Dealing with the Alignment of Strategies Within the Collaborative Networked Partners

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Abstract. Over the last years, enterprises awareness towards establishing col-
laborative processes has significantly grown due to the benefits obtained when
participating in a collaborative network (CN). This paper is a continuation of
the work developed by Andres and Poler [1] in which a set of collaborative pro-
cesses are identified. This paper particularly focuses on the *strategies alignment
(SA) process*, highlighting its influence on the success of a CN. A preliminary
framework is outlined to address the collaborative process of SA, consisting of
a model, a method and a methodology. Highlighting the importance of the use
of cloud-based systems to support small and medium enterprises (SMEs) to deal
with the SA process. The implementation of the proposed framework allows
identifying what are the strategies that are aligned and how its activation in-
creases the network performance, resulting in more stable and sustainable col-
laborative relationships, and assuring the proper operation of the CNs.

Keywords: Strategies alignment (SA) · Collaborative networks (CN) · Collabo-
rative processes · Sustainability · SMEs · Cloud-based engineering systems.

1   Introduction

Along the last fifteen years, a wide research activity has been carried out in the CN
context; this research especially focuses in small and medium enterprises (SMEs) due
to their higher lack of resources and capabilities to conduct collaborative processes. A
wide rage of models, guidelines and tools have been developed along the literature to
assist enterprises to comply the requirements demanded by the CNs, and cope with
the appearance of possible obstacles derived from the collaborative processes partici-
pation [2]. Despite the challenges enterprises have to face up when establishing col-
laborative processes, taking part in a CN leads them to obtain higher competitive
advantages and greater degrees of agility, facilitating their survival in the current
competitive and globalised environments.

According to the definition provided by [3] a CN consist of a set of heterogeneous
and autonomous entities, which collaborate to better achieve common or compatible
goals. Each autonomous entity defines its own objectives and formulates its own strat-
egies apart from defining a common goal. The raised strategies encompass a set of

actions described to achieve the objectives defined, whose accomplishment is measured through key performance indicators (KPIs). Once the strategies are formulated the enterprises have to decide which ones activate in order to achieve the objectives defined and obtain the desired performance [4]. When deciding what strategies activate, an enterprise may opt for making this decision from an isolate perspective, that is, by only taking into account the extent to which the activation of its strategies will benefit the achievement of its own objectives. An enterprise that makes this decision, by only taking into account its own objectives, may trigger a contradictory situation in which the strategies activated by one enterprise positively influence the objectives defined in the same enterprise but could negatively influence the achievement of the objectives defined by the other network enterprises, leading to a partnership failure. On the other hand, an enterprise can opt for deciding what are the strategies to activate by considering not only its own objectives, but also taking into account the achievement of the objectives defined by the other network partners.

1.1   Research Question

CNs are characterised by the heterogeneity of the enterprises and the objectives they define, consequently, a high diversity of strategies are formulated, to achieve these objectives, which at times might contradict one each other. In order to support the network partners on deciding about what strategies to activate, so that they positively influence all the objectives defined by network partners, a set of collaborative mechanisms are needed with the main aim of identifying the strategies that are aligned. In the light of this, a research question emerges:

What would be an adequate model, method and methodology to identify amongst all the strategies, formulated by the network partners, those that must be activated so that there are aligned and positively influence the objectives of all the partners?

The opportunities derived from the proper selection of strategies opens new ways to decide what strategies to activate, considering all the objectives defined by the enterprises. In this context, the research challenge emerges evolving from the null consideration of the objectives defined by all the network partners towards deciding what strategies to activate by considering how they affect to the objectives achievement of the rest of enterprises. The measurement of the increase of KPIs when certain strategies are activated will allow SMEs to identify what is the combination of strategies that results on higher increases on the KPIs. As will be justified then, the information gathering required to implement the framework proposed to deal with the SA process will be supported by cloud-based systems. Accordingly, the paper is organised as follows: Section 2 identifies how the SA process can benefit from the application of cloud-based systems; in Section 3 the SA concept is defined and a brief overview of how this concept has ben treated in the literature is given; Section 4 provides a summarised description of the proposed framework, consisting of a model, a method and a guideline to address the SA process; conclusions and future research lines are presented in Section 5.

2 Benefits from Cloud-Based Engineering Systems

According to [5] the cloud-service term is understood as an Internet-based technology used as a repository of information and IT services provided to the enterprises (seen as customers) that updates the data, computes the required issues (computation) and maintains the IT (software). The SA process, established in a CN context, involves a large diversity of SMEs having their own information. To address the proposed SA model interoperable information systems are required to exchange the data demanded. Cloud-based systems allow achieving data interoperability between different applications belonging to different SMEs; exchanging, connecting and integrating the data required to feed the model developed to deal with the SA process [6]. Considering the characteristics affecting the widely distributed SMEs, for which the proposed SA framework is designed, cloud-computing resources contribute to overcome some limitations of the SMEs in terms of (i) increasing their capability to process and storage the information, (ii) reducing the lack of interoperability in their applications, and (iii) shortening their limited computed power, with appropriate computational resources, technologies and software. One useful application of cloud-based systems in the context of SA is the integration of the simulation software used to solve the proposed SA model: *AnyLogic®* [7]. This system dynamics simulation software will be included in the cloud in order to support all the enterprises, belonging to the collaborative network, on the decision making of which strategies to activate in order to be aligned one with each other.

3 Definition and State of Art

In this section a definition of what in this paper is meant by the SA concept, is offered. Besides this, a brief overview on how the alignment concept has been treated in the literature is given.

Strategies Alignment (SA) Concept. Considering that the strategies are the set of actions to be performed in order to fulfil the objectives defined, there are characterised by being aligned when: each activated strategy not only promotes the achievement of the objectives defined by the enterprise that raises such strategy, but also positively influences the accomplishment of the objectives defined by the rest of the network partners. The SA concept is linked with the strategies *complementarity*, in which two or more strategies, apart from being able to exist together harmoniously if simultaneously activated (compatibility), enhance the benefits obtained in the associated objectives, receiving positive influences from the set of activated strategies

The literature has used different terms to refer to the alignment concept in the CNs context, such CN participants' alignment [8], strategic alliance [9], collaborative strategy [10] or values alignment [11]. As regards the alignment in the specific context of strategies, different works have been developed, by considering in most of the cases the alignment of two particular strategies (table 1).

The analysis of the selected works has allowed identifying a common feature about how the alignment concept is treated. Concluding that, the approaches developed so far to deal with the alignment of strategies deals with the strategies *compatibility*. What is to say that, the alignment term is used to promote the simultaneous activation of pairs of specific strategies, which make a good combination, but does not involves, necessarily, that the enterprises performance increase when compatible strategies are activated. Accordingly, none of the works, provided so far, give a global view of the whole range of strategies defined by all the enterprises of the CN. In the light of this, the SA framework proposed in this paper goes further and develops a holistic approach identifying *complementary* strategies, in which the collaborative network system is analysed as a whole, considering all the strategies formulated by the enterprises that comprise it. The holistic nature of the proposed approach allows determining how the objectives of each company behave (increasing or decreasing its performance levels) as a result of the synergies arising from the activated strategies.

Table 1. Alignment of specific strategies and authors

Alignment of specific strategies	Authors
Business Strategy & IT Strategy	Cuenca et al. [12]
Business Strategy & Information Assurance Efforts	Jean-Noël et al. [13]
Business Strategy & e-Business	Raymond and Bergeron [14]
Supply Strategies	Cousins [15]
Global Sourcing Strategies	Selen and Ashayeri [16]
Marketing Strategy & Sourcing Strategy	Green et al. [17]
Supply Chain Configuration & Distribution Channels	Wu et al. [18]
Product Design Strategies	Dell'Era and Verganti [19]
Product & SC characteristics	Lyons and Ma'aram [20]
Product & SC Processes	Stavrulaki and Davis [21]
Green SCM & Business Strategy	Whitelock [22]

4   Research Contribution in Strategies Alignment

The strategies alignment process is considered a key factor that, if carried out, leads the CN to have higher levels of performance, and therefore, success. The problem identified in this paper is the strategies misalignment, which may lead to partnership failure. In order to deal with this relevant problem, the paper bases its research on a theoretical body of knowledge regarding Collaborative Networks, Industrial Management, and System Dynamics. The research scientific methodology used has its ground on the *Constructive Research* method [23]. A framework consisting of (i) a *model*, to represent the links between the objectives and the strategies formulated by all the networked partners, (ii) a *method*, selected to solve the particular modelled process, the SA, and (iii) a *methodology*, to guide the CN enterprises on how to apply the model, to solve the specific problem of SA, is proposed. This framework identifies the set of strategies to activate in order to be aligned.

4.1 Strategies Alignment Modelling

The SA model addresses the decision making of what strategies to activate though an approach that allows to identify the set of strategies that if activated positively influence (or its negative influence is minimum) all the objectives defined by all the network partners. The model computes the increase (or decrease) of the KPIs, used to measure the objectives, depending on what strategies are activated. Accordingly, the model is based on deciding which strategies to activate so that the increase of the KPIs is maximised. The set of parameters characterising the SA model are depicted in (table 2). These parameters allow defining the function that models the influence the strategies exert over the KPIs (fig 1).

Table 2. Parameters and its classification in systems dynamic

Index			
net	set of networks (*net = 1, …, N*)	*k*	set of KPIs (*k = 1, …, K*)
i	set of enterprises (*i = 1, …, I*)	*s*	set of strategies (*s = 1, …, S*)
x	set of objectives (*o = 1, …, O*)		

Parameters		Type of variable
kpi_{ixk}	KPI k defined by enterprise i to measure the objective x	Auxiliary Variables (kpi_{ixk})
kpi_i	KPI at enterprise level (the sum of the kpi_{ixk})	
kpi_{net}	KPI at network level (the sum of the kpi_i)	
str_{is}	Strategy s defined by the enterprise i	Auxiliary Variables (str_{is})
u_str_{is}	Units of strategies to activate of str_{is}	
c_str_{is}	Cost of one unit of strategy str_{is}	
$val\_str_{is}\_kpi_{ixk}$	Value estimated by the enterprise defining the increase or decrease of the kpi_{ixk} when one unit of str_{is} is activated	
ti_str_{is}	Time of initialisation of str_{is}	
ti_str_{is}	Time of finalisation of str_{is}	
$d_1\_str_{is}$	Delay time, period of time in which, once the str_{is} is initiated, the str_{is} does not exerts influence over the kpi_{ixk}	
$d_2\_str_{is}$	The influence that str_{is} exerts on the kpi_{ixk} is not immediate, unlike it takes a time to reach the maximum level of influence ($val\_str_{is}\_kpi_{ixk}$)	
$slope\_str_{is}\_kpi_{ixk}$	The progressive influence during $d_2\_str_{is}$	
$d_4\_str_{is}$	Duration of strategy str_{is}	
$inf\_str_{is}\_kpi_{ixk}$	Maximum level of influence of str_{is} in kpi_{ixk}	
bi	Budget owned by enterprise i to activate the strategies	Stock Variables
∇kpi_{ixk}	Increase of the KPI when the strategies are activated	
$F\_inf\_str_{is}\_kpi_{ixk}$	Function of influence that the kpi_{ixk} experiences when the strategy str_{is} is activated (fig 1)	Flow Variable

The objective function is defined by maximising the parameter kpi_{net} through modifying the decision variables defined by ti_str_{is} and u_str_{is}.

$$max.\ kpi_{net} \tag{1}$$

$$kpi_{net} = \sum_i ikpi_i \tag{2}$$

$$kpi_i = \sum_i \nabla kpi_{ixk} \tag{3}$$

$$\nabla kpi_{ixk} = \int F_{\inf\ str_{is}\ kpi_{ixk}}(t) \cdot dt \tag{4}$$

$$F\_inf\_str_{is}\_kpi_{ixk}$$
$$= \begin{cases} 0;\ t < t_{i}\_str_{is} + d_1\_str_{is}\ \wedge\ t < t_f\_str_{is} \\ slope\_str_{is}\_kpi_{ixk};\ t_{i}\_str_{is} + d_1\_str_{is}\ \leq t \leq t_{i}\_str_{is} + d_1\_str_{is} + d_2\_str_{is} \\ inf\_str_{is}\_kpi_{ixk};\ t_{i}\_str_{is} + d_1\_str_{is}\ + d_2\_str_{is} < t \leq t_f\_str_{is} \end{cases} \tag{5}$$
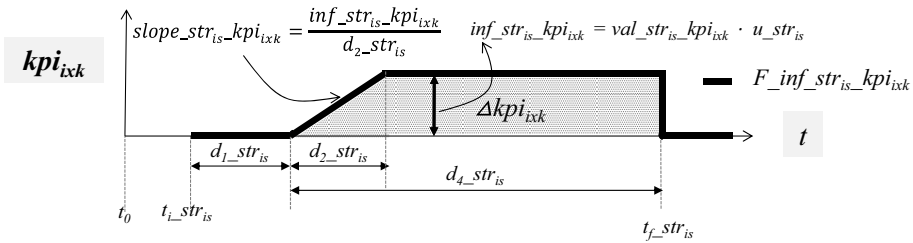

Fig. 1. Function modelling the KPIs behaviour when a strategy is activated $F\_str_{is}\_kpi_{ik}$.

4.2   Method: Systems Dynamic (SD)

The systems dynamic [24] is the method selected to solve the SA model, due to allows characterising the causal relationships between the strategies and the objectives, and models the influences that the objectives experience when certain set of strategies are activated. The parameters that characterise the model are arranged according to the classification given by SD method: stock variables, flow variables and auxiliary variables (table 2, *Type of Variables* column) [25]. The tool used to solve the SA model is *AnyLogic®* [7], allowing simulating in SD. This software includes an optimiser package that allows obtaining the best set of parameters (ti_str_{is}, u_str_{is},) that maximise the network performance (kpi_n).

4.3   Methodology

The collection of steps that allows enterprises to identify the set of aligned strategies that optimise the network performance is described. The methodology consist of: (i) selecting the enterprises that participate in the SA process; (ii) identifying for each enterprise the objectives defined: the kpi_{ixk} used to measure these objectives and the strategies formulated (str_{is}) to be potentially activated; (iii) gathering the data: each

enterprise estimates the value, $val\_str_{is}\_kpi_{ixk}$, that determines the strategies (str_{is}) influence on the kpi_{ixk} when the first ones are activated, besides this, all the data regarding the strategies characterisation is also collected (costs and durations). The use of cloud-based systems support enterprises on gathering the data; (iv) feeding the model with the gathered data; (v) the SA model is simulated in *AnyLogic®* software. The number of units to activate of each strategy, u_str_{is}, and the time unit in which each strategy is initiated, t_str_{is}, are determined, maximising the kpi_n. The use of cloud-based systems is used to provide to all the collaborative SMEs with software. We refer readers to Andres and Poler [25] for a detailed numerical example applying the above-developed model.

5   Conclusions and Future Work

This paper focuses on the SA process, addressing it through modelling the influences that the strategies exert on the KPIs, defined to measure the objectives achievement. The System Dynamics is the method used to solve the model. *AnyLogic®* software is selected to implement the modelled process of SA. The provided approach supports the decision making process of which strategies activate at enterprise level from an holistic perspective considering all the strategies defined by the enterprises of a CN, allowing obtaining optimal network performance levels. Cloud-based systems are useful tools to support enterprises on gathering the information required by the SMEs in order to feed and implement the model. Despite the advantages obtained from the application of the SA framework, there is a limitation related with the information gathering, as regards the estimation of the value $val\_str_{is}\_kpi'_{ixk}$, specially if the strategy str_{is} has never been activated or there is a lack of information flow between the CN enterprises. The drawbacks as regards the information exchange and uncertainty inherent to CN must be considered in the formulation of the model and definition of the methodology. In the light of this, future work is lead to (i) extend the work developed so far defining a complete model and methodology in order to deal with the identified limitations, (ii) validate the developed approach in a real supply network, and (iii) demonstrate the usefulness of the developed contribution through simulations comparing collaborative and non-collaborative scenarios, of the decision making regarding the strategies activation.

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