The roles of FTA in improving performance measurement systems to enable alignment between business strategy and operations: Insights from three practical cases

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ABSTRACT

Despite the growing number of publications on firms' performance measurement systems (PMS), consensus has not yet been achieved on the steps for their implementation within an organisation. Against this background the authors report the lessons learnt in developing and testing a new PMS that they have devised advancing on the Balance Scorecard (BSC) approach. In reviewing three cases in which their system was applied, they highlight that the inclusion of Future-oriented Technology Analysis (FTA) would have prevented some of the failures experienced. FTA is seen as crucial in linking strategy and operations with a long-term vision of where a firm sees itself in the future. In this regard, FTA holds the promise to embed critical aspects for jointly shaping common directions to follow across a firm's value chain. These include the notion of stakeholder involvement in decision processes of mutual appreciation and a shared understanding of stakeholders' views as well as of joint experimentation and mutual learning. The authors conclude by highlighting specific ways in which FTA can be integrated in the PMS proposed.

1. Introduction

One of the main challenges faced by organisations resides in executing planned strategies [1–3]. The misalignment between strategy-design and implementation has been long identified [4] and there have been several attempts by scholars and practitioners to tackle this challenge. Several tools have been developed that foster alignment between strategy and actions, and across value or supply chains [5].

However, many of these models display important weaknesses. In particular, they fail to tackle efficiently the communication of the strategy across all organisational levels [6–10], as well as to deploy the strategy in short term operational plans [8,10], involve mid-management in strategy formulation [6], execution is a component of strategy and must be the core element of the company's culture [9] and adjustment of organisational strategy elements [6,7].

Furthermore there is evidence that firms' efforts are currently concentrated on activities targeted at strategy design, rather than its implementation [11–16]. According to [17], this happens despite the awareness that both researchers and executives have that organisational performance is directly linked to an alignment between

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endogenous variables (strategy, structure and processes) and exogenous ones (e.g. environmental uncertainty and technology). The truth is that, as stated by [18], the separation between strategy formulation and implementation constitutes a false dichotomy, since these are intrinsically connected through the integration of thought and action.

In this context, systems which are able to measure the performance of a firm (performance measurement systems or PMS) have become a critical asset for an organisation aiming to successfully implement its defined strategy. Such systems aim at enhancing a firm' advantages, both internal and external, with a focus on process improvements. Ultimately, PMS should enable businesses to build the necessary actions to reach its strategy and excel [19].

PMS are based on performance indicators. These systems have been developed to allow an organisation to focus on results and to allocate resources rapidly and efficiently. At the same time, PMS should amplify the controls a firm has over the implementation of strategy [20]. The implementation of a strategy via PMS should, therefore, allow an organisation to develop the necessary targets, actions and behaviours across its value chain in line with the defined strategy, in a sort of cause-effect relationship [10,21–23]. Finally, both the financial and non-financial indicators selected through the PMS should enable new targets or actions to be developed or adjustments in the strategy to take place. This happens through feedback instruments embedded in the PMS.

The balanced scorecard (BSC) is the most common PMS [24]. The BSC is a management system that presents a firm's vision and strategies in four perspectives: financial, customer, internal business process, and learning and growth [10]. These perspectives have their objectives outlined in measures, targets, and initiatives through cause and effect relationships (hypotheses) [25].

The BSC is considered to be innovative since it includes some of the elements which are of greatest importance to enable a strategy to be implemented across business value chains [25]. These elements are: (1) transformation of a strategy into operational actions; (2) creation of hypotheses based on cause-effect relationships; (3) monitoring of both financial and non-financial measures; and (4) alignment and management of the scope of objectives facilitating feedback and strategic learning with the aim of transforming strategy into a continuous process. Despite its advantages the BSC is still not capable to align convincingly strategy design and implementation, partly because it is rooted in a static and linear view of management and does not take into account the ability to flexibly adapt and change over time (Annex 1).

The authors thus developed a new PMS to tackle these limitations, which is presented in Section 2. The main dimensions being tackled are: organisational learning, critical analysis of strategic processes, alignment between strategy and its implementation in the value chain, participation in decision making, and relationship between critical success factors.

Section 3 outlines the empirical application of the proposed system in three case studies. Results show, however, that the link provided between strategy development and its implementation across a firm value chain does not allow the whole system to become flexible and adaptive over time.

FTA is therefore suggested, in Section 4, as a possible instrument to deal with such shortcomings and improve the operationalisation of the proposed system. In particular, we argue that embedding FTA in the system would enable firms to steer solutions to possible challenges through joint-up decision making and implementation processes. Finally, section 5 summarises the main conclusions.

2. Proposed system

The system proposed, as reported in Fig. 1, is articulated in four different phases which seek to optimise the use and implementation of the BSC. The proposed system supports formulation and implementation to be designed in alignment. It does so by helping an organisation to better understand the process by which mission, vision, values, challenges and policies are formulated, and how these resonate across its value chain.

The *first phase* (*organisational strategy*) consists in supporting the definition of the strategic positioning of a firm within its environment. The strength in shaping a strategy and its implementation simultaneously lies in the promotion of organisational alignment. This happens through periodic meetings to discuss strategic themes, which create commitment to an increased understanding of the organization's strategic objectives. Moreover, this phase must interact with the second phase (strategic diagnostic), because the information collected about the firm and its environment will serve as input for a continuous feedback related to its mission, values and politics.

The *second phase* (*strategic diagnostic*) combines a method for analysing business environments (SWOT analysis) with a method for constructing scenarios (the Global Business Network). SWOT analyses provide the foundations for defining alternative futures. The Global Business Network (GBN) method enables an assessment of the resources and competencies needed in relation to the trends that ought to mould the future of the business. This combination is not casual and provides a better optimisation of both tools and integration of results expected from the strategic diagnosis.

SWOT analysis becomes robust in supporting strategy design when used in conjunction with other models such as the BSC, the Quality Function Deployment [26] and the GBN method [27]. The combination of SWOT and GBN stimulates joint reflections on the future in terms of scenarios, i.e. the way in which strengths and weaknesses, both internal (firm) and external (environment, including value chain), will behave or evolve over time. Moreover, the scenario development process should become an important contribution to organisational learning [28].

The *third phase* (*cascading strategy into operational actions*) was conceived based on the original structure of the BSC. The process of cascading strategy is based on the definition of strategic objectives, measures, targets and initiatives. These actions
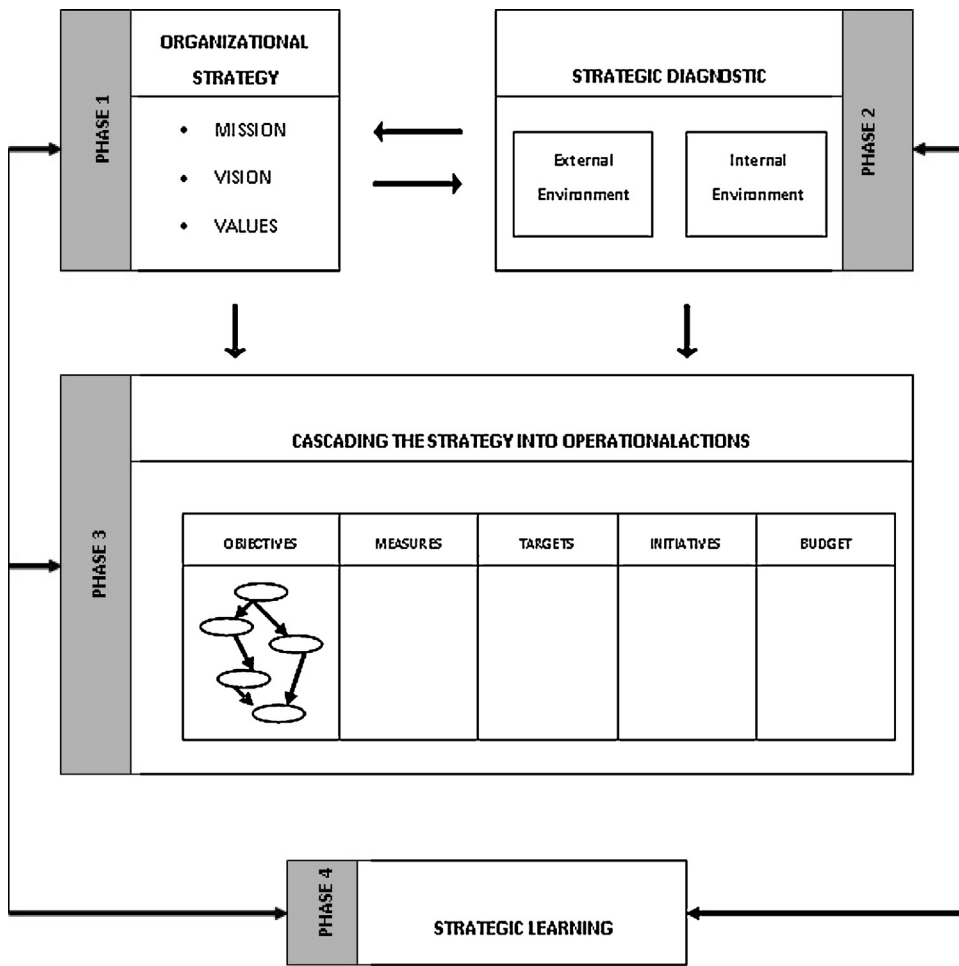
Fig. 1. Proposed system.

together represent the strategy translated into operational actions, which is often poorly developed by firms [12,25,29–31]. The third phase takes place through six steps:

1. *Definition of strategic objectives*: here the results of the Strategic Diagnosis (*second phase*) will be analysed in terms of its impacts on alternative scenarios. Such analysis is key to define the strategic objectives of the firm departing from the value perspectives of the BSC (i.e. financial, customer, internal processes, learning and growth).
2. *Construction of strategy maps*: once the strategic objectives have been defined, the next step consists of constructing a cause-effect map illustrating the route by which these objectives will be implemented. This takes place relating the strategic objectives to the four perspectives of the BSC.[1]
3. *Selection of measures*: the selection of measures must be aligned with the strategic objectives and consolidated within the strategy map (previous steps). This is done by initially analysing the existing system of measures and how these are formalised within the firm's routines. Once the consistency of these measures is verified it is possible to propose alternatives for better alignment between measures and strategic objectives.[2]
4. *Targets supervision*: the organisation should establish standards for comparison of its measures. This is done by analysing historical behaviour and through strategic benchmarking. It is important to highlight that the chosen targets must take

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[1] The system proposes the use of the Dynamic System [32] to capture the key variables that influence the system behaviour and the circular connections of cause-effect that exist (Annex 2).

[2] The ten tests within the Performance Prism [33] can be used to assess whether selected measures and their respective metrics are adequate, thus enabling the firm to build a robust system for measuring performance.

into account the availability and facility to access information, and the regularity by which related and relevant data is collected [32].

5. *Strategic management of initiatives*: these refer to the actions selected in each of the four BSC perspectives to achieve the defined strategic targets (step 1 above). This step aims at generating a learning process by which experience and (tacit and explicit) knowledge is embedded in a business set of routines.[3]

6. *Strategic budget*: this step should converge the firm's resources to critical initiatives in a dynamic way. Periodic review enables one to update forecasts and targets according to requirements of strategic or dynamic changes. This allows a better allocation of resources in order to efficiently respond to such changes.[4]

The *fourth phase* (*strategic learning*) is based on the model proposed by Kaplan and Norton [12], itself inspired by the concept of learning as discussed by Argyris and Schön [34]. This phase identifies mechanisms to systematise the firm's strategic learning process. It entails the need for organisations to hold strategic meetings in two loops: the first a monitoring and control circuit (single loop) and the second a learning circuit (double loop). Such learning meetings are held to obtain feedback on the progress of the strategy's implementation. It also enables one to test the hypotheses on which the strategy was based to identify any necessary adjustments. These are paramount to enable learning to take place across the system (i.e. value chain).

The relationship between the four phases of the proposal is dynamic since there is a continual feedback loop between them that leads to constant reflection and analysis of results and, if needed, to enable one to return to previous steps to refine prior decisions.

Therefore, the above combination enhances the potential capability of a firm and its diverse partners and stakeholders across the value chain to properly define joint or shared strategic objectives. This offers a robust tool for systemic processes aiming to align strategy and operations across a given system (i.e. value chain). Such alignment shall take place through the development of a common vision and both joint and individual strategic objectives and related customised operational processes and monitoring systems.

3. Empirical applications: identification of the system's limitations

Once validated, the system proposed was tested in three case studies. All three organisations are located in Brazil. The selection of cases followed three premises: (a) prior implementation of the balanced scorecard to check if the proposed system would deal with the difficulties and limitations of the BSC; (b) transparency and access to information generated by their BSC to understand the problems each organisation faces and to generate solutions via the proposed system and (c) select organisations from different sectors to assess the need to adapt and refine the proposed system.

The organisations facilitated access to information through meetings between managers and the staff responsible for implementing the proposed system. These served to exchange information and experiences as well as obtain consensus on the changes needed in their existing BSC, i.e. formalised in this way a "contract" to implement a new management model. Moreover, the involvement of managers in the implementation of the proposed system generated commitment on the one hand and, on the other hand, "inside" information that allowed us to both validate the methodology proposed and to identify needs for improvements. Moreover, the insights generated via discussions with the managers were used to promote an in-depth analysis of the existing BSC and was critical to support the decision making process.

3.1. An example from the Brazilian State of Parana

3.1.1. Rationale

The Government of the State of Paraná was selected in order to test the proposed system in public administration. The reality of public management in Brazil is marked by a lack of financial resources and excessive social problems, which increases the importance of setting long-term strategic actions. Overall, the implementation of government policies should take place through transparent and efficient public management. It should, therefore, align and harmonise the human effort involved and the use of material resources in pursuit of the defined goals and objectives. In this context, the proposed system aimed to become an important strategic tool for monitoring the effectiveness of public management.

3.1.2. Description

The first case aimed to assess the efficiency of the Brazilian State of Parana in sharing juridical knowledge with citizens in order to enhance the implementation of sustainable policies and increase transparency. The implementation of the proposed

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[3] The system proposes the use of the CommonKADS [35] and the Hoshin Kanri [36,37] tools to support the acquisition, representation, modelling and maintenance of a firm's knowledge system. Hoshin Kanri in combination with CommonKADs (Annex 3) guarantee, therefore, organisational learning to take place; the latter being responsible for describing the capability of a firm's knowledge system to solve problems using organisational learning.

[4] In the proposed system the method of perpetual budget [38] offers such characteristics as it supports the analysis of cause-effect relationships within a logic adapted to the BSC. The perpetual budget consists in the identification of cause-effect relationships between changes that redirect strategy and the organisation's budgeting targets. This method allows for greater flexibility when updating or changing targets, irrespective of established budgetary planning.

system followed the designed phases and steps. However, phases 3 and 4 were the most critical since these enabled the State representatives to understand the citizens' perceptions regarding political decisions.

3.1.3. Positive results

To break the strategy defined by the State into operational actions a number of meetings and workshops took place with the involvement of citizens' representatives (phase 3),[5] since one of the differences between a typical BSC and the proposed system is the creation of shared objectives. These enabled the creation of an environment that welcomed diversity and different perspectives to build a joint understanding of which cultural and educational aspects were considered relevant from the citizens' standpoint. The established dialogue was important to increase the perception of democracy among those involved. Moreover, the mutual learning process between State and citizens' representatives enabled the development of shared decisions, which resulted in the design of more robust and consistent policies that were aligned with local needs.

The established dialogue helped State representatives understand the need of building proper feedback mechanisms to continually capture and monitor citizens' concerns and expectations. Once in place, this would allow the State to offer solutions to emerging problems due to the strategic feedback mechanism in place (phase 4).

Together, the conversational environment (phase 3) and the feedback mechanisms developed (phase 4) allowed an increase in effectiveness regarding public management. This happened due to the joint creation, monitoring and evaluation of two new strategic indicators: community satisfaction and participation in decision making. The former increased from 46% into 72%, and the later from 30% to 60% in relation to implementation of public policies.

3.1.4. Negative results

The main problem occurred in the translation of what was captured in meetings and workshops or through the feedback mechanisms in place into input for strategy design (phase 1). Often what was agreed between State and citizens' representatives was not converted directly into input for policy design due to the fact that such decisions required the acceptance of governmental bodies. Hence, the lack of involvement of government representatives into the debate, due to the bureaucracy in place, did not allow the consolidation of the conversational environment created while implementing the proposed system. In turn, the link between citizens' expectations and desires collected via dialogue (phase 3) and feedback mechanisms (phase 4) did not generate new strategies (phase 1). Once such link could not materialise it was not possible to develop scenarios based upon strategic diagnosis (phase 2), which depends on phase 1, to effectively increase the efficiency of the Brazilian State of Parana in time. To sum up, the implementation of the proposed system did not enable an effective space for mutual learning and experimentation to take place between stakeholders, nor the shaping of a shared vision to be developed.

3.2. An example from the higher education sector

3.2.1. Rationale

The second case focused on a higher education institution that was pursuing a management model focused on efficiency standards for sustainability and continuity in the long run. To do so it would require the creation of values for intangible assets. In this context, the proposed system was implemented to support a rethinking of the institution, its values and its development into a desired future, considering a new regulatory framework and competitive environment. The objective was to change the current management model based on improvisation, common sense and past experiences.

3.2.2. Description

The second case aimed at verifying if the social responsibility indicators used by a higher education institution were sufficiently aligned to its strategic objectives. The implementation of the proposed system enabled an understanding that indicators in use reflected only philanthropy instead of social inclusion. The opening up of the organisation's strategic objectives into indicators, targets and initiatives or actions that reflect the true intentions of the institution enabled an overall reassessment of the institution's strategy (phase 1). Moreover, through a systematic consultation of key stakeholders, the proposed system allowed mutual learning to take place. On the other hand, the learning process enabled the identification of the problem itself, which was a strategic misalignment. Thus, the system fostered the possibility to re-shape the organization's strategy.

3.2.3. Positive results

The construction of strategic maps through system dynamics (step 2 phase 3) enabled an in-depth understanding of the cause-effect relationships between existing strategic objectives. This allowed the organisation to unlock the reasons for its clients and community dissatisfaction. The institution has a number of social projects in place. However, these projects stay in a stand-by mode in the period of compulsory holidays, since teachers, students and employees are obliged to stop

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[5] Phases in between brackets relate to the proposed system.

attending the communities which depend on such social projects. Moreover, working laws restricted the possibilities of continuity during the holiday's period.

Through the Management of Strategic Initiatives (step 5 phase 3) the institution was able to properly map the university processes and monitor the needs and requirements of all its stakeholders. As a result the social projects were maintained during the holidays. This happened since community leaders were selected and trained to implement the actions required for each project during holidays. Moreover, the use of CommonKADS (step 5 phase 3) guaranteed organisational learning to take place based upon the development of new abilities for all involved (teachers, students, community, etc.), which was critical to ensure the execution of the organisation's strategic plan. The involvement of community leadership reflected a change in the operationalisation of the institution's strategy which lead to increased satisfaction reflected in indicators such as transparency, quality of life, among others.

3.2.4. Negative results

Through the application of the proposed system it was possible to observe, however, that the strategic diagnosis (phase 2) did not achieve all its potential in meeting expectations. The analysis of strengths and weaknesses (SWOT analysis) stimulated an important reflection in terms of the future via the application of the Global Business Network scenarios. However, when imagining and preparing for the future, it was possible to see that the institution was not able to shape a process to build a shared understanding of stakeholders' views as well as of risks, opportunities, system capabilities and dynamic changes. As a consequence, the positive results attained during the implementation of the proposed system are at risk since these have not been considered in the scenarios and projections for the years to come.

3.3. An example from the not for profit sector

3.3.1. Rationale

The third case was selected due to the growing importance of the third sector in Brazil and worldwide. In such contexts, non-profit measures are key to assess the success of any given action, as well as the degree of efficiency and effectiveness in serving the needs of its employees and collaborators. This means that financial conditions may favour or inhibit the operationalisation of such organisations, but rarely are their main objectives. For this reason we became interested in applying the proposed system to assist the organisation in achieving its vision through a well defined strategy aligned with its implementation, together with its employees.

3.3.2. Description

The third case was designed to see how a non-profit organisation unfolded its strategic objectives into actions aligned to a dynamic budget (step 6 under phase 3). It aimed to show community members the benefits of a long-term vision that allowed one to incorporate suggestions from the community. This meant to generate sustainable solutions in the long run and enable the community to become more independent in the future.

3.3.3. Positive results

The proposed system enabled community members to develop their own strategies, with a focus on long term sustainability indicators. These were generated through the development of strategy maps (phase 2), in conjunction with the city of Florianópolis, SC, Brazil and relevant stakeholders, which generated opportunities to link new jobs with the local UNDP Programme. In this case, the proposed system allowed the preparation of a business plan for obtaining resources from the UNDP Programme. This enabled the development of the necessary infrastructure for the venture, as well as provided scholarships for the members of the community. At the same time, the city major, a key actor in the process, supported the initiative by developing employment opportunities for youngsters and offering entrepreneurship courses.

3.3.4. Negative results

The community efforts to put in practice the project actions and benefits in terms of scholarships and jobs do not guarantee the success of the mentioned non-profit organisation. This happens due to the lack of an action plan (phase 3) which will lead to a loss in the community's motivation in time. The demands are many, the needs are immediate, but the sustainability of the project is expected to happen only in five years. This means that there is a need to establish clear priorities with deadlines and to enable the community to monitor success during the next five years. This should stimulate motivation and support stakeholders to believe in the project being idealised. Hence, the proposed system should improve in terms of its notion of stakeholder involvement to enable the development of a common vision to be pursued across the system, to promote a collective articulation of these visions and related expectations, and to develop an action plan to monitor the achievement of the agreed vision as well as enable adaptation over time.

3.4. Limitations of the proposed system

In spite of the success factors enabled through the use of the proposed system, its application in practice (case studies) has shown that there are still a number of elements which need to be improved. These are critical to enable it to become flexible

and adaptive, and to integrate the value chain. For instance, the ways in which stakeholders are perceived and involved in decision processes such as the definition of strategic objectives is often neglected. This is true even in stages one would believe to be otherwise, like in the development of scenarios, in the construction of strategy maps or in the strategic management of initiatives. The same is true when dealing with complexity to process and interpret alternative options to support decision making. Also, in combining robust measures with learning and knowledge while monitoring the system and enabling it to become operational.

Moreover, the timeframe of the analysis provided by the system proposed is, like any other BSC, most often short-term (usually five years or less). Also, it does not allow disruptive (i.e. weak signals and wild cards) or creative elements to be included. Hence, it is not possible to link learning and strategy to a long-term vision of where the organisation wants to position itself within possible alternative futures; let alone to perform such an analysis including partners and stakeholders' views of what the future might entail or where they see themselves both individually and collectively. Moreover, although the system proposed enables knowledge to be formalised, shared and transferred across the value chain, this barely takes place in relation to implementing a common strategy. This happens if trust and participatory instruments are not in place when designing a strategy that takes into consideration the diversity of views across the value chain and the collective articulation of visions and expectations.

To deal with such shortcomings it is necessary to reinforce the notion of: (i) stakeholder involvement, (ii) mutual experimentation and learning (instead of organisational learning based on individual/tacit knowledge), and (iii) a common vision to be pursued across the system based upon the mutual positioning of value chain actors in relation to the future. Such reinforcement is critical to allow the coordination and mobilisation of necessary skills and resources towards a common target. And these are characteristics intrinsic to FTA, which must then be embedded in the proposed system to enable an effective connection between strategy and implementation across the value chain.

4. Roles of FTA

FTA and its elements of strategic foresight, forecasting and technology assessment can play a number of important roles in linking a firm's strategy to its implementation across the value chain. These are able to support a common action plan to become operational and the overall system to become adaptive over time.

The limitations of BSC which were still not effectively addressed by the proposed system, as noted above, can all be overcome, in principle, by embedding FTA in the proposal.

FTA has a long tradition in creating spaces for dialogue and in engaging different actors to confront views, learn from one another, and agree on a path to follow. Such a path usually includes broader and more comprehensive options than would otherwise have been the case [39]. Coordinating such interactions is thus paramount to enable alignment of actors and select (joint) strategies to be pursued. This also allows different organisations to build on complementary resources rather than to duplicate efforts [40]. At the same time, FTA is considered to contribute to enhanced governance modes that improve the performance of innovation systems [41]. Koschatzky [42] agrees when stating that foresight can be seen as a governance process, whereas [43] claim that this happens through shared or networked learning (facilitated through FTA). They affirm that networked learning enables a process of innovation and institutional adaptation that is participatory, interactive and in which social relations and the communication of insights and knowledge [44] are critical for successful outcomes.

The above can be operarionalised, to a great extent, through processes and tools that enable spaces for inclusive dialogue to take place [40,44–46]. Embedding this form of dialogue in the proposed system would thus improve the ways in which stakeholders are perceived. Also the ways that they are involved in decision processes. In turn, these would lead to further mutual experimentation and learning.

At the same time, FTA supports one to deal with complexity [47] to process and interpret weak signals, wild cards [48,49] and alternative options [46,50,51] to support decision making. All this is critical to reconcile creativity and rational analysis [45]. Also, to link learning and strategy to a long-term common vision of where the organisation wants to position itself within possible alternative futures. These include partners and stakeholders' views of what the future might entail. Also, it 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 value chain enables trust to be developed across the system through participatory instruments. These take into consideration the diversity of views across the value chain and the collective articulation of visions and expectations. However, such common vision to be pursued across the system should be based upon the mutual positioning of value chain actors in relation to future needs [52]. Ultimately, interactions [45,53–56] 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.

Rather than reducing the uncertainty firms and their stakeholders in the value chain confront, both individually and together, foresight can help actors to anticipate and manage emerging challenges. It does so by providing spaces where actors can come together to shape equally likely paths into the future through a collective articulation of visions and expectations (thus supporting phase 1). Such articulation would be the basis for actors to jointly experiment and develop creative options and solutions to challenges (thus supporting phase 1) as well as learn with one another (thus supporting phases 3 and 4). Enabling spaces like this through foresight embedded within the proposed system to formalise this collective process of mutual learning and experimentation would enable increased communication across the value chain. In turn, this would foster the development of partnerships based on trust (thus supporting phase 4).

Foresight also supports the firm's and its stakeholders' ability to develop a joint vision and define where each one would like to position itself within a range of likely futures (thus supporting phase 1). It does so by enabling a shared understanding of stakeholders' views as well as of risks, opportunities, system capabilities and dynamic changes (thus supporting phase 2). This builds upon knowledge which has been developed, formalised and diffused across the value chain.

In this context, the inclusion of forecasting and technology assessment features would allow further experimentation (e.g. modelling) in relation to the possible pathways actors can pursue both individually and collectively. This is important to support the definition of a common as well as an individual strategy (thus supporting phase 1). The breakdown of individual strategies into action plans and related monitoring systems aligned to a common goal in the value chain would thus support phase 3. Ultimately, this process is critical to increase legitimacy, ownership and transparency of decisions.

Hence, embedding FTA within the proposed system would enable firms to steer solutions to possible challenges through joint-up decision making and implementation processes. These include the coordination and mobilisation of required resources across the value chain. Hence, it supports the system to undertake systemic transitions and develop new configurations through a multi-level governance approach, as well as further experimentation and learning. Fig. 2 outlines the proposed "renewed" system including the FTA aspects here outlined.

The "renewed" system proposed in Fig. 2 holds the promise of supporting the shaping of a shared vision across the value chain, which is key to enable alignment between strategy and its implementation across a firm' value chain. Also, such a system shall enable the development of associated collective and individual strategies with related action plans as well as monitoring and evaluation systems.

The system outlined in Fig. 2 builds upon the structure of the BSC and its typical phases, and includes FTA elements into this structure to empower the organisation to appropriately apply foresight in business [39] using a PMS. This entails an improved ability to include a long-term view of the organisation and its partners in the value chain considering alternative futures and building upon increased participation in decision making processes for applications such as: anticipatory
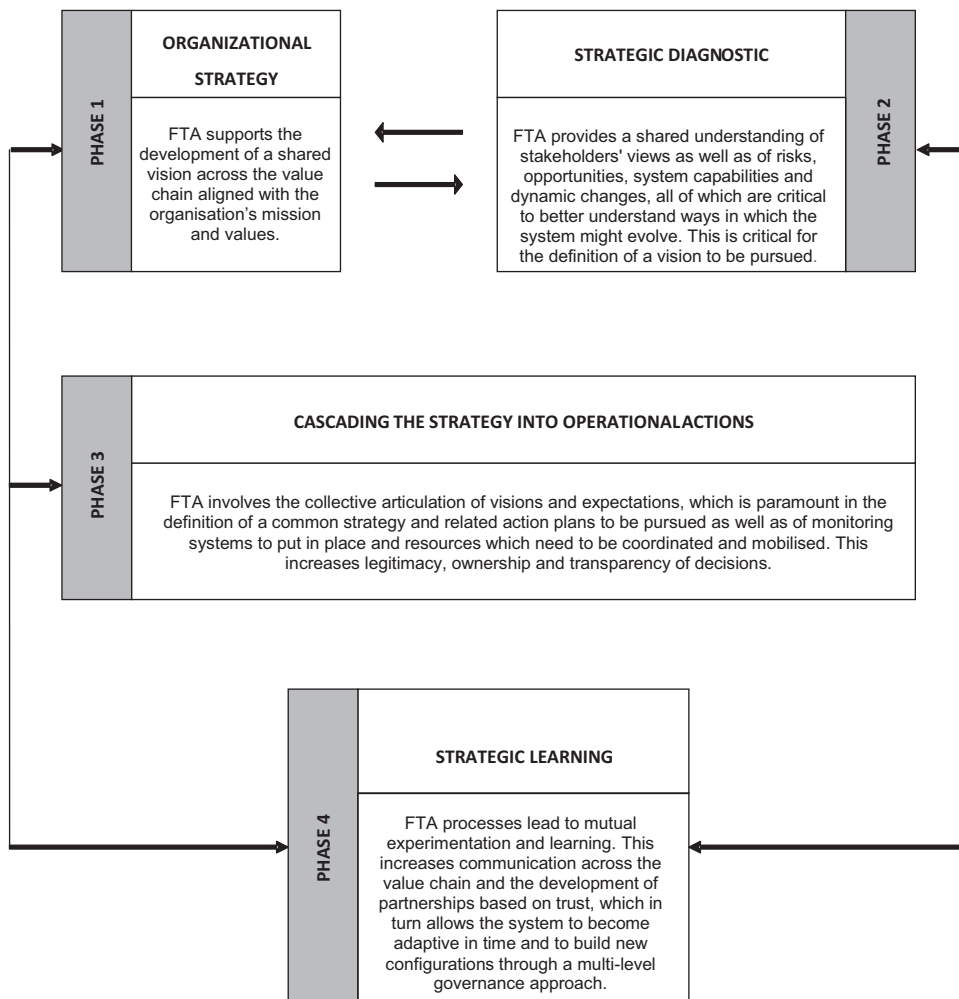

Fig. 2. FTA embedded within the proposed system.

intelligence systems, direction setting, priority setting, strategy formulation, marketing, organisational change, and innovation [39].

More importantly, the system outlined in Fig. 2 addresses all limitations encountered both in research and practice related to the effective implementation of the BSC. This is particularly true with a view of aligning value chain actors towards a shared vision enabled through FTA. It builds upon the creation of spaces for dialogue and communication channels which allow a shared understanding of individual actors' capabilities, needs and perceptions, as well as mutual learning and experimentation. Ultimately, this process shall lead to increased legitimacy, ownership and transparency of decisions across the value chain. These are critical to enable new partnerships built on trust to be formed and, therefore, to enable the chain and its actors to become co-adaptive in time.

However, a new piloting of the system would be critical to both validate and refine the system. Such an application of the system in practice shall be subject of future work to be developed by the authors.

5. Conclusions

The system proposed was developed based on perceived gaps in the process of implementing the BSC. The guiding objective was to combine characteristics inherent to PMS, such as participation, dynamism and its direct relationship with organisational strategy. Therefore, contributions from a variety of tools were combined in such a manner as to allow these objectives to be embedded within a system based on the BSC.

The application of the proposed system in practice shows that the notion of stakeholder involvement, mutual experimentation and learning, and of a common vision to be pursued across the system is however still neglected. The paper attempts to bridge such gap by bringing together management research and practice with FTA, which in itself is an original contribution to the former field.

By doing so the authors' claim that the use of the system proposed aligned with FTA helps overcoming overall PMS (and in particular BSC) limitations. It does so by supporting the shaping and monitoring of complex and dynamic systems. Hence, it should effectively enable the overall system under analysis (i.e. value chain) and individuals to become adaptive over time.

Finally, embedding FTA within the system proposed shall enable firms to steer solutions to possible challenges through joint-up decision making and implementation processes. These include the coordination and mobilisation of resources across the value chain. Ultimately, the renewed system with embedded FTA supports the system under analysis (i.e. value chain) to undertake systemic transitions and to develop new configurations through a multi-level governance approach, as well as mutual experimentation and learning. However, in order to validate and refine such a renewed system the authors propose its application in practice as an avenue for future research.

Annex 1. Limitations of the balanced scorecard and suggestions to overcome them.

Limitation	Authors	Suggestions	Authors
The balanced scorecard is more of a diagram representing relationships or a flow diagram than a map of cause and effect relationships, which nowadays is referred to as a strategy map	[57–61]	System dynamics	[61–65]
In order to analyse the cause and effect relationships between measures, a number of different scales are required	[60,61]	System dynamics Performance Prism	[61–65] [33]
The cause and effect relationships between performance measures are linear and static	[57,58,60,61,66]	System dynamics	[61–65]
There is a lack of criteria on which to base the selection of specific performance measures	[52,59]	Performance Prism	[33]
There is a need for additional perspectives if all stakeholders are to be catered for	[1,33,58–60,67]	Performance Prism	[33]
Independent variables (non-financial ones) are incorrectly identified as primary drivers of future stakeholder satisfaction	[58]	Quality Function Deployment (QFD)	[58]
There is no criteria-based assessment of the external environment	[60]	SWOT analysis	[26]
There is a lack of any system to define measures linked to consistent targets	[58,59]	Quality Function Deployment (QFD) SWOT analysis Analysis of scenarios Performance Prism	[58] [26] [68] [33]
The balanced scorecard fails because of difficulties that are encountered during the implementation phase	[1,69]	Hoshin Kanri	[70]
Employees are not represented when strategic objectives and measures are defined	[60]	Hoshin Kanri Skandia Navigator	[34,36,37] [71–75]
The balanced scorecard does not take into account the interaction between the processes of strategy development and implementation	[1,69]	Proposed system	Marinho and Cagnin (present paper, forthcoming)

Annex 2. Casual relationship diagram. Yuniarto and Elhag [76].
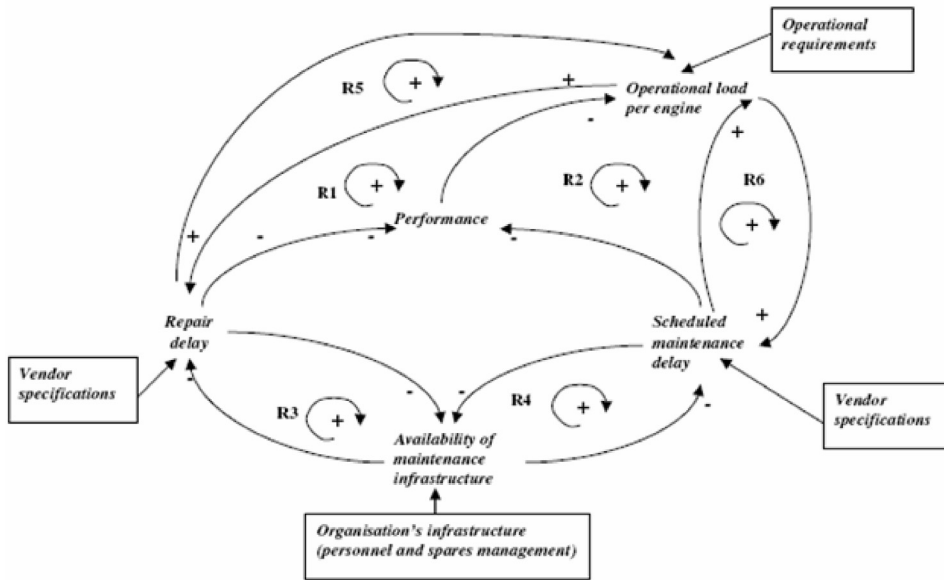
Annex 3. CommonKADS methodology. Adapted from Schreiber et al. [35].
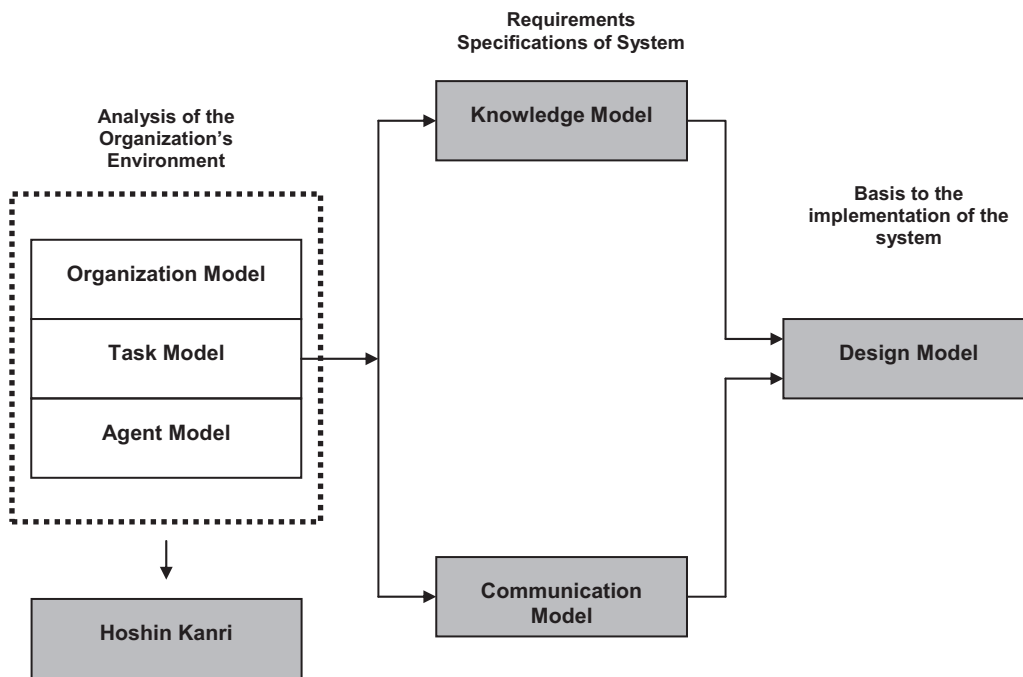
Adapted from Schreiber et al. [35]

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