015).

Third, hard conceptual systems reduce environmental complexity because they embody the very complexity-reduction function of the firm system. Firms act as social systems that neglect society though their tendency to focus more on issues of *coordination* – deemed to ameliorate the firm's capability set – than on questions of *cooperation* – which enable inter-systemic trust and loyalty (Valentinov and Thompson 2019). By neglecting society at large, the firm ensures that its underlying autopoiesis-maintaining mechanisms, including the sub-system of hard methods, ignore broad environmental factors.

In essence, the complexity-reducing, autopoietic, and operationally closed conceptual system of hard methods ultimately leads to a reinforcement of the siloed approach to problem solving that renders many measures ineffective and facilitates eventual self-endangerment.

Corporate Sustainability through a Systemic Lens: The *soft* methods

Stakeholder theory stands among those that have shaped the debate around the viability of the business system as a generator of shared prosperity and universal sustainability. It rests on the idea "that a business has groups and individuals who have a stake in the success or failure of the business" (Freeman 1984; Freeman et al., 2010, p. xv) and who interact to jointly create and trade value (Harrison and Freeman 1999). The suggestion that "the manifestations of certain types of ethical behavior will result in competitive advantage" (Jones 1995, p. 421) may explain the widespread adoption of the instrumental stakeholder approach within the firm system (e.g., Porter and Kramer 2006, McWilliams and Siegel 2010, Porter and Kramer 2011, Jones et al. 2018, Kalyar et al. 2019, Calic et al. 2020). Proponents of this instrumental version of the theory maintain that such approach increases value for both stakeholders and the firm (Harrison et al. 2010, Harrison and Wicks 2013), and as a means of gaining credibility through effective corporate social responsibility (CSR) communication (Jauernig and Valentinov 2019).

Recent voices have challenged this instrumental viewpoint. For example, Weitzner and Deutsch (2019) has called for retirement of the instrumental stakeholder theory" (p. 1) while Roth et al. (2018) have called for a post-capitalist CSR that transcends its contemporary dysfunctionalities. Indeed, CSR "increasingly appears to be commodified and to primarily seek to increase profits or divert attention from negative externalities" (p. 1). It supports "the paradoxical anti-social essence" of the social logic of capitalism (Fleming and Jones 2013, p. xiii) to which CSR gives "an air of ethicality (or potential ethicality)" (ibid.), and legitimizes the continuous empowerment of the rich and powerful elite at the expense of universal justice and equality (Giridharadas 2019).

Some students of systems theories propose that the sustainability "of a system borrows from sustainability of a supersystem and rests on lack of sustainability in subsystems" (Voinov and Farley 2007, p. 107). Drawing on Bertalanffy's (1968) whole-part systems theory, these students explicate the contradiction in the sustainability of the socioeconomic ecological system and that of its components, such that sustainability of subsystems found in "lower hierarchical levels", including "firm, industry, economy, or even culture" (Voinov and Farley 2007, p. 108), is achieved to the detriment of the supersystem's sustainability, which "may work against sustainability of humanity and the biosphere" (ibid.). This system-environment tension is of considerable importance in contexts of degrowth marked by short-term market imperatives (Roth 2016), and if applied to the context of the firm, this theory helps to develop the reflection on integrating the firm system, with all its subsystems, into the natural system (Plaza-Úbeda et al. 2020). Contrastingly, in Luhmann's (1995) perspective, such tensions occur as a result of functional differentiation between multiple function systems (Roth 2017, Roth et al. 2019, Valentinov and Hajdu 2019). More broadly, the complexity-sustainability trade-off developed by Valentinov (2014) provides a solid conceptual foundation for navigating the dynamics of systems, including especially the business system, in their relation with the environment and their implications on societal sustainability at large.

Complexity theory provides fertile foregrounds for understanding and addressing societal sustainability. Manson (2001) breaks complexity theory into three major divisions: Algorithmic complexity, which deals with mathematical complexity theory and information theory and which "contends that the complexity of a system lies in the difficulty faced in describing system characteristics" (p. 2); deterministic complexity, which is based on chaos and catastrophe theories and which posits that "the interaction of two or three key variables can create largely stable systems prone to sudden discontinuities" (ibid.); and aggregate complexity which deals with the emergence of complex system behaviors based on individual interacting elements. As an outgrowth of general systems theory, complexity theory brings the additional benefits of tackling systemic non-linearities, emergence and self-organization patterns, and time evolution (Forrester 1994, Sterman 2001, 2018). Complexity theory offers substantial potential for more adequately addressing societal sustainability issues which have been described as wicked problems (Sun and Yang 2016, DeFries and Nagendra 2017, Goel 2019, Eden and Wagstaff 2020). Indeed, the conceptualization logic underlying system dynamics modelling, agent-based modelling, or self-organization concepts, naturally espouses the challenges and requirements of sustainability issues in such a way as to capture the complexities of feedbacks, non-linearities, and emergence, among others (BenDor et al. 2009, Machado et al. 2015, Zhang et al. 2016, Rebs et al. 2019).

As two distinct conceptual systems, the worlds of *hard* and *soft* methods have cohabited in respectful distance with each other. They have developed internal autopoietic protocols in their attempt to respond to sustainability questions. It is important to recognize, however, that such distancing has not always yielded the most favorable environment for fostering mutual exchange, cooperation, and co-construction. There might be reason to believe, then that the worlds of *hard* and *soft* methods might benefit from a more overt reconsideration of their respective scopes, roles, impacts and boundaries as it comes to addressing the timely issue of societal sustainability. This paper is an attempt at such reconsideration.

De-Codifying the Codes: Blurring Frontiers for Integrated Sustainability

Why Blur Frontiers?

Why is it important to create the hard-soft connections in approaches to corporate and societal sustainability? Or, turning the question on its head, why not doing so could be dangerous for systems' sustainability? Acting as separate conceptual systems, the hard and soft methods borrow much of the function systems' characteristics described in Luhmann's theory. As noted, hard methods employed by the firm reduce environmental complexity only to increase their own. They are functionally differentiated from soft methods and favor the development and rooting of complexity-enhancing feedbacks within the firm (Valentinov 2017, Valentinov and Thompson 2019). Consequently, a few critical problems arise.

First, while corporate sustainability methods are meant to reflect and account for the environment's needs and intricacies, current methods merely seek to reduce the complexity of their environments, leading to ineffectiveness. Ineffectiveness is worsened by the operational closure of the system of hard methods which makes integration with external systems' requirements almost impossible. This system and its effects are exemplified, for instance, by the hazardous industries undertaking shallow CSR initiatives devised, implemented, assessed, and communicated exclusively through corporate eyes. Here, we observe the attempted transformation of corporate sustainability methods and approaches into a socially accepted channel for advancing and legitimizing corporate agenda with only murky consideration for environmental factors (Prasad and Holzinger 2013).

Secondly, failing to integrate external complexities through soft methods into managerial hard decision-making processes engenders limited and biased appraisal of stakeholders' priorities upon which the firm's sustainability critically depends. In fact, "many stakeholders deem current sustainability performance measurement and assessment approaches insufficient for their needs." (Silva et al. 2019, p. 204). Yet, the vast majority of methods employed both in research and practice display high instrumental technicality that often overlooks external non-hard factors (Morioka and de Carvalho 2016). The result is a potentially unsustainable system that rests in ignorance of the broader environment (Valentinov 2015, p. 146). If the firm clings obstinately to hard methods to manage societal sustainability, then it endangers its own sustainability.

Finally, the growing rift between hard and soft methods poses considerable challenge to potential cross-fertilization benefits that can be reaped from their integration. Ultimately, the absence of such 'integrated solutions' leads to undermining the systems' own pre-requisites toward the "paradox of functional differentiation" which directly translates into "the ecological degradation of society" (Valentinov 2015, p. 148).

In sum, ignoring potential integration of the systems of hard and soft methods for sustainability management poses threats on multiple levels: on societal sustainability due to the autopoiesis and operational closure of the two systems; on firm's sustainability due to the paradox of complexity reduction; and on the sustainability of science and knowledge due to the paradox of functional differentiation.

De-Codifying the Codes

A Luhmannian perspective would suggest that integration of *hard* and *soft* methods systems is not unrealistic, considering structural coupling. Structural couplings regulate and constrain the range of possible structures used by the system to maintain its autopoiesis (Valentinov 2014, p. 17). Although it may not lead to perfectly coordinated inter-systemic solutions to societal problems, improved integration is feasible (Valentinov 2014, p. 18). Improving integration between the systems of hard and soft methods boils down to imposing limitations on the possible operations potentially carried out by each side. Practically, this is undertaken in two distinct and complementary ways: *Upstream limitation*, whereby the system self-imposes restrictions on the type of methods initially selected and kept within operation in order to address societal sustainability; and *downstream limitation* whereby the system erases existing codes and *rewrites* new ones by developing novel integration mechanisms. This *decodification-recodification process* entails the subsumption of sub-methods from both systems together into new methods that constitute the new 'codes' bridging the two systems.

In *upstream limitation*, the functional system keeps only the methods that are not radically skewed toward one end of the spectrum, such that the methods would not exclude eventual redesign of their descriptive boundaries toward incorporation of external elements from the environment. In *downstream limitation*, methods are redesigned following a decodification-recodification process: selected methods are analyzed and broken down into sub-elements to allow for innovative reconceptualization of their boundaries (or codes); this is the *decodification* step. Next, sequences from external systems' elements are incorporated within the disintegrated methods to allow for the resurgence of newly designed methods capable of making sense of both systems' complexities; this is the *recodification* step. The resulting methods can be considered as a newly emerging, smaller system that is firmly rooted in the two initially disjoint systems, forming therein an open route for information circulation, reciprocal understanding, and ultimate integration. This mechanism for integrating *hard* and *soft* methods systems through codification will enable defining preliminary junction points between traditional economics of the firm and ecological requirements of the global environment.

The *Hard-Soft* Divide in the Sustainability Balanced Scorecard: Case Illustration

The Balanced Scorecard

The Balanced Scorecard (BSC) was introduced by Kaplan and Norton (1996) as an instrument for monitoring organizational performance from a wider perspective than traditional finance. The authors realized that existing performance management systems presented two main limitations. First, standard financial ratios usually relied on in accounting and financial statements present a snapshot of the firm's past achievements as opposed to current or future performance, and thus could not be a dependable indicator of how the firm is likely to perform in the future. Second, business strategies usually follow a top-down pattern and are hard for employees to translate into clear measures they can readily make sense of. The BSC approach is based on the assumption that capital investment is no longer the only determinant of firms' success, and that factors like customer satisfaction, innovation and adaptability are increasingly more viewed as essential elements of a firm's long term success (Kaplan and Norton 2005). The BSC suggests that in addition to the finance perspective, organizations should screen three more perspectives: learning and growth, internal processes, and customer relationships.

As an extension of the traditional BSC, the Sustainability Balanced Scorecard (SBSC) has emerged as a strategic management tool that further encompasses ecological and social factors such as to support "the alignment and management of all corporate activities according to their strategic relevance." (Figge et al. 2002, p. 269). Matching organizational functions to sustainability outcomes, the SBSC has been recognized as an overarching instrument for sustainability performance management and monitoring (Möller and Schaltegger 2005, Schaltegger and Wagner 2006).

The Debate

Recently, the SBSC has been subject to debate with respect to both its relevance and suitability for effectively addressing corporate sustainability issues, and more particularly, for enabling a healthy transition to integrated sustainability (Hahn and Figge 2016, Hansen and Schaltegger 2016, 2017).

Two essential elements make up the major points of dissent: 1) The fit of the SBSC to effectively address corporate sustainability; and 2) the relevance of SBSC architectures non obstante where and how they are used. As for the fit, it has been argued that the SBSC is ill-suited to effectively address corporate sustainability issues for three main reasons: i) the SBSC's inadequacy to capture the level-spanning nature of sustainability; ii) the SBSC's inability to capture system complexity and to allow for embracing inherent heterogeneity and conflict; and iii) the SBSC's failure to enable transformational change towards sustainability. With respect to relevance, the argument revolves essentially around iv) the role of the SBSC's goals and hierarchy to execute or depart from a purely profit-seeking strategy; and v) the relationship between the SBSC's architecture and the firm value system (Table 1).

At face value, the above arguments appear primarily to be addressing reflections pertaining to the SBSC as a stand-alone management tool. However, the deepness and intricacies of the suggested arguments invite for a more thoughtful consideration of their underlying philosophies.

Beyond the Debate: The Hard-Soft Divide

The SBSC's fit or misfit for resolving societal sustainability issues, and the viability or not of concomitant architectures are merely the discernible side of a wider-spanning research investigation. In reality, the above argument markedly epitomizes the *hard-soft* divide in the approaches to corporate sustainability management. Clearly, the opposed parties advocate for distinct and visibly disconnected views of the most suitable approaches for the task. Hansen and Schaltegger (2016) advance the working complexity of the SBSC –including the underlying hard equations, the cause-effect chains, and the input-output models– as a powerful strategic management instrument for observing societal sustainability through a systematic and operationally rigorous approach. Hahn and Figge (2016), on their side, call for repositioning the adequacy of such a tool to integrate concerns of earth-human relationships in a systemic lens, to account for various stakeholders interests, and to properly tackle problems of non-linearity and conflict. Clearly, the opposed parties seem to speak the languages of *hard* methods and *soft* methods respectively in articulating their approaches to corporate sustainability management.

In view of this, contemplating integration avenues of the opposed approaches might serve to prompting the emergence of alternative conceptualizations toward effectively integrated management of sustainability (Figure 1).

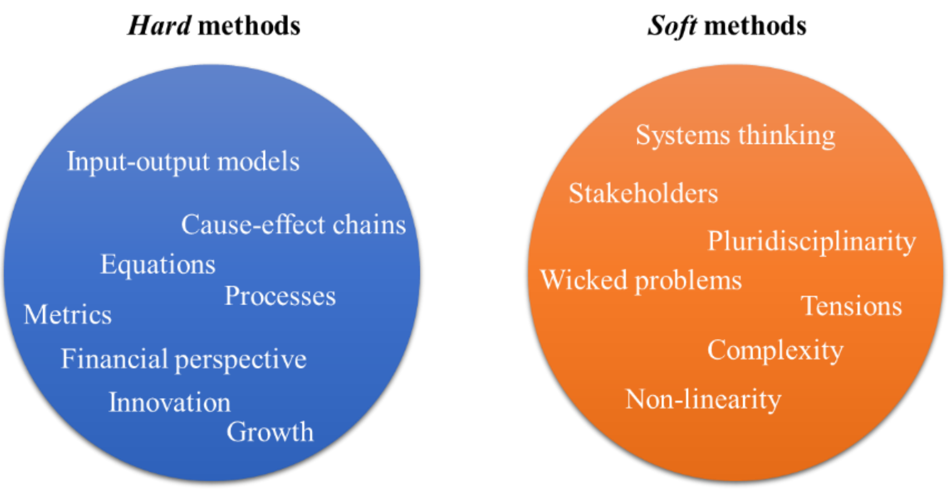

Figure 1. The worlds of *hard* and *soft* methods of sustainability management through the SBSC

Seeking integration between the two worlds comes to nothing more than de-codifying and recodifying the respective boundaries (or codes) of the two systems based on the *upstream* and *downstream limitation* mechanisms described earlier. This limitation –or withdrawal– process consists of re-engineering the underlying methods in ways to write 'new codes' satisfying specific integration conditions. Scrutiny of the ins and outs of the argument, considering the above theoretical grounding, enables to identify such conditions as below (Figure 2):

Condition 1: The SBSC should be used to measure the firm's social and environmental impacts (not outputs) on the external ecosystem as well as to forecast these impacts in the future.

Condition 2a: The SBSC should cater for eventual tensions arising from conflicting stakeholder groups.

Condition 2b: The SBSC does not need to faithfully represents reality with its complex, non-linear causal relationships, but complexity and non-linearity must have been analyzed and dealt with as part of SBSC design.

Condition 3**:** The SBSC should act as a checks-and-balances instrument that causes managers to become aware of their monitoring and strategizing deficiencies. The created 'torpedo effect' raises management's consciousness to take corrective and measurable action towards transformational change.

Condition 4a: The SBSC's architecture should not be predefined based on the prevalent firm's internal value system. Rather, it should emerge from the collective conceptualizations of internal drivers and external stakeholders, genuinely expressing their possibly conflicting priorities.

Condition 4b: The SBSC should not aim to present profit as the single and ultimate top-level goal.

Condition 5: The usefulness of the SBSC does not stem from, nor does it depend upon, the integration mode, which reflects the physical location of sustainability indicators on the scorecard's dimensions. Integration modes are indicative only and do not influence the use and role of the SBSC on formulating and executing the strategy.

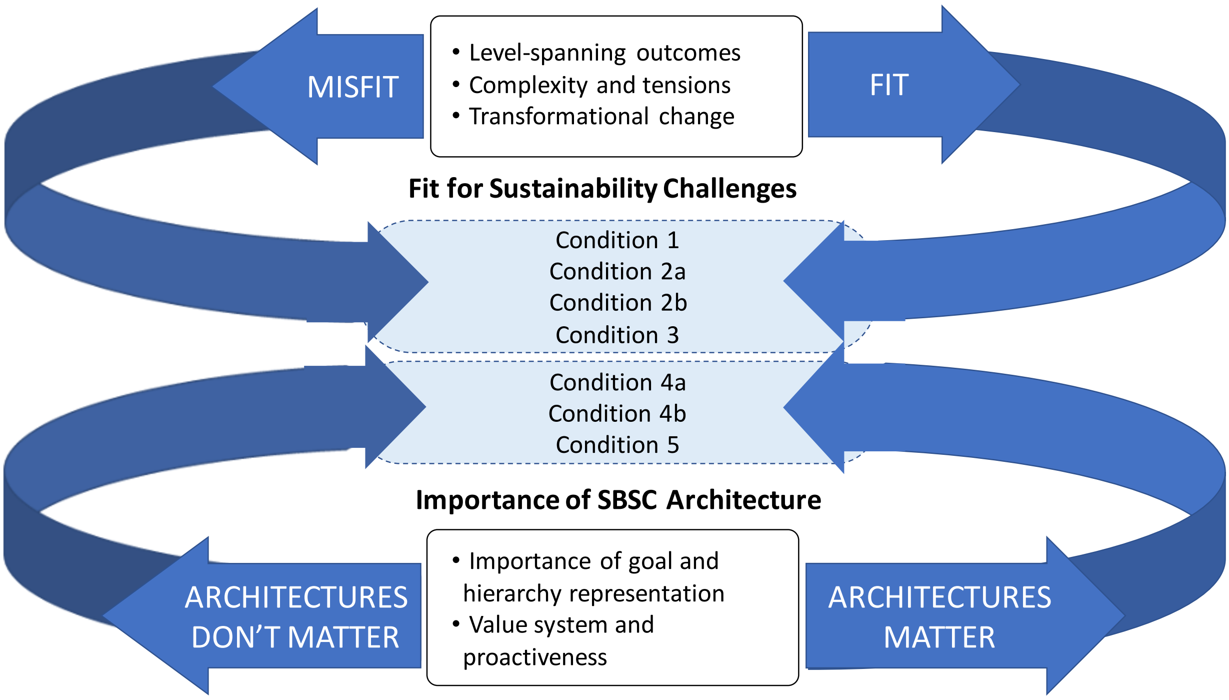

Figure 2. Conditions enabling the transition to Integrated Sustainability

These conditions allow explicating the divide in the argument and detecting research areas that would benefit from further exploration (Table 1).

Table 1. Integration conditions and Decodification-Recodification requirements

	SBSC perceived weakness	*Criticism by _ENREF_31Hahn and Figge (2016)*	*Argument by Hansen and Schaltegger (2017)*	*Decodification-Recodification requirements*	*Integration conditions*
Fit of SBSC to address Corporate Sustainability	**Level-spanning outcomes**	Failure to address earth-human problems	Question the relevance of addressing systemic problems at the firm level.	Assessing and measuring the impact of firm sustainability strategy with the SBSC on the external environment and ecosystem.	Condition 1
	Complexity and tensions	Failure to embrace complexity and inherent conflict.	SBSC is not meant to describe complexity but to help simplify the complex reality. Consideration of ambidexterity in management of sustainability.	Embracing organizational complexity and tensions by relying on systems that can help solve wicked problems. System dynamics modeling, for example, allows representing systemic non-linearity and complexity through dynamic feed-back loops and stock-flow modeling (Bianchi and Montemaggiore 2008, Barnabè 2011, Tsalis et al. 2015).	Condition 2a Condition 2b
	Transformational change	Failure to trigger radical change towards sustainability	Strawman argument. Warning against overloading the SBSC with unintended expectations.	Exploring interactive SBSCs through dynamic levers that enable evaluating the impact of various sustainability actions and decisions on organizational goals, and that suggest counteractive action. This process eventually provides the necessary grounding to guide managers into switching to more transformational strategies towards sustainability.	Condition 3
Importance of SBSC Architectures	**Goals and hierarchy**	Architecture is Irrelevant.	Architecture is useful to determine firm priorities.	Demonstrating the role of SBSC architecture to *clarify* and *quantify* priorities through analytical decision aid techniques (Hubbard 2009, Hsu et al. 2011).	Condition 4a
		Strong subordination of societal objectives to profit.	Alternative architectures (flat or semi-hierarchical) proved effective in sustainability management.	Exploring alternative strategy map design methodologies that allow flexible and emergent arrangement of SBSC perspectives without preconceived prioritization or subordination.	Condition 4a
		Hierarchy only serves to maintain profit-oriented value systems.	Profit is not evil. Profit can serve a healthy cohabitation of economic and societal aims.	Exploring frameworks where profit and societal impact are mutually supportive in a self-reinforcing loop.	Condition 4b
	Value system and sustainability proactiveness	Flawed connection between SBSC integration modes and firm sustainability strategy.	*Outside-in* contingency framework. SBSC architecture fit with two contingency factors (sustainability strategy and firm value system).	Exploring design processes where SBSC construction and sustainability strategy and value system evolve jointly in complementary and corrective cycles.	Conditions 4a, 4b Condition 5

If properly satisfied, the conditions above enable redesigning the SBSC based on a novel combination of the two systems of hard and soft methods. The emerging system bears the new codes created from the welded methods (Figure 3).

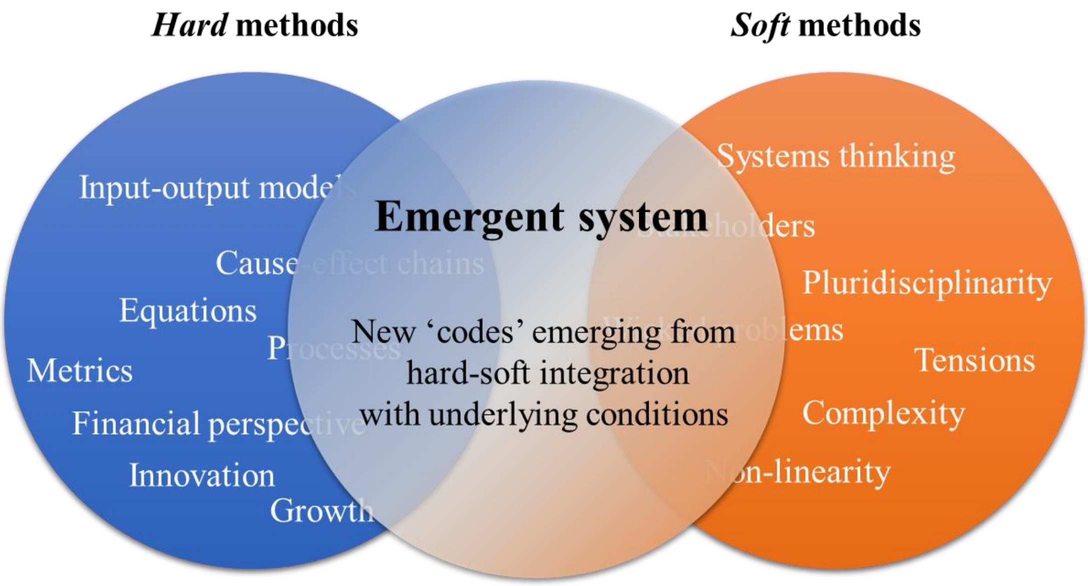

Figure 3. The emerging system from the integration of the worlds of *hard* and *soft* SBSC methods

Transitioning to Integrated Sustainability trough the SBSC: A Proposed Framework

In the following, we propose a SBSC design framework that 1) satisfies the integration conditions outlined above, and 2) illustrates the decodification-recodification process supporting such integration. The framework is constructed in two phases. Each phase consists of sub-steps that highlight the *upstream* and *downstream* withdrawal function described in the decodification-recodification process (Figure 4).

Phase I: *Designing the emerging SBSC structure.* A major weakness of the classical approach to the BSC construction process relates to excluding important stakeholder groups, such as suppliers, government agencies, NGOs, etc., (Kaplan and Norton 1996, Tsalis et al. 2015). In contrast, the present framework invites active and methodical participation from multifarious stakeholder groups *(condition 2a)* in a three-step process:

1) *Defining the SBSC perspectives*. The process begins with the formation of a committee comprised of internal and external stakeholders to jointly develop the SBSC's conceptual architecture. The committee decides on the perspectives to include as well as on a discretionary integration mode (Figge et al. 2002, Hansen and Schaltegger 2016). Here, any chosen integration mode is not a constraint per se to the efficiency of the SBSC since all indicators will eventually be linked to one another in the dynamic strategy map. Therefore, perspectives do not function as distinct silos, instead, the boundaries between them are dissipated; *Condition 5* is satisfied.
2) *designing the strategy map and inter-perspective relationships*. In this critical step, committee members decide on the SBSC's overall hierarchical structure. Far from being exclusively influenced by the subjective conjectures of firm managers, this step involves a peculiar combination of soft and hard methods, exemplifying the typical decodification-recodification process of integration. In essence, two methods from the two worlds are combine: Decision-Making Trial and Evaluation Laboratory (DEMATEL) (Chen et al. 2011, Jassbi et al. 2011) and stakeholder theory in a participative process that yields the best possible conceptualization of the SBSC strategy map. DEMATEL is a technique that has been consistently used to effectively construct unbiased, structured, and measurable cause-effect links among elements of a system (Chen et al. 2011, Jassbi et al. 2011). It has been applied in various fields including sustainability management, (Mehregan et al. 2014, Gandhi et al. 2015, Wu and Chang 2015). By being part of DEMATEL process, committee participants become the main contributors and designers of the SBSC strategy map in a structured methodology that helps to overcome mental models' biases through systematic identification of both the links that might or might not exist among balanced scorecard (BSC) perspectives and the nature of influence exerted by factors (cause or effect) (*condition 2b*) (Chaker et al. 2017). In addition, to account for ambiguity and imprecision in human language, fuzzy logic is integrated with DEMATEL method to help to effectively translate linguistic variables into crisp data (Tseng and Lin 2009, Lin 2013). The resulting SBSC architecture is thus a representation of stakeholders' understanding of what the firm's sustainability strategy ought to be, which supports the *outside-in* outline described in Hansen and

Schaltegger's (2017) work. It is of importance to mention here that this fuzzy DEMATEL-based representation is not tied to any preconceived hierarchical structure since participants don't know initially which perspectives will be subordinated to which others. Subordination is only determined by the total direct-indirect matrix derived from the method; *conditions 4a and 4b* are met.

3) *defining key performance indicators (KPIs) and inter/intra-perspective KPI links*. Indicators in the SBSC influence each other in various forms. These influences evolve in time and change with contexts (Schoeneborn 2003). In the SBSC design process, it is important to be able to capture the essence of this interdependence and quantify these relationships in an objective and structured methodology as recognized in *condition 2b*. In this step, DEMATEL with fuzzy extension will ensure that the above-mentioned characteristics are respected.

Upon completion of the design phase, a conceptual static representation of the SBSC is obtained with systematic inter-perspective and intra-perspective cause-effect chains. The essential advantage of the design methodology proposed in this first phase is two-fold: First, the SBSC's overall architecture and hierarchy are not initially imposed by managers or pre-existing frameworks and mental models (as in the traditional balanced scorecard (Kaplan and Norton 1996)). Instead, the hierarchical structure emerges from an analytical process where multiple stakeholders are involved. Second, the direction and strength of the cause-effect links among KPIs and between perspectives are determined based on an accurate and non-subjective analytical technique, which ensures both the inclusion and the positioning of all the salient elements in the SBSC map.

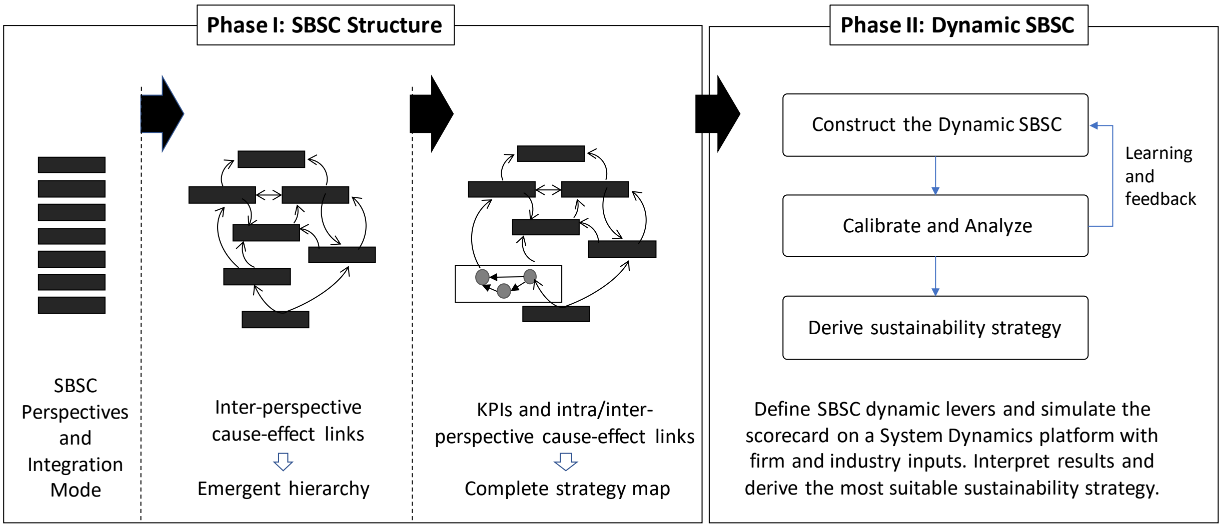

Figure 4. Proposed framework for integrate sustainability through the SBSC

Phase II: *Deriving the Dynamic SBSC.* A major criticism that has been addressed to the conventional BSC pertains to its static character which presents only a given picture of the organization at a specific point of time (Nørreklit 2000, Barnabè 2011). The dynamic balanced scorecard was introduced as a mechanism to address the deficiencies of the BSC relating to time delays, feedback, and non-linearity (Akkermans and Van Oorschot 2005, Bianchi and Montemaggiore 2008, Barnabè 2011), resulting in the so-called dynamic BSC. Later, the sustainability dynamic SBSC was introduced (Tsalis et al. 2015).

For integrated sustainability, we construct the SBSC as a system dynamics model incorporating feedback loops and data inflow/outflow across perspectives. The resulting dynamic SBSC accounts for the complexity that is naturally inherent to sustainability. More generally, system dynamics modeling brings the advantage of modeling complexity by combining the technical grounding from mathematics and engineering with the nonlinearities of social and environmental sciences, organizational behavior, and psychology (Forrester 1997). A pivotal question is raised though around managers' ability to properly convert real world information into reliable systemic models (Sterman 2001). Existing alternatives used to derive system dynamics models are all based on soft methodologies with no rigorous quantitative foundation (Forrester 1994). It is believed that "system dynamics [...] is lacking objective processes for model conceptualization" (p. 253). To address this important deficiency, the proposed dynamic SBSC uses variable weights derived from the total direct-indirect fuzzy DEMATEL matrix obtained in Phase I to ensure a systematic and unbiased recognition of the most important causal links amongst the SBSC variables and the strength of influence they exert on one another (as in Chaker et al. 2015). Thus, in phase II of the design process, the emerging SBSC underscores two keystone features: the assessment and forecasting of corporate sustainability impact on the ecosystem (*condition 1*); and ad-hoc simulation that supports strategy formulation, gap analysis and strategy reformulation (*condition 3*).

Discussion

The SBSC design framework presented above embodies a live illustration of integration between two distinct and seemingly disconnected conceptual systems. Drawing inspiration from Luhmann's (1995) theory of systems, this integration process rests on the restriction of the possible operational arrangements that the system is able to carry out (Valentinov 2014). Thus, following *upstream* and *downstream* limitation processes, we reconfigure the systems of hard and soft methods required for a more comprehensive understanding of societal sustainability issues. This reconfiguration consists of decodifying and recodifying respective elements of the systems (selected hard and soft methods), based on identified bridging conditions, so as to enable the emergence of newly codified, integrated, elements (Figure 5). In particular, the above illustration shows that an integrated, multi-disciplinary approach to sustainability management is feasible.

The proposed SBSC attends to the key research gaps identified in Table 1. With respect to goals and hierarchy, the proposed framework enables the natural emergence of adaptive SBSC structures that reflect in the least subjective way various stakeholders' perceptions and needs. As conflict in sustainability management is considered to be the general rule, not the exception (e.g., Hahn et al. 2010), making room for properly raising the right tensions and confronting contrasted viewpoints must be a priority in SBSC design. The present framework responds to this priority by effectively integrating different stakeholder groups, non-obstante their "salience" (Roth et al. 2019, p. 681), within the strategy map creation process toward the generation of a *truly balanced* SBSC. This makes a viable contribution to research in this arena as no work has hitherto explicitly proposed a model that enables the natural emergence of such adaptive and balanced architectures in a systematic and integrative methodology.

With respect to complexity and non-linearity, the present framework relies on dynamic modeling of firm's cause-effect relationships using feedback loops and time delays. Corporations are complex systems because they involve relationships that are both multiple (large in number) and complex (non-linear). The systemic evolution of a firm is thus unpredictable from a linear modeling perspective. In such contexts, system dynamics can be a suitable approach for capturing complexity that arises from non-linear interrelations (Tsalis and Nikolaou 2017). In particular, the dynamic SBSC is seen as an appropriate tool for representing the changing dynamics of a complex organization with a map of perspectives and key performance metrics (Tsalis et al. 2015).

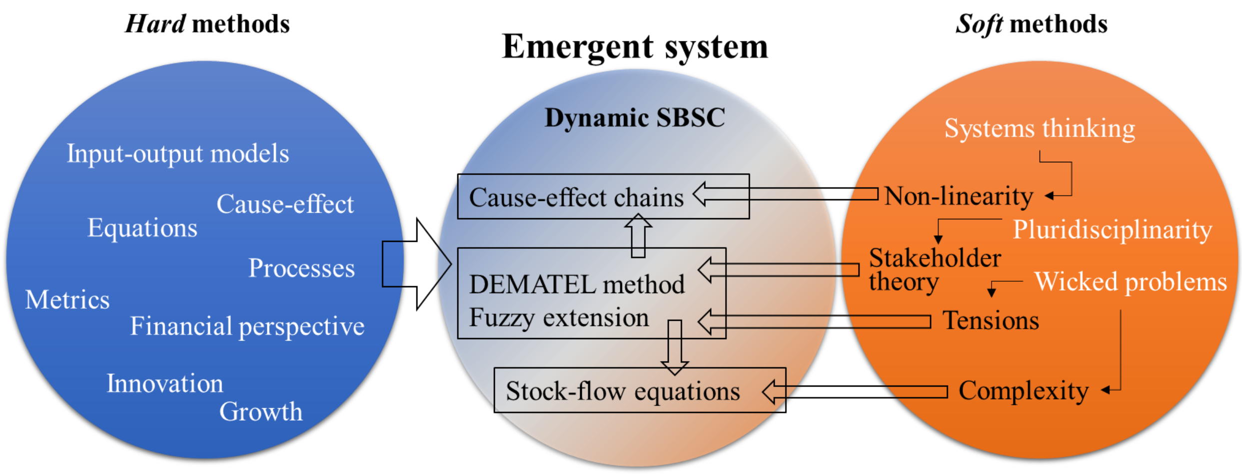

Figure 5. Decodification-recodification process in the hard-soft method integration

With respect to causality, the present framework validates causal relationships in the SBSC with a proven analytical technique in the system dynamics model. In the conventional BSC, and the SBSC by extension, relationships between indicators and perspectives are based on "experience and common sense" and "could not be statistically validated to be causal" (Sundin et al. 2010, p. 16). The arrows in the strategy map were not originally intended to express statistical cause-effect relationships, but rather general interdependencies (Sundin et al. 2010). This observation challenges our advancement in that topic on two fronts: first, as modelers, we do not have a mechanism indicating which cause-effect links do exist between which indicators –or perspectives. Second, assuming we identify some of those causality links, we are unable to accurately quantify the degree of influence exerted by the variables. Unless these two challenges are overcome, we may not consider the SBSC to make a faithful representation of the real world. The present framework enables constructing cause-effect relationships with fuzzy DEMATEL technique, which allows 1) elucidating the existence or not of important causality links between variables; and 2) affecting appropriate weights (or degrees of influence) to different links in the causal relation map derived from DEMATEL's total direct-indirect matrix. Thus, the framework simultaneously addresses causality (versus mere interdependence), accuracy (versus common sense), and objective assessment (versus mental models' subjectivity) (Figure 6).

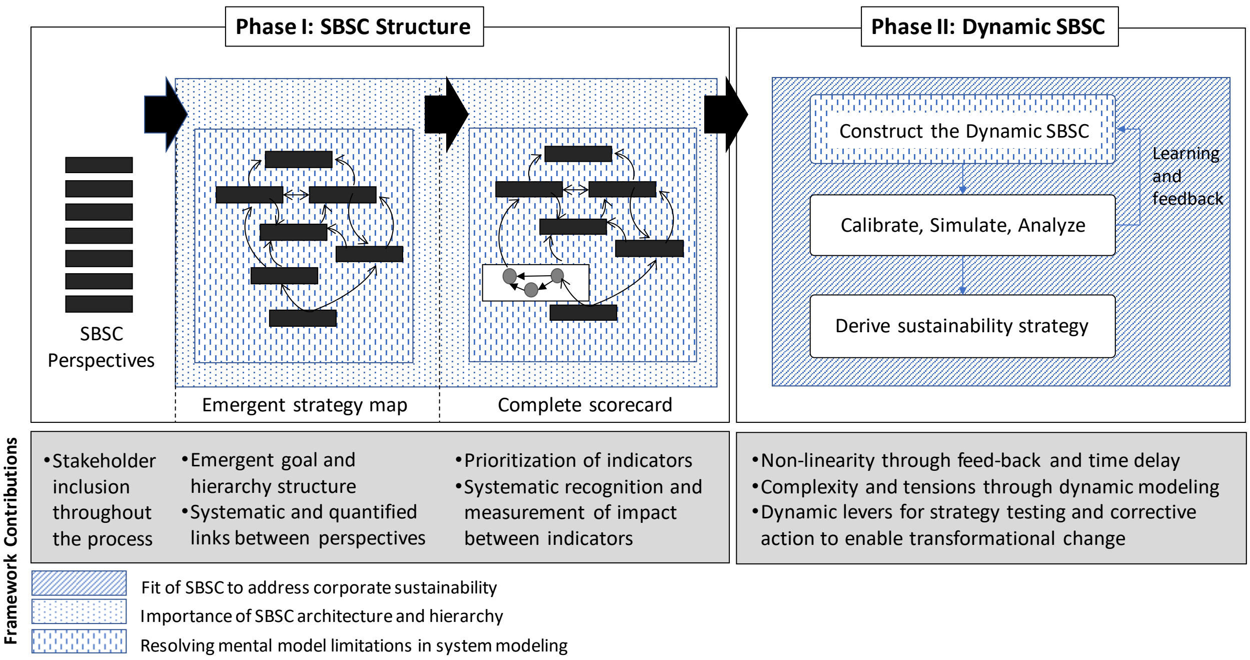

Figure 6. Conceptual contributions of the proposed SBSC design framework

Lastly, and most importantly, the present integration framework is theoretically sustainable; that is, it enjoys both *Complexity* and *Systemicity* required in Integrative Propositional Analysis (IPA) (Wallis 2015a, 2016). In IPA, Complexity refers to the number of concepts within a theory while Systemicity is the "measure of interconnectedness between those concepts; essentially a ratio of concatenated concepts to the total number of concepts" (Wallis and Valentinov 2017b, p. 3). Systemicity varies between zero (no connectedness) and one (high connectedness), and "is held to be a strong indicator for the usefulness of a theory." (p. 5) The higher the theory's Systemicity, the more useful it is. In general, “IPA shows that theories are more effective in practical application when they have higher levels of Complexity and Systemicity” (ibid.). In the proposed SBSC design framework, Complexity is inherently present with the large number of key performance indicators involved within perspectives. These elements are tightly interconnected with one another through cause-effect links identified and quantified using DEMATEL method, which allows for high Systemicity of the emerging SBSC system. Thus, the present design framework is potentially theoretically sustainable and highly useful in practical application.

Conclusion

Societal sustainability, which comes at the crossroads of multiple and diverse sciences, is most often studied under disparate and distinct disciplines that favor vertical mental models with highly specialized, highly siloed thinking. It is interesting to observe that few research efforts have been undertaken for conceptualizing transverse integration of sustainability disciplines toward advanced understanding, and likely resolution, of the current societal sustainability crisis. This paper attempts to fill this gap in proposing a theoretical approach for integrated sustainability inspired from Luhmann’s (1995) theory of social systems. In this effort, we view the worlds of *hard* and *soft* methods for sustainability management as individual conceptual systems (Wallis 2016) that inherit much of functional systems’ characteristics in the Luhmannian perspective. These two systems are thus autopoietic, operationally closed, functionally differentiated, and complexity reducing (Valentinov 2014, 2015).

Conceptualizing integration of the two systems boils down to ‘withdrawing’ their own complexity by restricting the range of possible structures used by each of them to maintain its internal autopoiesis (Valentinov 2014). Practically, this translates into re-engineering the underlying methods in a two-phase process: *upstream* limitation and *downstream* limitation. The resulting decodification-recodification leads to the emergence of a new system of fused methods that carries ‘codes’ from the two integrated systems, and that is prone to offer a broader, more comprehensive understanding of societal sustainability issues.

To illustrate this integration process, we drop anchor in a stimulating debate that was raised around the viability and usefulness of Sustainability Balanced Scorecard (SBSC) architectures in ensuring a safe transition toward integrated sustainability. We model the conditions under which the points of dissent are brought to common ground and propose a SBSC design framework constructed following the decodification-recodification process. The emerging methods of the new SBSC draw from both *hard* and *soft* systems' attributes and therefore, enable overcoming, in a systematic and non-subjective way, most of the limits of the conventional balanced scorecard including complexity, non-linearity, conflict management, and cause-effect relationships. Moreover, the proposed framework exhibits high Complexity and Systemicity factor measures (Wallis 2015a), which makes it enjoy high durability and effectiveness in practical application within the corporate and societal realm.

More generally, the present work makes an important contribution to sustainability management research and practice. First, by drawing a parallel between social systems and conceptual systems, we drive home the argument that a thoughtful combination of operational (*hard*) and systemic (*soft*) approaches to sustainability management will improve our understanding of this emerging area of research. Constructing models and frameworks that successfully integrate crosswise sciences (human, environmental, economic, etc.) with engineering and mathematical modeling can make a significant addition to sustainability research and can potentially take this field to the next level of performance. Second, recognizing that this integration is advantageous and necessary for the sustainability of systems, we demonstrate that it is also feasible and useful in very practical terms.

It is worth mentioning, nonetheless, that while the proposed decodification-recodification integration process is generalizable to multiple systems, its undertaking is not so straight-forward and may request some re-engineering mechanisms based on contextual variables. For example, seeking integration between the legal and economic function systems may employ integration forms that are different from those demanded between the political and environmental function systems. Furthermore, leading successful integration between two distinct systems would require a good enough grasp of both system's codification processes.

For further validity, the present conceptualizing work may benefit from practical experimenting on real social (business and society) and conceptual (hard and soft methods) systems. Such field experimentation would serve to underpin the theoretical statements and/or uncover unexplored pathways toward palliating potential shortcomings. Prospectively, the present work calls attention for revisited consideration of the prevailing learning structures in our education systems which most predominantly tend to put learners in ‘categories’ of knowledge. The vastly complex and unpredictable world we live in necessitates, indeed, transcending the vertical learning paradigms with horizontal frames that enable embracing multifarious knowledge levels toward stronger mutual understanding and undertaking of long-term societal sustainability.

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