A Performance-Based Scenario Methodology to Assess Collaborative Networks Business Model Dynamicity

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Abstract. In today's business marketplace many enterprises collaborate forming a collaborative network (CN) in order to achieve competitive and sustainable advantages. In this context, CNs should have not only well-defined business models but also mechanisms and tools that help them out to assess such business models as well as other CN operations at their early stages. Due to shorter lifecycles and to the current fierce competition such an evaluation should be made as quickly as possible and analyzing real data rather than based on opinions and subjective judgments. This paper presents the application of a methodology that allows such an assessment as well as the generation of business scenarios based on the performance of the CN. Then, it first defines the appropriate CN key performance indicators (KPIs), gathering data for a certain time-period; then, it applies multivariate techniques to this data, identifying relationships between the KPIs, and being able to build the timely evolution of the CN based on this data; next, it is able to design a business scenario based on the timely evolution that the CN should have according to its business models and operations results achieved so far. With all this additional information decision-makers could decide whether the CN's business models succeeded or not so far and what actions to take in order to achieve the future desirable scenario.

Keywords: scenarios; business models; collaborative networks.

1 Introduction

Design, implementation, re-definition and sustainability of business models are complex tasks. However, these are key tasks when aiming to stay in business in a sustainable manner for a long time. Nowadays, when competition is fiercer than ever and business environments are turbulent ones there is a need to evaluate, under a

dynamic approach, whether a business model is and, what it is more important, will be successful. When bringing this thematic to the Collaborative Network (CN) context, it becomes more complex, as CNs requires of more organizational skills and capabilities to do so than in single companies. Therefore, the business model dynamic assessment issue is one of the most serious research gaps to be covered within the current literature. Then, recently some authors [1], [2] affirmed that an orientation towards experimenting with and exploiting new business opportunities was the key to cope with dynamicity. In addition, organizations achieving coherence between leadership, culture, and employee commitment are in the first line regarding business models knowledge and, extensively, success. Experimenting is directly liked to innovation, which is of great importance when aimed to develop a sustained business model. However, there is a lack of models/methodologies that clearly propose an approach to link CNs experimentation results and CNs performance. Additionally, the current approaches do not integrate a business scenario methodology within a solid and complete performance measurement system.

Then, this paper applies a methodology that will help to CNs decision-makers to assess, in its early stages, whether a business model is successful or not and whether it will, based on real recent performance, be successful in both the short and the medium-term. This will be made through the development of business scenarios based on applying multivariate statistical techniques to real data as gathered by sound performance indicators. The outcome of this methodology will help to decide whether to pursue the defined CN business model, and other important CN operations, or not. The main results of applying this methodology to a CN are highlighted, as well as final conclusions, future research work and generalization of the findings.

2 Scenario Planning and Performance Measurement

Even though it is widely accepted that the usage of scenario planning is very beneficial for organisations, this has not been totally proved. In fact, there are several works that aim to establish links between scenario planning practices and benefits. Chermack [3] proposed fourteen different hypothesis that aimed to demonstrate the existence of correlation between scenario planning and other factors such as firm performance, improved decision making or learning. Additionally, [4] revised several case studies, empirical studies and theoretical works that evaluated scenario based decision-making processes. Real world evaluations lacked measures of verification, which usually turned out to be subjective ones. On the other hand, theoretical evaluations involved rationales difficult to properly assess. Finally, it is stated that when evaluating a decision-making method, the human component should be carefully taken into account.

Therefore, a system that somehow combined the implementation of scenarios within a performance measurement system (PMS) would be of great utility to decision-makers. In this sense, and even though in the last years several important supply chain PMS have been developed – i.e. [5], [6], [7] - none of these works do enable effective mechanisms to incorporate scenarios application. At the individual enterprise context something similar happens, as there are only two works that have

dealt in some deep this idea. Fink et. al. [8] developed a called "future scorecard" in which some consideration is given to the possibility of developing a scorecard that possesses an additional input with the information and conclusions derived from environmental analysis. On the other hand, Othman [9] establishes that a balanced scorecard could be linked with scenario planning by taking into account a future state or scenarios to be reached when formulating the PMS strategy. Both of these works are theoretical and do not go beyond, as they neither propose a structured method nor provide experiences derived from application.

Hence, the methodology developed by [10] Rodriguez 2010 incorporates business scenario generation within a PMS. In order to do this, it is based on real data coming from the PMS, as collected by the key performance indicators, to design the different business scenarios. Therefore, decision-makers have available scenarios based on real data coming from their own PMS and they can therefore project this data to achieve the future position of the organisations. Moreover, they will know in advance what values should take the different indicators in order to reach this future desirable position and, extensively, will be able to react and propose and apply actions that will make this possible. This methodology applies multivariate techniques such as Principal Component Analysis and Partial Least Squares to find combination of inter-related KPIs and to project them in order to define the future business scenario.

This methodology was applied to organisations but not yet to CN. This paper presents next the main results of applying it to the key performance indicators regarding the business models and operations of a CN.

3 Application

The above mentioned methodology has been implemented in a specific CN in order to be able to design business scenarios that will help to decide not only to what extent a business model is being profitable and effective but also to decide whether to modify it or not. A Spanish furniture manufacturer and a home appliances company form such a CN. These two companies have kept business relationships for the last two decades and know each other very well. They combine different products in order to offer to customers different combinations of their products. Moreover, customers will have available a combination or pack of products whose value proposition exceeds the traditional single-company one. It is important to point out that these two companies are the core ones of the CN, but this involves to many other organisations that come from the raw material suppliers to the own final customers. Additionally, this study was carried out when the CN was already stated and working and therefore metrics collected data from different key business models indicators, as well as from other parts of the CN, rapidly. Therefore, decisions made as a result of the experimentation, calculated performance business scenarios, were expected to have an impact in the short-term.

Then, it was initially needed to define key performance indicators able to measure, control and monitor not only business models activities and changes but also other important parts of the CN regarding both its customers and operations. Therefore, a

list of 15 key performance indicators was defined. These are shown in Table 1. The business models key performance indicators were defined following [1].

Table 1. CN key performance indicators

Id.	KPI
1	Number of knowledge strategies changes
2	Improvement of the degree of contextualization of multi-disciplinary knowledge
3	Improvement of the service level
4	Improvement of the customer involvement level
5	Improvement of the customer fidelity degree
6	Improvement of the delivery time
7	Decrement of the life cycle time-to-market
8	Improvement of the customer satisfaction degree
9	Improvement level of the GRI indicators related to sustainable production
10	Number of collaborative product designs
11	Improvement of the number of additional business services offered
12	Improvement of the degree of collaborative innovation
13	Improvement of the degree of perceived quality
14	Improvement in of sales achieved (% turnover)
15	New business opportunities discovered

Some of these KPIs were quite abstract and a great effort was made in order of not only properly collecting the data but also creating a standardize process accepted by the partners. Then, many KPIs were collected via experts' analysis instead of direct feeding from some databases. For instance, KPI number 1 was collected once the experts analysed whether there was any knowledge strategy change compared to the previous situation, as defined in the immediate previous time period. In order to do so, experts had to analysed different points and results from the CN carrying out different activities: developing a questionnaire, monitoring the evolution of the CN regarding financial results, personnel perception or knowledge transfer and comparing the obtained results with the situation in which, according to its strategic formulation and business model, the CN should be.

Then, these KPIs were collecting data over a six-months time period. The operative phase of collecting the data was not an easy task. First of all, it was necessary to homogenize the frequency of the data from the KPIs. In other words, some KPIs were regularly collected (i.e. weekly frequency for the KPI number 3 of increment of service level) whereas others were collected in a more dilated way (i.e. every two months for the KPIs 1, 2 or 9).

Then, some initial data treatment was performed on such data (statistics, frequency homogenization), having available an initial data set. Such a data set formed an initial data matrix to which Principal Component Analysis was applied, obtaining different

principal components. The principal components are constituted by KPIs that interrelated. For this study, the two first principal components were retained, as they explained the 82% of the initial data variability. The indicators forming these two first components were the following.

- PC1. Indicators number: 3, 6, 7, 9, 10, 13 and 14
- PC2. Indicators number: 1, 2, 4 5 and 8.

Therefore, the PC1 could be representing the operational evolution of the CN whereas the PC2 could be representing the business model control and customer situation of the CN. It is necessary to point out that the KPIs not included within either PC1 or PC2 were forming other PCs that were not retained for this study.

Then, a monthly time evolution of these KPIs was obtained and the observed trend can be seen in Figure 1.

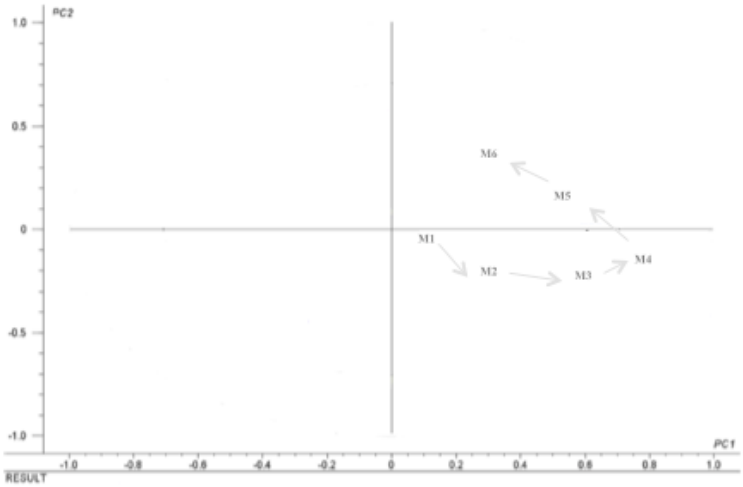

Fig. 1.- CN timely evolution

Then, from this time evolution, it can be seen that for the two first periods of time (M1, M2) the evolution of the PC1 is positive (growths) whereas the PC2 decreases. This means that the CN was positively growing regarding its operations (as measured by the KPIs that form the PC1) and decreasing regarding its business model and customer situation, as captured by PC2. Then, it can be observed a change in this trend in the periods M3 and M4, where PC1 still grows but slower than before and the PC2 stabilizes its decrement. Finally, in the periods M5 and M6 PC2 grows positively whereas the PC1 decreases its value. At the end of M6, the situation was by one hand that the CN was obtaining a good response in terms of the PC2 (business model and customer situation) coming from a bad starting; on the other hand, the CN was performing worse than initially regarding its operations.

With this information, the decision makers had to decide what they wanted to achieve in the next period(s) of time. Since the KPIs related to business models were

performing well in the last periods, they decided to generate a scenario where the CN operations improved, maintaining the positive growing trend of PC2. Then, the PCA was applied again providing some future values to the KPIs of both PC1 and PC2. This application was performed several times until the future scenario (E), as shown in Figure 2, was achieved.

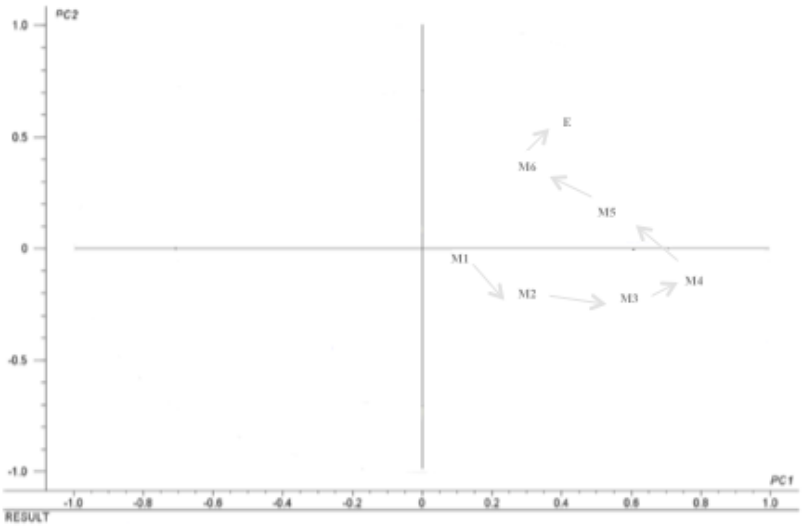

Fig. 2.- CN's scenario based on KPIs projection

Therefore, decision-makers knew what values the KPIs associated to both principal components should be achieved in the next time-period. In order to force them to achieve such values, they accorded to carry out some actions. Since the evolution of the PC2 was positive they decided that they were performing reasonably well regarding business model and customer situation and focused therefore on modifying the trend of PC1. In doing so, they decided to apply, among others, the next actions:

- Supervise and re-organise the design team.
- Look for new first-tier suppliers.
- Application of lean manufacturing techniques.
- Improve customer participation in the design and first units production processes.

As pointed out before, these actions were indicated to act and achieve results in the short-term. However, the effect of these actions may take time and it should be monitored and re-adjusted if necessary over-time.

4 Conclusions

This work has presented the main results of applying a methodology for designing scenarios based on performance for CNs. This methodology allows to decision-makers to decide whether the CN's business models and operations have being achieved so far. In the application presented, after applying Principal Component Analysis, two principal components were retained for the study, representing both the operational evolution of the CN and the business model control and customer situation of the CN. These two principal components were represented over a period of time of six months, being able to determine whether the expected objectives were being achieved or not. The principal component 2 of business model control and customer situation had a good positively growth trend whereas the principal component 1 of CN operations was decreasing in value. This lead to decision makers to design a future desirable business scenario, which would bring to the principal component 1 to positively growth in the next time periods. Additionally, adequate actions to make that the KPIs inherent to the principal component 1 would get the position defined for the business scenario were stated.

This application can be generalized for any CN that has got KPIs defined and wants to analyse the timely evolution of its performance, as a result of the timely evolution of some principal components formed by different CN KPIs. Besides, such a CN can also define one or some scenarios and associated actions to be taken within the CN.

Future research work could focus on linking together the KPIs that constitute the different principal components with the CN strategic objectives; this would lead to a representation of the timely evolution of CN at the strategic levels.

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