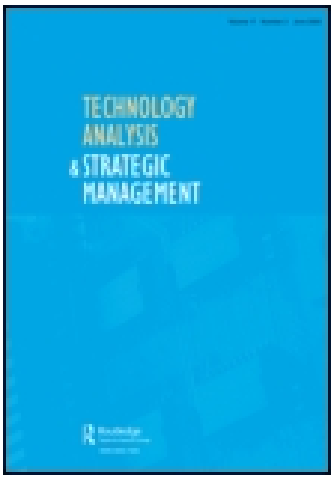

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A framework, with embedded FTA, to enable business networks to evolve towards sustainable development

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A framework, with embedded FTA, to enable business networks to evolve towards sustainable development

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This paper suggests a dynamic framework of continual learning to enable a business to develop a capacity to anticipate and address change within the networks in which it is embedded, using future-oriented technology analysis (FTA) thinking to shape the business's path towards sustainable development. The proposed framework has been devised to enable a firm to become a participant that helps shaping the path to a common vision within its network being flexible enough to adapt to the changing circumstances of the environment and of its relationships. The objective is to help organisations create a tailored as well as a common strategy in their network of relationships, with the support of FTA, achieving influence among their partners to progress towards higher levels of sustainable development, in order to reach the desired common vision of sustainability.

Keywords: network vision; management framework and path to sustainable development; dialogue and interaction; disruptive and transformative change; FTA and complex ecosystems

1. Introduction

Future-oriented technology analysis (FTA) thinking is used in an explanation and a model of how companies create enduring continuity needed for sustainable development (Brundtland 1987). This paper suggests a dynamic framework of continual learning to enable businesses to anticipate and address change in the networks within which they are embedded. The behaviour of these networks is analysed from the perspective of sympoietic complex systems. Embedding FTA within the proposed management dynamic framework enables business networks to develop their sympoietic system capability, through interactions and inclusive dialogue, thus contributing to a business's successful continuity.

The sustainable development of a business depends on the integration of sustainable thinking into mainstream decision-making and core operational processes: this differs from the triple-bottom-line approach (Elkington 1998).

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Sustainability can be defined as the capability of an organisation to persist into the long-term future: sustainable development would then be the processes needed to move towards sustainability (SIGMA 2001). Therefore, policy-makers' responses to sustainability are multifaceted choices that must consider the interdependencies between the many dimensions of sustainable development.

Hence, business sustainability evolves from the linear concept of a value chain introduced by Porter (1985) or the current paradigm of supply chain management or value nets (Bovet and Martha 2000a, 2000b, 2000c, 2000d, 2000e). The analysis of value within a firm (Porter 1980, 1985a, 1985b, 1991, 1997), through the integration of customers into the chain (McStravic 1999) and later the incorporation of suppliers/deliverers as well as customers (Bovet and Martha 2000), leads to a network of value creation. Value is still translated by an 'economic' bottom line and, in this context, is decoded in financial returns to shareholders based on operation efficiency and/or customers' and/or suppliers'/deliverers' engagement, with the ultimate goal of satisfying customers' needs.

The concept of a value chain became fundamental to strategic planning once Porter described how a firm can use it to identify sources of differentiation, choose the breadth of its competitive scope, improve its organisational design, perform cost and efficiency analysis, and identify sources of interrelationships between business units (O'Sullivan and Geringer 1993). Developments in this approach, such as the natural value chain and value nets, bring into the scenario the requirement of aligning customers and also suppliers in the decision-making process and the operational procedures needed to carry out the necessary value activities to achieve the ultimate goal of satisfying the end-customer. All these approaches focus on the operational processes or value activities, and their necessary supporting procedures, to transform basic inputs into final goods or services. These can and should be triggered by customers to enable the process to be effective and able to deliver the expected value.

However, to deliver wealth, aligned with social and environmental benefits, to shareholders and to stakeholders within society, value has to be redefined. To do so, the research outlined in this paper builds upon a critical view of value creation and competitive advantage in both supply chain management and corporate social responsibility (CSR). The overall research strategy is depicted in Appendix 1. Currently, both supply chain management and CSR use financial rhetoric (e.g. social, ethical and environmental) embedded in shareholder logic. In this paper, a new concept of networked sustainability (Cagnin 2005) is introduced as an evolution of the value net. Value is redefined to be a triple-bottom-line balance of the creation of economic, environmental and social values to and by all actors within a business's network: the redefinition is based on universal principles (Covey 1997) shaped by six dimensions of sustainability (Bursztyn et al. 1999; Loveridge 1999; Cagnin 2005), namely social (S), spatial-technological (ST), economic (E), ecological (Ec), political (P) and values-norms (V) (acronym SSTEEPV).

In this context, Section 2 outlines that current models responsible for moulding a business's competitive advantage sustainably are weak in the nature of stakeholders' involvement in strategic partnerships. There is a rising importance in comprehending the advantages that firms can gain from network relationships (Hoffman 2000) and in understanding how networks operate and how a network environment can enhance the core competencies of a firm: these lead to sustainable competitive advantages. Hence, there is still a latent need to understand how other stakeholders can bring value to a firm – and vice versa – to help shape different sustainable competitive advantages.

Section 3 describes that networked sustainability goes one step beyond the value net by considering the global system within which a firm is embedded, including nature and different stakeholders within society in one interconnected system. Such a network has to operate as a cyclical system where value is redefined from Porter's strategies, on cost leadership and differentiation, to be

represented by a triple-bottom-line balance or the creation of economic, environmental and social values to and by all actors within the network. It is based on universal principles and shaped by the other three pillars of sustainable development: spatial-technological, institutional-political and cultural-values.

Cooperation and dynamic partnerships (Holliday, Schmidheiny, and Watts 2002) are the cornerstones of networked sustainability. Moreover, the value activities in the network must align and integrate operational processes, as in a traditional value chain, but also be able to build an approach in which actors in the network participate in defining common vision and strategy. The important questions are as follows: which activities play a key role in enabling businesses to access new sources of competitive advantage and should be considered as value activities of a network and what roles can FTA play as well as how the network value activities ought to evolve in time to shape business sustainability?

In Section 4, the value-creating activities managed across a business network are linked to the ability of a network to self-organise: it must also be able to anticipate and respond to transforming disruptive change. The proposed management framework and the roles that FTA can play are then introduced comparing networks to complex sympoietic systems. Finally, Section 5 summarises the main conclusions and outlines implications for policy and subsequent decision-making.

2. Analysis of existing tools and their gaps

Since the 1990s, a range of tools have been brought in to help companies design their path to sustainable development. The processes and activities embrace the necessity for internal and external communication of social and ethical actions; stakeholder dialogues; organisational change, fair and ethical negotiations; fair work conditions; training and education of human resources; environmental and animal protection; community development and human rights, among others.

Existing tools (Appendix 2) operate in two broad areas: first, in a group of critical principles that need to be internalised into the core of the organisation's operations to shape the route towards sustainable development and, second, to compose management approaches. These seek to support firms while they implement monitoring and reporting of the activities that each enterprise believes are needed to achieve an enhanced triple-bottom-line business performance.

There remains a gap between offering the crucial principles and values that should mould an organisation's behaviour and how these are translated into activities able to shape specific actions according to its context in individual, network and organisational culture (Caldow and Kirby 1996). The situation seems to rely on the ability to build a group of generic behaviours or actions over which a company can correlate its own culture in order to design its individual path towards sustainable development and implement the envisaged plan. The group of generic behaviours or actions is that which should be promoted so that companies can effectively follow their (network) vision of sustainable development.

Each of the most used business sustainability tools (Appendix 2) is allocated according to the four main functions that the tool can perform inside companies and the six dimensions of sustainability. The current gaps that are being tackled by the proposed framework in comparison to the analysed tools are also depicted. The focuses of the four functions are as follows:

- *Principles and values*: primarily universal principles and their learning aspect, that is, how companies integrate or 'internalise' the underlying principles into their vision so that they can be further translated into their core business operations.

Table 1. Existing tools and their relation to the PDCA cycle.

PDCA cycle and Management system		Life-cycle analysis	ISO 14001	AA 1000	SIGMA
	Decide to be in business		Environmental policy definition		
P	Design the business	Objective and scope	Planning	Planning	Planning
D	Run the business	Inventory analysis	Implementation and operation	Accounting	Delivery
C	Monitor the business	Impact evaluation	Verification and corrective action	Auditing and reporting	Monitor, review and report
A	Sustain the business	Interpretation	Critical analysis by leadership	Embedding	Leadership and vision

Source: Chehebe (1998), ISO (2012), D'Avignon (1996), Cajazeira (1997), Donaire (1999), Maimon (1999), Accountability (1999), BSI (2003).

- *Actions or behaviours*: the actions or behaviours needed to promote the translation of the principles embedded in the vision into broad activities that, shaped by a firm's individual context and culture, will offer different and clear possibilities to implement the organisation's (network) vision of sustainable development.
- *Management approach*: supporting a company's selection among the underlying possibilities of improvement so that it can shape a strategy to achieve the desired vision of sustainable development and implement the designed plan to meet this vision, as well as monitoring the business and its stakeholders' performance.
- *Operation performance*: verifying and reporting the business performance improvement through established and specific indicators so that one can redefine its strategy and shape a new plan for the next cycle of improvement.

Table 1 gives a brief overview of some of the tools depicted in Appendix 2 and how these generally relate to the PDCA (plan–do–check–act) cycle (Campos 1992; SIGMA 2001), which describes the layer behind business management systems. The continuous improvement cycle found in the PDCA is the key process for driving learning and innovation in an organisation. These tools are based on continuous improvement cycles as firms need to undergo a whole cycle of implementation in order to learn for the next cycle and are, therefore, able to deal only with incremental changes rather than with disruptive ones.

3. Maturity model: a path towards networks'sustainable development

3.1. *Network value activities*

Traditionally, in a network, value activities are the building blocks by which a firm creates products and services valuable to its stakeholders: value chain activities are divided into primary activities (physical creation of a product) and support activities (support the interrelationships among primary activities). In a non-traditional network, value activities remain undivided since they all leverage and support each other: they need to be integrated to be considered as 'primary' for the

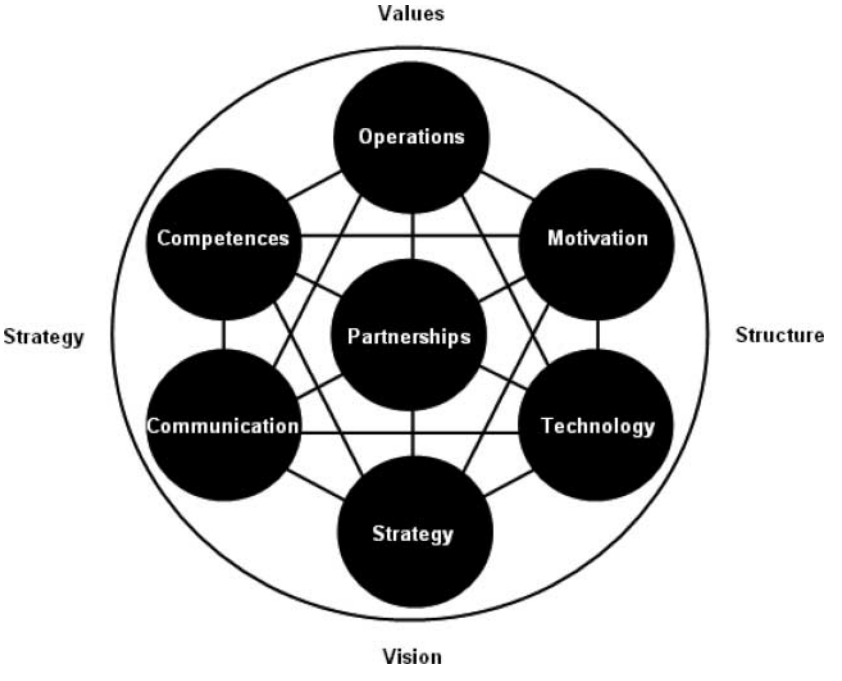

Figure 1. Business sustainability activities model.
Source: Cagnin (2005).

development and delivery of responsible products and services across the network throughout their life cycle. The heart of a network becomes interaction alignment and integration of all operations and their supporting activities across products and services among all its actors. Would that be enough to achieve this life-cycle objective?

For the six dimensions of sustainability to be embedded in a firm's core operations, its operational activities must be integrated throughout its network and in alignment with a common strategy across the network. The latter depends on creating an interactive dialogue through active participation and mutual understanding among the actors involved to enable the whole network to pursue the same vision of sustainable development. The accomplishment of such a vision depends on how each firm and its network of relationships interact across the network to align value-creating activities.

The common and complementary elements between the needs of value creation, within a firm's network, and the intangible assets underlying sustainable development are partnerships, strategy, communication, competencies, motivation, technology and operations. These are the activities needed for the creation of value in sustainable development (Cagnin 2005). Appendix 3 summarises the main characteristics of these value activities. Figure 1 depicts the business's Activities Model and shows the main value-creating activities that a business needs to sustain it in the long term. These activities require capabilities that are intrinsically complex and interdependent: these must be learnt and practised simultaneously across the network.

The Activities Model (Figure 1) is based on the quantum leaps model devised by Shelton (1997), which describes the necessary capabilities needed to transform our organisations and ourselves to achieve quantum organisations. These are assumed to be critical to a business's sustainable

development, since it is based on a vision that characterises the universe as a nonlinear dynamic system, unpredictable, subjective and able to self-organise (Maturana and Varela 1980, 1997; Capra 1997; Dempster 1998, 2000; Maturana 1998).

3.2. *Basis for the management framework and roles that FTA can play*

The proposed management framework aims to support the achievement of a business with aligned socio-economic–environmental performance across its network that helps firms develop a participative process throughout to shape a common vision of sustainable development to be pursued by all actors involved in the system.

Moreover, it should link the activities that need to be performed at each stage to build an organisation's ability to know itself (how things are done in the present), enabling the design of the necessary actions to achieve the desirable future (how things ought to be done according to the business's and its networks' vision). It is the process of seeking in the present to bridge the gap between the present and the future continuously, to enhance and enable a business to sustain competitive advantages and follow its path to sustainable development. The framework is dynamic to incorporate changes along the way and enable its own evolution following the organisation's and its networks' progress towards the common vision of sustainable development. The dynamic capability and ability to behave as a complex system are what enable the system to adapt to disruptive changes.

Rather than looking for one generic business model for sustainability, firms should work out their own model that brings new opportunities through dialogue and interaction, being transparent and accountable to stakeholders (Brinch-Pedersen 2003). Hence, firms should use the evolutionary lessons as a main step in integrating sustainable development into the business model.

The management framework is also based on a broad management system that can be applied to any business, based on the PDCA cycle. Nevertheless, the learning process (a feature of foresight) embedded in the proposed framework differs from the one entrenched in other management tools (Appendix 2) as learning also occurs according to the capabilities accumulated within the systems' operation. Learning is then a continual process that also takes place during each implementation cycle: the firm will be armed then with better and clearer opportunities for an evolutionary leap in sustainability performance and to deal with disruptive change, in alignment with the partners in its network.

According to Gertler and Wolfe (2002), networked learning enables a process of adaptation that is participatory and interactive and in which social relations and the communication of insights and knowledge (Georghiou et al. 2008) are critical for successful outcomes. This can be operationalised, to a great extent, through processes and tools that enable spaces for inclusive dialogue to take place (Shelton 1997; Cagnin 2005; Boden et al. 2010; Cagnin, Amanatidou, and Keenan 2012). Embedding this form of dialogue in the proposed management framework improves the ways in which stakeholders are perceived by one another and also the ways that they are involved in decision processes. In turn, these lead to further mutual experimentation and collaborative learning.

Collaborative learning is the basis of this evolutionary leap founded on an inclusive and active dialogue among all parties in the network: stakeholders can then identify their expectations and attach concrete meaning and actions to the business's values (Giversen 2003). Trust must be achieved by developing the confidence of all parties in every link of the network's intent and behaviour (Lund 2003). To build this kind of trust, all parties need to engage, as equals, in dialogue through an inclusive approach (Olsen 2003).

The development of effective and lasting partnerships is critical, requiring a common identity (a true feeling of who 'we' are as partners as well as of who each actor is as individuals) and of legitimacy (important to sustain credibility, recognition and success) (Hardis 2003). Trust cannot be taken for granted but needs to be encouraged continuously and stimulated by practising every day what is preached.

Dialogue to develop 'meta-learning' across the network is crucial. It is the recognition of others' feelings or points of view (appreciation is another part of foresight) since this breaks down existing limits, brings coherence to everybody involved and builds revolutionary ideas of what is possible (Shelton 1997). The expression 'meta-learning' was created by Losada (1999) and defined as 'the ability of a team to dissolve attractors that close possibilities for effective action and to evolve attractors that open possibilities for effective action'. Meta-learning can also be understood as the ability to learn how to learn and/or think (Losada 2001).

According to Losada (1999), high-performance teams need an inclusive dialogue approach for all stakeholders in the network. It seems to be critical to creating a continual collaborative learning process across the network and brings value to all the involved parties, allowing an evolutionary leap in sustainability performance to materialise. The broad stages of this management framework are described in Appendix 4, which includes the need for an inclusive dialogue approach with all stakeholders in the network with FTA permeating all processes: this is believed to be the basis of driving the achievement of high-performance continual learning and to bringing ultimate value to all parties involved in the network.

Moreover, FTA supports one to deal with complexity (Saritas 2006) to process and interpret weak signals, wild cards (Amanatidou et al. 2012; Könnölä et al. 2012) and alternative options (Bezold et al. 2009; Boden et al. 2010; Cagnin and Könnölä, forthcoming) to support decision-making. All these are critical to reconcile creativity and rational analysis (Shelton 1997; Cagnin 2005). Also, these are required to link learning and strategy to a long-term common vision of where an organisation wants to position itself within possible alternative futures. These include partners' and stakeholders' views of what the future might entail. It also considers where all actors see themselves both individually and collectively within these alternative futures.

The link between learning and strategy around a common vision in the network enables trust to be developed across the system through participatory instruments. These take into consideration the diversity of views across the network and the collective articulation of visions and expectations. However, such a common vision to be pursued across the system should be based upon the mutual positioning of network actors in relation to future needs (Cagnin, Amanatidou, and Keenan 2012). Ultimately, interactions (Maturana and Varela 1980, 1997; Capra 1997; Dempster 1998, 2000; Maturana 1998; Cagnin 2005) between actors need to be reinforced to allow the coordination and mobilisation of necessary skills and resources towards a common target, aligning therefore strategy and operations across the system.

Hence, FTA plays a significant role in anticipating and managing disruptive and transformative changes and does so by providing spaces for mutual appreciation, and recognition of each other's feelings, for mutual learning, knowledge-sharing and experimentation, all of which are critical to building the kind of interactions and inclusive dialogue across the network that lead to trust, legitimacy and a common identity. The latter are paramount for invention within the network. The anticipatory role of FTA allows an inclusive debate of possible and desirable futures and articulation of visions and expectations needed to reach a common goal and an adaptive path to follow, including the necessary resources which should be jointly developed, mobilised and coordinated. Table 2 outlines the main roles that FTA can play within such a framework.

Table 2. Contributions of FTA.

Management system	FTA roles
Decide to be in business	FTA supports mutual learning and shared understanding of network actors' views and feelings as well as of risks, opportunities, system capabilities and dynamic changes, all of which are critical to achieve a common vision of sustainable development as well as to mobilise and coordinate resources
Design the business	FTA as a source of strategic intelligence provides insights into possible and desirable directions and works as a source of trust as well as of transparency and legitimacy of options and decisions, clarifying the pros and cons of choices in the definition of a common strategic path to follow and resources to be prioritised
Run the business	FTA creates spaces for experimentation, learning and mutual appreciation, for the development of new or improved linkages and networks, and for the achievement of common ground, shared perspectives, dynamic multilateral partnerships, trust and adaptation as actors interact, new ideas emerge and existing and new knowledge are combined
Monitor the business	FTA processes lead to an enhanced responsiveness of the network, to change in attitudes and behaviours and to joint-up decisions for change in order to steer solutions to emerging challenges through an inclusive approach as well as further experimentation and learning, helping therefore the network to undertake systemic transitions and new configurations
Sustain the business	FTA enables the network to continue to exist in the long run by enabling it to behave as a complex living system as actors interact and connect through inclusive dialogue and mutual respect, in which each and every node of the network becomes an embedded participant that actively shapes the path to a common vision of sustainability

Source: Cagnin et al. (2008, 2012).

3.3. *Maturity model: how the network value activities evolve in time*

For a company, sustainable development is a major challenge. The limited notion of what constitutes 'sustainable development' is itself a riddle that any company faces. For most, the undeclared psychological imperative is to maintain 'successful continuity' and their independence. The second unspoken but implicit theme for a company is knowing that successful continuity, measured by being able to secure future profits and a strong share price, for a limited time horizon, will be maintained through interdependence between itself and a swarm of suppliers and customers. Businesses organise themselves to achieve these ends through activities under the rubric FTA, but these are not an all-important part since there are checks and balances exerted by many features of the swarm of companies in which the company is embedded. It is not an entity that can organise its 'world' for its own benefit to the exclusion of benefits for others.

The dynamism of a swarm or a network may be thought of as autopoiesis (Maturana and Varela 1980), but this applies strictly to an organisationally closed self-regenerating system. Dynamic and complex business networks are not of this kind, since they are always organisationally open, or partially so, to invasion by new participants or new elements. Sympoiesis (Dempster 1998) attempts to describe the boundaryless nature of system behaviour (more will be said about sympoiesis later) and is a closer approximation to the behaviour of a network of businesses all of which are seeking successful continuity for themselves and indirectly for the network itself.

What role does FTA play in successful continuity while attempting to follow what a firm believes to be its sustainable development and that of its mutually supporting network of businesses?

Foresight cannot remove the uncertainties any business faces and actually invests in: it does provide two important messages, namely what may be important to do to help secure successful continuity and what to avoid doing to prevent self-destruction. Of these two messages, the first is the most exciting and attracts much attention, but it is the second message that is the most important. Attention to the three basic requirements of foresight, appreciation, anticipation and learning, all of which imply numeracy, is a basic requirement for successful continuity. Foresight can also expose a range of equally likely paths into the future that may permit more insightful decisions to be made by a business. The armoury of methods that can be used to support and inform aspects of these decisions is considerable, but it does not remove the element of judgement and risk that accompanies any form of decision-making. Foresight demands that Wittgenstein's dictum that 'methods pass the problem by' be in mind constantly. Equally, Al Haig's dictum that 'vision without discipline is daydream' (Haig 1984) is necessary to prevent the outcomes of foresight becoming too expansive.

Once foresight has provided insights into possible business directions, forecasting and technology assessment are essential associates, both of which bring an element of legitimacy and transparency to the overall decision-making process. Both forecasting and technology assessment provide a more factual and numerical understanding of a business's financial and technical risks, opportunities and system capabilities, together with returns to stakeholders. In these ways, FTA can lead to the development of new (or enhanced) networks or linkages (stronger interactions) with the achievement of common ground, joint visions and enhanced responsiveness among the network members.

In these different ways, FTA can and does contribute to a business's successful continuity. FTA cannot remove the uncertainty that surrounds its contribution to or nature of sustainable development in the wider context of its supporting network and society as a whole. The Maturity Model is an attempt to build FTA's contributions to a structure, heavily dependent on the flow of ideas, data and information into a business and its network decision-making in its place in society.

The aim of the Maturity Model is to shape a possible business path towards sustainable development, outlining how the network value activities ought to evolve in time to shape business sustainability. It offers the possibility for each firm to assess its position regarding five maturity levels for sustainable development. Consequently, a business can build a tailored, common strategy throughout its network of relationships: it may also influence partners in their progress towards higher levels of sustainable development.

The Maturity Model suggested in Table 3 (Cagnin 2005) uses the notion of evolution in which a company will be seeking to achieve its (network) vision of sustainable development in uninterrupted cycles of improvement. The design of the Sustainability Maturity Model is founded on universal principles as well as the maturity of behaviours that can lead to the development of a mature business throughout its network of relationships (Cagnin 2005) and considers a number of other related attempts (Perlman and Takacs 1990; Katzenbach and Smith 1993; Eckenfelder 1997; Elrod and Tippett 1999; Berg et al. 2002; Kwak and Ibbs 2002; von Zedtwitz 2002; Rosenberg 2003; Verweire and Berghe 2003; Entovation International 2004; Losada and Heaphy 2004; Fredrickson and Losada 2005). As a reminder, the model seeks to enable

- a common strategy and/or strategies aligned across the network, founded on a shared vision for sustainable development to be pursued by all actors, with interdependent and agreed roles;
- a cooperative interactive network rooted in communication channels that allow relevant and agreed information to flow freely to create a common base of knowledge shared among partners to ensure that trust is enhanced; and

Table 3. Business sustainability maturity model.

	Maturity levels				
Value activity	1-Ad Hoc	2-Planned in isolation	3-Managed with no integration	4-Excellence at corproate level	5-High-performance sustainability net
Strategy	- Overhead, driven by regulation, complaints, management directives and cost of accidents and impacts - No processes or controls in place and no support from leadership/senior management - Success depends on individual efforts; change factors as an unpredictable serendipity - Sustainability functionally isolated; firm's main objective is to gain capital efficiency - Objectives only partly known	- Systematisation of existing practices - Objectives identified but not in alignment with business target (to gain operational efficiency) - Supporting mechanisms are informal, according to needs (access to past information) - Policies defined and the firm has strengths in doing similar work; focus on processes and activities planning - Change factors as processes and activities interdependence	- Decision based on risk/reward - Integration starts; but still seen as separate subject - Objectives are known; firm's target is to gain product/service quality and main objective is to enhance the firm's image - Negative impact prevention driven by processes - Balance between emotions and rationality not achieved - Responsibility assigned to a unit or team - Measuring is coordinated	- Customers as driver, focus on productivity and efficiency - Target is on cost reduction aiming competitive advantages - Seek social–environmental improvement, goals quantified and measurable; objectives revised; focus on planning and controlling multiple activities - Shared vision, individual awareness and leadership exist - Positive emotions lead to creativity and intution - Formal and powerful processes	- Sustainability-driven firm - Positive emotions (ratio at or above 2.90) lead to creativity across the sustainability net, focus on innovative ideas - Participative process; strategies and activities aligned and integrated across the net - Collaborative innovation and continuous sustainability performance improvement system, inter-group learning - Values (universal principles) embedded in every process

Partnerships	- Selection driver is price - Hierarchical structure - Functionally driven - Competition among partners	- Selection driver is delivery - Matrix structure where partners interact and proactive collaboration starts to be felt	- Selection driver is quality - Distributed coordination structure where structured collaboration starts to be felt	- Stakeholders' engage and trust are leveraged through dialogue - Communities of practice structure (focus on values)	- Driver is trust, values and mission are jiontly defined - Symbiotic network structure - Education across the net
Motivation	- Environment of we/they competition between individuals - Behavioural structure with no sense of ownership	- Structure of individual teams (no focus on collective performance); reward/punishment systems - Cooperation starts to be felt	- Cooperation between interdependent teams - Informal training of sustain ability and necessary skills and practice	- Teamwork, reward systems - Dialogue and conversations lead to individual discovery/learning - Teams Share experiences	- Self-managing teamwork, high-performance teams in the net - Inclusive dialogue and active participation, common vision
Competencies	- Information–paper processing and fast accountability - No individual, team or organisational learning	- Information–general support, comply with speed requirements - Individual learning to comply with functional roles	- Information–improve decisions - Team learning promoted to improve decision-making and business efficiency	- Information–strategic resource - Training and education - Quality of transferable knowledge is predicted	Information flow free and a common base of knowledge in the net maximises individuals' learning and creativity
Communication	- Minimal processes and channels in place	- Processes and channels are on project-to-project basis	- Based on the firm's core competencies and objectives	- Based on feedback loops and information persistence - Interpersonal and technological channels in use	- Based on cross boundary learning and knowledge flow - Intuition and rational analysis become complementary

(*Continued*)

Table 3. (Continued)

	Maturity levels				
Value activity	1-Ad Hoc	2-Planned in isolation	3-Managed with no integration	4-Excellence at corproate level	5-High-performance sustainability net
Technology	- Focus on manual individual routine automation; craft development character - Embryonic	- Databased, IT used to build systems that cross functions and allow data-sharing stimulus to support decisions	- Information based; IT used to build applications centred on processes rather than on functions, synchronised with the strategy	- Flexible infrastructure basis to enable communication and information flow through the firm; firm's self-organising capability	- Cooperative sustainability net - Network's self-organisation - Continuous learning/adaptation - Creativity in decision-making
Operations	- Focus on understanding and estabilishing basic processes that are not linked to strategy; end-of-pipe solutions; individual abilities	- Policies support practices; aim to reduce impacts with better use of materials and natural resources - Structured processes/activities	- Firm-wide understanding of activities, roles and responsibilities - Idea for integration/alignment - Streamlined processes/activities	Autonomous, flexible and integrated processess/activites; use of renewable energy sources and fewer natural resources	- Processes/activities/ values aligned across the net; functional silos removed (information flow) - Systemic processes/systems

- a high-performance partnership where all parties feel motivated both as individuals and members of interdependent groups, finding meaning and satisfaction in everything they do, and where intuition/creativity/emotions and rational analysis reconcile and become two complementary parts of the decision-making processes and of the necessary means to ensure an alignment of economic, environmental and social performance along the network.

4. Management framework

The proposed management framework emphasises the creative aspect of living systems where FTA is key to enable the kind of dialogue and interactions required to allow business networks to behave as sympoietic complex systems. In this context and according to Hock (1999), enterprises must be able to combine, with harmony, order and chaos, competition and cooperation, which characterise the fundamental principles of any organism, organisation or complex system, as well as of evolution and nature. Maturana and Varela (1980) agree when affirming that every organism has the power to self-generate by means of autopoiesis, which implies continuous auto-production and reproduction (Maturana and Varella 1997): autopoietic systems produce and are a product of themselves (Rocha 2003). Interpreting complex systems from the perspective of ecosystems, Dempster (1998) coined the expression sympoietic systems, indicating three main differences, related to key system characteristics between autopoiesis and sympoiesis:

1. autopoietic systems have self-defined boundaries, while sympoietic systems do not;
2. autopoietic systems are self-produced, whereas sympoietic systems are collectively produced; and
3. autopoietic systems are organisationally closed, while sympoietic systems are organisationally ajar.

Dempster (2000) concludes that these differences mean that autopoietic systems are homeostatic, development oriented, centrally controlled, predictable and efficient, whereas sympoietic systems are homeorhetic, evolutionary, distributively controlled, unpredictable and adaptive. According to Dempster, one of the most important differences between autopoietic and sympoietic systems relates to the balance between their ability to maintain their identity despite changes in the environment or to adapt their identity to fit changes.

The above descriptions present a useful heuristic to complex systems and the interactions between the dimensions of sustainable development, spatial-technological, social, economic, environmental or ecological, political-institutional and cultural-values. Living systems share matter, information and energy with their external environments: there is simultaneous autonomy and interdependence. According to Rocha (2003), complex systems require interactivity: in the same way, it is not possible to understand living systems without perceiving the systemic relationships of cells and there is no possibility of comprehending social systems without taking into consideration the connections that individuals establish with their worlds.

Interactive relationships create emergent possibilities, such as those that are believed to be ingrained in the management framework proposed. The information and knowledge which are shared throughout the business networks can lead to the networks' adaptation and evolution, but also enable all actors within such networks to progress towards higher levels of sustainable development. What one part does to another is indefinitely interpreted and informed to form more complex chains. Also, the interactions among all the actors within networks characterise the existence of such a system or the network itself. The stronger the interactions between the

components of the network, the greater will be its flexibility. The system will then be able to make evolutionary leaps characterised by the appearance of emerging properties. In this context, trust in each other and in one's own emotions (Fell and Russell 1994; Damasio 1996; Maturana 1998; Losada 1999, 2001; Fredrickson and Losada 2005) is crucial for choosing a sustainable path to life or for moving the whole system towards higher levels of sustainable development. Dialogue and information-sharing, founded on trust, are pre-requirements.

Features of universal ethics or universal principles and those of respect (Zohar 1990; Cagnin 2000) can be linked with Losada's notions of high-performance teams and organisations: individuals and corporations should have the ability to respect each other. These might be the necessary characteristics to enable actors within business networks to perform at higher levels and to improve their quality of life. Included here are respect and responsibility built upon inclusive dialogue and active participation, along with conflicts, generating transparency, development (Giversen 2003; Larsen 2003) and ability to live with the paradox of chaos and order, competition and cooperation, through sympoietic system capability.

Social change implies that people within a society must change: this happens either through encounters outside the specific social system or via reflections through language (Maturana and Varela 1997). Dialogue, respect and emotions for others' feelings are critical; the emotions of individuals build their rationality (Damasio 1996) and their human actions (Maturana 1998). Basic emotions are thus the basis of the operationalisation of living organisms, and these change as the environment changes. In other words, an individual adapts to his/her environment to avoid disintegration.

The adaptive management framework developed (Table 4) can help corporations embed their social and environmental responsibilities in their products and services and throughout their networks. Simultaneously, this enables change towards a common vision using tools which can support firms through the process to shape business sustainable development throughout their networks of relationships. Table 4 highlights the main processes involved at each stage of the broad business management system (Appendix 4), according to the network's value activities (Figure 1). In this context, it is worth highlighting Appendix 5, which puts the proposed management framework into context. The latter shows some of the management tools currently in use and places the management framework at the top of the figure for comparison. Comparatively, this indicates that an organisation can progress towards sustainable development more efficiently and responsibly by integrating the six dimensions of sustainability into its core operations. The framework then exhibits the promise of embedding, in its structure, critical principles that are often not taken into account by existing tools and shows the necessary activities and the interrelationships that need to be managed systemically to shape business sustainability.

FTA is embedded in the management framework to facilitate inclusive dialogue across the network, enabling actors to anticipate and manage disruptive and transformative changes. The kind of dialogue supported through FTA provides a new paradigm able to deal with unpredictability and support decision-making effectively by using models, such as sympoiesis, that emphasise the creative aspect of living systems which, according to Tuomi (2011), is critical to address some of the epistemic and ontological assumptions that underlie much of the current FTA practice.

Hence, embedding FTA within the proposed management framework enables a network to develop its sympoietic system capability: this is critical for the achievement of common ground, joint visions and enhanced responsiveness among the network members including truly novel aspects of how the future might evolve. Simultaneously, individual firms actively shape the future as an embedded network participant promoting a common vision within it and mobilising and coordinating the necessary resources towards achieving such a vision.

Table 4. Business sustainability management framework.

Stages		Activities	Sub-Activities
Stakeholder Participation Based on Inclusive Dialogue and Continuous Learning enabled through FTA	**Decide to be in business** Defining and reviewing the vision of sustainability	**Strategy**	Establish leadership commitment; and strategic architecture definition and review
		Partnerships	Identify and engage with stakeholders
		Motivation	Identify and define actions needed to enable the creation of motivation and an inclusive dialogue throughout the network
		Competences	Core competences definition and review
		Communication	Communication channels and processes definition and review
		Technology	Technology infrastructure definition and review
		Operations	Operations alignment definition and review
	Design the business Defining and reviewing the strategy to implement the vision of sustainability	**Strategy**	Strategic and tactical planning definition and review
		Partnerships	Partnerships selection; building; and leveraging
		Motivation	Motivational channels and processes selection; building; and leveraging
		Competences	Competences selection; building; leveraging; and core competences protection
		Communication	Communication channels and processes; building; and leveraging
		Technology	Existing IT, systems (IS), strategic, managerial and operational technologies analysis and selection
		Operations	Marketing and/or commercial; production; procurement; financial; human resources; legal
	Run the business Implementing the vision of sustainability	**Business Sustainability Maturity Model – Business Path to Sustainability** **Comparing present performance (as it is) with the business and the network vision for sustainability (as it ought to be) in order to keep the firm on track of its designated vision**	
	Monitor the business Collecting and monitoring relevant information to keep the business on track of its vision of sustainability	**Strategy**	Performance, environment, capabilities, constraints, opportunities, and changes and improvements possible
		Partnerships	Partnerships selection; building; and leveraging
		Motivation	Motivational channels and processes selection; building; and leveraging
		Competences	Competences selection; building; leveraging; and core competences protection
		Communication	Communication channels and processes; building; and leveraging
		Technology	Technology selection; building and leveraging
		Operations	Internal operations and network relationships, performance reporting
	Sustain the business		
	Achieve the identified vision of sustainability and giving subsidies for the creation of a new vision	**Verify if the firm achieved its objectives along the network and preparing the whole network to walk into a higher sustainability maturity level – 5th Maturity Level**	

5. Conclusions

Some notions are set out of what is involved in managing a business towards sustainable development within the Brundtland criteria (Brundtland 1987). Through its components (foresight, forecasting and technology assessment), FTA has an undeniably arduous role to play. It must facilitate a different kind of dialogue and interactions to take place across business networks to support effective decision-making: this is paramount. Consequently, firms will be enabled to anticipate and manage disruptive and transformative changes, allowing network partners to evolve together and creating an evolutionary leap in sustainability performance.

The implications for policy and decision-making are manifold. Regardless of seeing the world based on three interdependent pillars – businesses, civil society and governments – the truth is that all three sectors have to advance more or less at the same speed and in the same direction. Progress towards sustainable development may depend on building dynamic partnerships among these three pillars (Holliday, Schmidheiny, and Watts 2002).

In this context, the kind of dialogue required across a business network demands the inclusive participation of governments and overall societies, apart from those businesses which shape the network. This shall be enabled by the proposed management framework. However, both governments and firms should take part of the responsibility for educating society and promoting active citizen participation in decision-making, through inclusive dialogue, which can be achieved through FTA approaches and methods (Cagnin et al. 2008). This is a key aspect for policy intervention. Ultimately, this would also enable the development of a common base of knowledge and sustainability vision, as well as foster positive emotions and connectivity across networks by leveraging the number of interactions and opportunities for dialogue.

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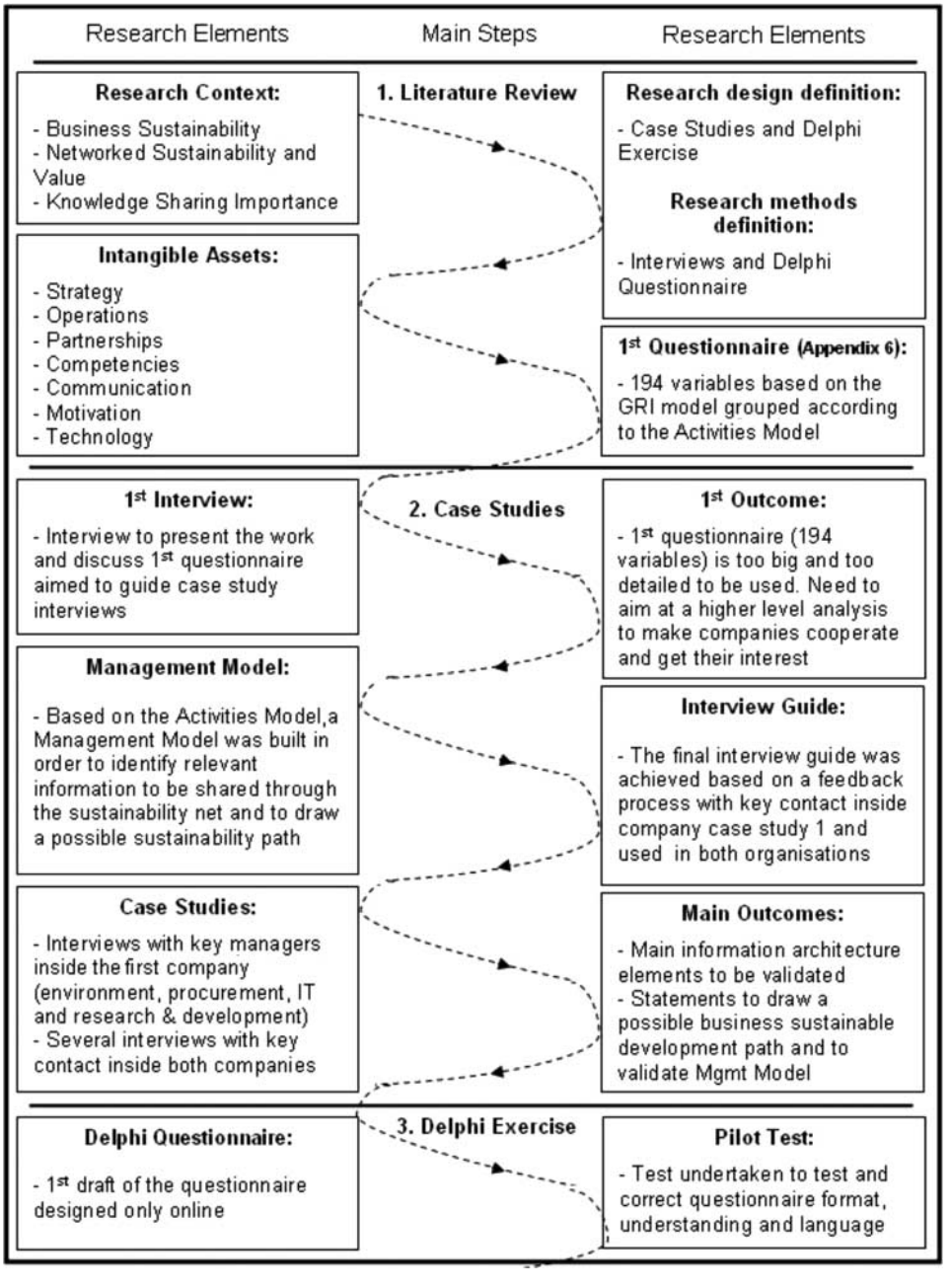
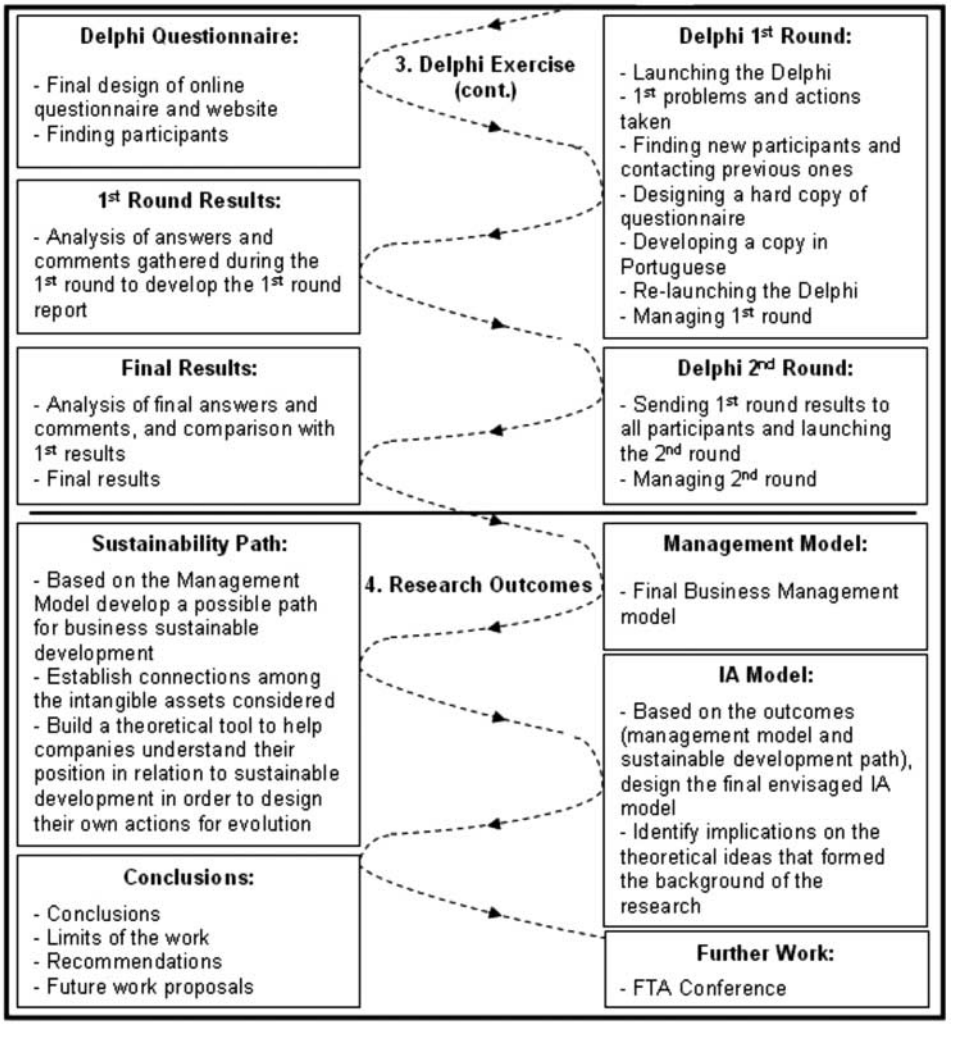
Appendix 1. Research overall strategy





Appendix 2. Existing business sustainability tools and research outcomes

		Dimensions of sustainability					
	Business activities	Economic	Environmental	Social	Institutional - Political	Spatial	Cultural
Strategy	Principles and Values → Visions	Proposed Business Sustainability Concept AGENDA 21 OECD guide OECD CSR Lisbon Strategy CRT UNGC NS GSPSR KCGCB SIGMA SRI	Proposed Business Sustainability Concept AGENDA 21 OECD guide OECD CSR Lisbon Strategy CRT UNGC NS GSPSR KCGCB SIGMA SRI	Proposed Business Sustainability Concept AGENDA 21 OECD guide OECD CSR ILO Lisbon Strategy CRT UNGC NS GSPSR KCGCB SIGMA SRI	Proposed Business Sustain. Concept AGENDA 21 OECD guide Lisbon Strategy CRT UNGC KCGCB GSPSR	Proposed Business Sustain. Concept AGENDA 21 OECD guide CRT UNGC KCGCB GSPSR	Proposed Business Sustain. Concept AGENDA 21 CRT UNGC KCGCB
	Vision→Actions Behaviours	Proposed management (mgmt) framework					
Operations	Management Tools/ Systems/Frameworks ↓ Behaviours/Actions→ Operations	Proposed Management Model SIGMA LCA NS	Proposed Management Model SIGMA LCA NS ISO 14000 ENAS CP MOED GH EM	Proposed Management Model SIGMA LCA NS SA800 AA1000	Proposed Mgmt Framework	Proposed Mgmt Framework	Proposed Mgmt Framework
	Operations → Measure Performance	GRI	GRI	GRI			

Appendix 3. Network value activities

Value activities	Main characteristics
Partnerships	It is in the core of CSR and essential to achieve a cooperative and systematic network
Strategy	It is the business commitment with a set of principles, values and policies which will guide the organisation in the long run to achieve its desired vision of sustainable development and gain sustainable competitive advantages
Communication	The ability to document and demonstrate in deeds through specific communication channels how intentions are put into practice, together with an ongoing continuous dialogue, builds mutual trust and transparency. The ability to communicate with different audiences (all stakeholders) and in diverse specific languages becomes critical in this context
Competencies	There is a latent importance of building an organisational culture that stimulates knowledge generation and sharing through the network to achieve a dynamic process of innovation, learning and continuous improvement
Motivation	Making available the necessary tools and an environmental where collaborators share responsibility and ownership for achievements is critical to enable everybody to change their individual ideas and build a common set of values
Technology	An effective integration of social and environmental strategies can be strongly supported by theuse of IT. Hence, technology (i.e. IT and IS) plays a critical role in building and enabling an infrastructure to collect, filter, analyse, share and disseminate the business values and indicators along the network and thus create individual and cooperative competitive advantages
Operation	The business principles and values throughout the network are expressed through its operations. The business values reflected in its operations are what demonstrate the firm's ability to act responsbility and ethically. Hence, values are seen as a strategic tool to align all activities along the network and to give the direction as to where the firm will go, with whom and how

Appendix 4. Business broad management system

Stages		PDCA Cycle	Meaning
Stakeholders Participation Based on Inclusive Dialogue and Continuous Learning through FTA	Decide to be in business		It is the stage of thinking and reviewing past and present decisions and performance to decide whether or not to be in business (changes needed) according to competitive and environmental changes and the range of feedback the firm is able to build. Furthermore, it is time to define a vision for sustainable development to be pursued in alignment with the seven dimensions of sustainability, which should be commonly agreed with the business network partners.
	Design the business	P	It is the process of planning how the business must be shaped in roder to achieve the vision of sustainability via the definition of a strategy and necessary targets to be met. It aims to build the expected future by designing how the business strategy will be implemented.
	Run the business	D	It is to implement the defined strategy and its designed plan every day. It becomes essential to compare the actual results (the way it is now – as it is) with the expected ones (the way the organisation wishes to be – as it ought to be), through a feedback process, in order to shape sustainability and learning along the process.
	Monitor the business	C	It is to monitor all necessary information of how the business is running and evaluate the obtained results based on developed indicators. This will enable the organisation to make an assessment about whether what it had originally hoped to accomplish was actually achieved (gap analysis) so it can establish future capability of analysis and decision making processes.
	Sustain the business	A	It is a process developed by every day activities. It depends of being able to meet everything that was defined in the earlier plan stage, based on universal principles, cooperation, innovation and continuous learning, but also based on the diverse range of feedback and partnership the company is able to build. From the single individual, passing through the organisation and its relationships, seeking to consider the overall society. In the end, it is about improving economic, social and environmental integrated performance, knowing that one depends and leverage on the other. Understand 'yesterday' tuned and looking for 'tomorrow' – to maintain balance between past and future, between what is known and what is new (something unpredictable) – is the requirement to success. It is thus a reflection about what has actually worked and not worked, and then to adjust the organisational thinking and actions for the future. This phase is where sustainability performance evolutionary leaps can occur bringing, as a consequence, processes of innovation and the changes needed for survival and to sustain competitive responsible advantages in the future.

Appendix 5. Management framework in context