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Collaborative Project Management Framework for Partner Network Initiation

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Abstract

Fast changing market conditions force SMEs to collaborate dynamically with each other for carrying out projects accordingly to customer requirements in a competitive way. In order to simplify the cooperation, a Collaborative Network (CN) of enterprises forms Partner Networks (PN), where partners define the rules of collaboration and sign collaboration agreements. This paper provides a conceptual model of a sustainable realization of collaborative projects for SME-s from the machinery domain that follows criteria for involving new members to a PN. Furthermore, the authors describe the initiation of a PN joining process and introduce the business processes classifier for enterprises partners. The main objective of research is to enable the commencement of new projects, or Virtual Organization (VO) faster for the price proposal preparation. Today there is a gap exists in the state-of-the-art with respect to a comprehensive lifecycle of PN-initiation and collaborative project management, starting from its very inception. The primary purpose of this paper is to introduce a novel model that enables a faster PN initiation process; the novel process of PN initiation covers the aspects of composing the partner network, the PN-initiation lifecycle and a corresponding architecture for PN initiation.

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1. Introduction

Increased market competition force SMEs to collaborate with other enterprises in order to compete successfully against larger corporations. Such networks known from literature as Industrial Clusters, Partner Networks (PN), Collaboration Networks (CN), Collaborative Networked Organizations (CNO), Virtual Breeding Environment (VBE) etc.

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CNO are autonomous, geographically distributed networks that support heterogeneous organizations to collaborate and achieve better common or compatible goals through their interactions. The VBE represents an association or pool of organizations and their related supporting institutions, adhering to a long-term cooperation agreement template, with the main goal of increasing their preparedness towards collaboration in potential Virtual Organizations (VO)-s [1]. The main difference between PN and VBE is the operating environment that as part of a PN with its legal aspects. The companies entering into a PN sign a framework agreement that comprises a collective juridical body. Based on that agreement the companies can quickly form a Virtual Organisation (VO), in order to be ready for a legally correct response to the changing market demands [2].

However, a gap exists with respect to the comprehensive lifecycle of collaborative project management starting from its very early inception phase, as the related-work discussion of Section 2 reveals. The authors accumulated the defined steps in advance, which they follow throughout the research process, as well as with the specific objective for data collection as the most important criteria in quantitative research [4]. The research focuses on the formation of new and innovative artefacts, broadened to the boundaries of human- and organizational capabilities. Based on design science approach, the authors suggested the novel conceptual model and application of the designed artefact, which enable to receive knowledge and an understanding of the problem domain and its solutions [3]. The paper also imply the practical implementation of the PN joining survey and four enterprises have been practiced this survey. To conclude, this position paper introduces a novel conceptual model for the PN initiation and sustainable realization of collaborative projects comprising SME-s from the Machinery domain with the help of design science

The authors formulate the research problem as a question that arise based on literature review and collaboration requirements collected from selected enterprises from the machinery domain: How to initiate a PN of enterprises in a time and cost efficient way? In addition to sustainable realization of collaborative projects for SMEs, the introduced conceptual model also support the PN initiation process. This paper covers the first step of the model, i.e., introducing the process of new collaborative partners joining PN. In next step of research, the authors will proceed with the next step of conceptual model, or they will develop the algorithm for PN enterprises efficiency measurement. Facing the research question, this paper covers the first step of the PN formation, or joining of PN with the help of questionnaires.

In current research paper, the authors deduce the hypothesis that is testable and falsifiable: It is possible to collect the initial data required for PN initiation and partner allocation based on services provided by questionnaires. Likewise, the research focuses on finding the accurate answer for the research hypothesis. Consequently, this paper tests the research hypothesis and solves the defined problems related to the initiation of new collaborative projects and project-proposal preparation that take considerable time leading to a potential loss of business opportunities.

This paper targets readers from research and industry who are interested in the initiation steps of PN while moving forward to the establishment of collaboration through PN. The authors are looking forward to receive the feedback from research and business users who are interested in participating in PN establishment and verification steps.

2. Literature review

In current chapter, the authors provide literature review that covers the following topics: the collaborative networks of enterprises, virtual organizations, project management and collaborative project management, B2B enterprise architecture, which they finalize by problem statement.

2.1. Collaborative networks of enterprises

The relation between CN, PN and VO, is given in Fig.1. It describes the relation between the Collaborative Networks (CN), Partner Network (PN) and Virtual Organization (VO). The authors assume that the enterprises outside PN would not participate in the project, since the PN contract does not bound them legally to do so. But those enterprises are the part of a bigger (external) network known as CN, that end up with N number of enterprises, which depends on the resources needed to accomplish a certain project. The enterprise can join PN based on business processes audit results, which assess the maturity level and sign the legal contract, if the candidate enterprise has passed the audit successfully

The figure 1 illustrates a case, when production Ent. 1 is acting as a FP and searching for resources requested by customer, which are not available in own facility, such as packaging and logistics. After Ent. 1 has completed the

search in the pool of enterprises of PN, it discovered two enterprises that provide packaging service and the same number of enterprises that provide the logistics service. FP has decided to initiate the collaboration with all enterprises, which means that enterprises 3.1 and 3.2 are sharing required logistics resources. The same rule is valid in respect to packaging and other services requested by customer, if there are more than one partner enterprise, who provide the service requested. After the FP has selected the partners required to fulfill project tasks, the selected enterprises are forming the VO, see Fig. 1.

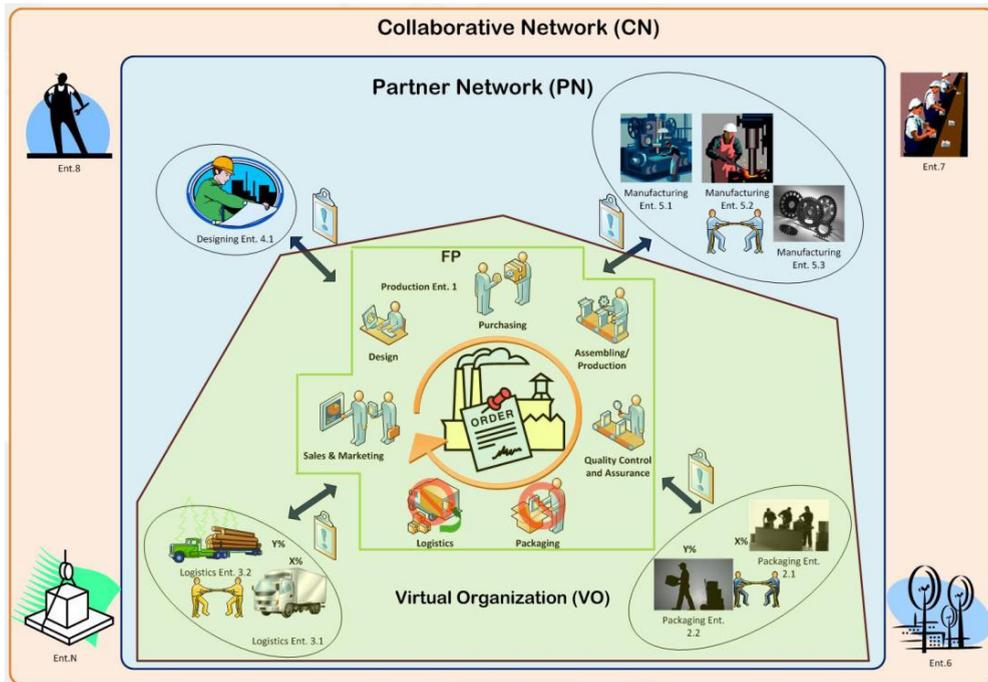


Fig. 1. The structure of Collaborative Networks (CN), Partner Network (PN) and Virtual Organization (VO).

In order to determine the most suitable notation for a PN lifecycle definition the research group has tested the existing notations. Business Process Management Notation (BPMN) we consider suitable for process modelling for IT users and EPC/VAC for business users. Applications systems instantiations of a Service-Oriented Cloud Computing architecture enables enterprises to join PNs in a meaningfully automated way [5]. The novel process of PN initiation covers the aspects of composing the partner network, the PN initiation lifecycle and a corresponding architecture for PN initiation.

2.2. Virtual organizations

Virtual Organization (VO) is a temporary alliance of independent companies that formed to fulfil particular task or project. Building VO means that the necessary companies recruit among the PN as subcontractors for critical service provisioning by companies that are in the better financial and market position, or Focal Players (FP), who act as the general project managers. In case if the needed competencies are not available, or their quality is not sufficient in the current domain PN, the company from another domain PN, from CN or the external company invited to participate [1]. The FP assess the PN candidate enterprises based on their process maturity [6]. There are four types of maturities, which influence VO: VO Maturity, Organization Maturity, VO Collaborator Maturity and Partner Network Maturity [2]. The fast evaluation of a maturity level supported by questionnaires [7].

Based on the competencies, the FP analyses the business opportunity to find out whether it is worthwhile to launch a new project after which the FP will be a PN team Members for a project. This includes business planning that leads to the development of an integrated business model, including specific business concept (processes, skills, resources, etc.) and financial models. When the companies formed a VO, the actual operation may range from design to manufacturing and retail. A collaboration termination means the VO of companies dissolves and their employees make space for the next upcoming business opportunities [8] [9]. The successful accomplishment of the operation aims to the achieved the desired business impact, after which – unless there is a directly succeeding order – the project terminates.

2.3. Project management and CPM

The discipline of project management is rising at exponential rate and its importance can be seen in every organization that is dealing with certain business processes. Nowadays and in the near future, it is almost impossible to imagine the management career without management of projects. Project management deals with a dynamic set of tools that improves people ability to plan, implement and manage activities in order to accomplish specific organizational objectives. On the other hand, project management is not just a set of tools, but it is a result oriented management approach, which facilitates to form a foundation of collaborative relationships among a various sort of characters [10]. Project management is also crucial facilitator to act as a business improvement methodology similar like six sigma and lean manufacturing that companies are willing to adopt in order to improve their efficiency and competitiveness. In fact, the robust project management indicates a company core competence and allows it to exploit the effect of these improvement methodologies [11].

Performing industrial projects is often difficult to accomplish. Reaching all goals on quality, time, cost, and respecting human wellbeing. Making decisions effectively and immediately would help to achieve the goals and prevent the waste of time, human and material resources [12]. Thus, the most important roles of the FP is to define required partners and correctly form VOs, to calculate the budget, timeframe, estimate the risks of a new project proposal and to provide the Collaborative Project Management (CPM) after the project proposal is accepted. In order to perform the task, companies belonging to a VO have to exchange periodically statuses of their tasks with a PN.

2.4. Architecture for B2B collaboration.

Today's SME are improving the efficiency and effectiveness of business collaboration, which emerges the need to match e-business services inter-organizationally. Recent research activities [13] show a need for using a reference architecture to evaluate and design standard-, and concrete architectures for business-to-business (B2B) collaboration. The so-called eSourcing Reference Architecture eSRA emerges from B2B-research projects and in addition to quick evaluation of research-based B2B-architectures supports the industrial applications suits. That way, we show the usability and applicability in that with the help of eSRA, system designers directly establish a comprehensive understanding of fundamental B2B concepts and develop higher-quality domain-specific architectures.

Underlying for eSRA is service outsourcing [14] as a business paradigm in which an organization has a part of its business process performed by a service provider. Process views are pivotal to support this way of working. A process view shields secret or irrelevant details from a private business process, thus allowing an organization to reveal only public, relevant parts of its private business process to partner organizations. To enable the construction of process views at various levels of detail, the eSourcing framework defines several projection relations between process views and the underlying internal processes.

An integral part of eSRA for brokering process views is an intelligent service broker to semi-automatically find collaboration parties and learn about their identity, services, and reputation. We propose a BPaaS-HUB architecture [15] that enables speedy business-partner discovery and support for on-the-fly background checking. The HUB-architecture addresses the domain-independent requirements of the functionality, data-exchange protocol, and system behavior.

Based on the citations above, in [16] we show a method for the development of large socio-technical systems that is now more feasible with the availability of service-oriented cloud computing although this results in a higher complexity level with respect to security and dependability in service- ecosystems. While the communication between humans and software is more complex this way developing system architectures that comprise proactive agents are a means to tackle that complexity.

The novel framework enabled types of collaborations, also known as virtual enterprises (VE), are governed by pre-defined contracts that restrict the behavior of each participating enterprise. However, since each enterprise is autonomous, conflicts could arise during the collaboration. In [17], we present an approach for conflict modelling and management in VEs. We first detects a conflict by analyzing the exception that is reported during execution and then uncover the type of conflict from the exception and, depending on the nature of the exception, proposes the appropriate conflict management strategy.

Finally, in [18], we show existing choreography languages for the governance of novel VE-collaboration are typically technology driven and focus less on their sociotechnical suitability and expressiveness that recognizes the interaction between people in organizations and technology in workplaces. The eSourcing Markup Language (eSML) addresses this gap, extracted from our studies of suitability and expressiveness for supporting the automation of business collaboration. eSML has been applied in case studies and its development approach is replicable for exploring strengths and weaknesses of other choreography languages.

2.5. Problem statement

Today's SME enterprises are working in old fashion way: business processes are kept in the heads of the managers, the IS tools are rarely used for collaboration establishment, the project management activities are rarely supported by analytical tools that enable the efficiency measurement. Initiation of new collaborative projects and project proposal preparation takes considerable time and leads to the loss of the business opportunities.

Collaborative Project Management (CPM) is the complicated task and the aim of current research is to suggest the CPM framework for the sustainable realization of collaborative projects. The phases of joining to the collaborative network, business processes description and Project realization should be covered with suggested conceptual model. The aim of the current research is to develop a CPM model for the sustainable realization of collaborative projects for SMEs, apply it in PN-s, and describe the first Step of the model.

3. Conceptual model of sustainable realization of collaborative projects for SME-s

Current research paper covers the first step of Conceptual model of sustainable realization of collaborative projects for SME-s of Machinery domain see Fig.2.

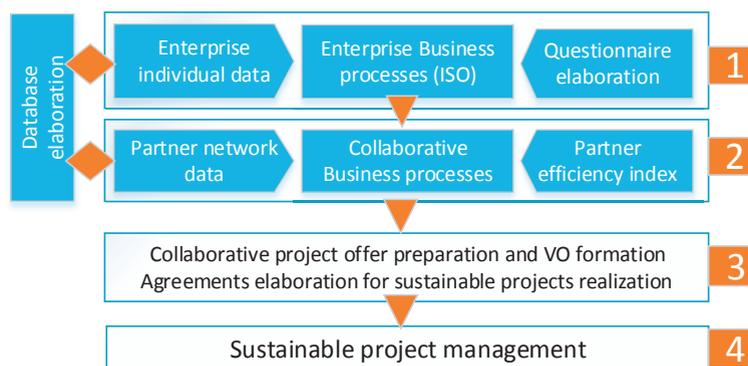


Fig. 2. Conceptual model of sustainable realization of collaborative projects.

The conceptual model consists of four steps:

- Step 1. Preparation of Candidate Enterprises to join PN. In order to be able to join a PN the candidate enterprise must fulfil a four sub-steps:
 - a. Fill in the questionnaire. Based on the questionnaire, it is decided in which area enterprises provide services (related to the business processes of an enterprise) and the enterprise data is added to an appropriate category [19].
 - b. Passing a PN audit, that measures organizational maturity [20]. Organizational maturity means that enterprise describe their business processes based on quality standard (e.g. ISO, EMAS) requirements as BPMN or EPC models [21].
 - c. Signing of contractual and Service Level Agreements
 - d. Filling in the forms for enterprise data transformation towards PN database tables pertaining to machine centers and their availability.
- Step 2. PEI will enable to select the optimal partner's based on a fuzzy preference relation matrix [22] and will support the measurement of collaborative business processes efficiency. PN establishment and creation of Partner Efficiency Index (PEI) process consists of two sub-steps
 - a. In order to assess the enterprise readiness to join a PN, the maturity of a collaborative BP and processes of data collection for PN are audited by independent experts after the enterprise business processes are mapped to the collaborative business processes of PN the input to collaborative business processes is updated automatically.
 - b. In order to rate the Partners Enterprises the PEI is used. It is based on a fuzzy tool for supplier's evaluation that is adopted for the PN enterprise selection for VO formation.
- Step 3. The Initiation of collaborative projects consist of collaborative project offers preparation, VO formation and agreements elaboration process presented in Figure 3.
 - a. Collaborative Project (CP) offer preparation and partner's selection for VO formation. After the new order request is received by one of the PN enterprises, the collaborative project initiator, or Focal Player (FP) select the required domain, define the project steps and describes the production route (as in the case of Manufacturing domain). After the FP described the routing operation the suitable partners are selected based on the resources specifications and resource availability data. The PEI calculated for each operation of production route, presented by candidate partner. It followed by a similarity analysis, in order to manufacture the product subassemblies in one location. The output of a similarity analysis is the list of possible enterprise partners that rated based on FP preference for a particular project. The AHP methodology used for pairwise comparison of the project price and time importance prior to the final calculation of the PEI for possible partner enterprises.
 - b. Agreements elaboration for sustainable project realization. After all stages of setting up a collaborative project described, the candidate partners will receive the offers from FP. The FP will modify the list based on combination of the previous experience of collaboration within a PN and PEI. After VO candidate partner's proposals confirmed by FP the VO formed. The FP calculation based on collaborative project measures and finally sent as a proposal to the customer. After the proposal accepted by a customer the contract is signed by the customer and FP, and between a FP and the selected VO partners respectively.
- Step 4. Sustainable collaborative project management. After the CP starts, it is important to provide the environment for successful implementation. This environment enables the tracking of the project progress, based on the input data that will submitted by VO members.

4. Involving of new member to PN

4.1. Initiation of joining process

The general scheme of a new partner joining to the PN depicts Fig. 3. The new member should understand the PN conception. It is important that a new partner becomes a full member and has a full picture of the philosophy and fill the strategically.

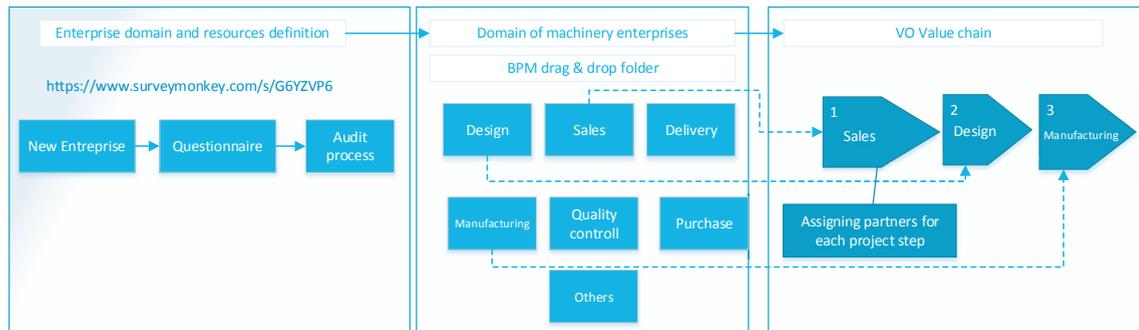


Fig. 3. PN formation stages.

In order to determine the most suitable notation for a PN lifecycle definition the research group has tested the existing notations. Business Process Management Notation (BPMN) we consider suitable for process modelling for IT users and EPC/VAC for business users. Applications systems instantiations of a Service-Oriented Cloud Computing architecture enables enterprises to join PNs in a meaningfully automated way [13]. The novel process of PN initiation covers the aspects of composing the partner network, the PN initiation lifecycle and a corresponding architecture for PN initiation. The joining process consists of several phases: involvement of New Partner Enterprise, filling in the Questionnaire and Auditing.

4.1.1. Involvement of New Partner Enterprise

An initial process for PN formation is a partner's determination and selection process. The partners will participate in fulfilling of projects and strategic goals of PN. "Selection of partners depends not only on the expected future situation, but also on the existing partnerships of the enterprise driving the network set up. The selection of the partners could be based on artefacts." [24]:

- "Their functional competences that is how they could support the Life Cycle of the products the network is aiming at. Functional competencies are described in terms of the type of solution addressed by the competence, what resources and capabilities it is composed of and how robust it is in terms of agility and sensitivity." [24]
- "Partners' ability to enter into and participate in VOs. Two basic elements are the partners' ability to manage and implement alliances and to display alliance spirit and behavior." [24]
- "ICT maturity of the potential partner. Very important issues that should be taken into consideration are whether you are able to integrate with the applications the partner is using, and whether the partner is willing to share the level and type of information you want to access." [24]
- "Additional aspects with new, unknown partners are consideration concerning partner values and belief, used terminology, etc." [24]. "Concurrent with the partner selection or as an element of assessing potential partners some initiatives could be taken concerning establishing and ensuring that the partners have a shared goal hierarchy, i.e. mission, vision, strategies and objectives." [24].

4.1.2. Questionnaire

An enterprise fills a preliminary questionnaire to identify initial date and to get know base requirements for PN member. The questionnaire embraces information about the company and its key artefacts. The information does not include any date, which may be treated for the company from the point of its confidentiality and security. At the same time the information touches the aspects of the company that may be applicable to be enough to start cooperation with PN members. Our research has revealed the key artefacts. It was splitted into several groups:

- Company business objectives,
- Described organizational process,
- Communication channels,
- Company capacity and capability,
- Company certificates, achievements and etc.,
- Previous experience in virtual organizations.

4.1.3. Auditing process

This company auditing step follows the key artefacts definition, . This step is executed by a Company Tutor. Company Tutor is a fully accepted member of the PN. Every company of the PN becomes a tutor and able to invite the new members. The aim of audit is to verify the company against the introduced key artefacts. The information in the questionnaire should be validated by the Company Tutor. “Sufficient samples are taken to ensure all requirements are addressed. This includes performance monitoring, measuring, reporting and reviewing against key performance objectives and targets.” [25]

Initially a Company Tutor is responsible for the invited companies, their adaptation and integration to the PN against the rest of Partner Network Managerial Office (PNMO) This process should to smooth over the difficulties and clarify the details of cooperation principles to the new members.

The Frame Contract signing, where the details of Collaboration Principles are defined, finishes the auditing process. Partner Network

The Partner Network (PN) is a way to compete for Small and Medium Enterprises (SMEs) with Large Companies and Corporations. PN can be defined as a group of independent enterprises that joint in an environment and have a possibility to cooperation to enhance capabilities and capacity for a common goal achievement. The definition of PN is very close to Collaborative Network (CN) where the aim is to aligning activities so that more results that are efficient achieved [26].

PN managerial legal entity is called Partner Network Managerial Office (PNO). The main obligations of PNO are:

- represent the PN members to the customers
- measure the PN members Key Performance Indicators (KPI)
- ensure the information channel for PN members for the exchange of agreed information
- organizing the process of PN members drop off and to support the joining of new members. [27]

4.2. Business processes classificatory

The partner audit phases ends by direction of new member to the PN repository and define the roles of new involved member in the PN. The roles are classified and it allows easy allocate partner in the hierarchy of PN repository tree. Fig. 4 depicts the sample of PN repository. A new partner might have several roles and provide some services for PN. During selection process of VO, FP has a possibility to evaluate partner in several categories (as a designer, as a producer, etc.) depending on which category company belong to.

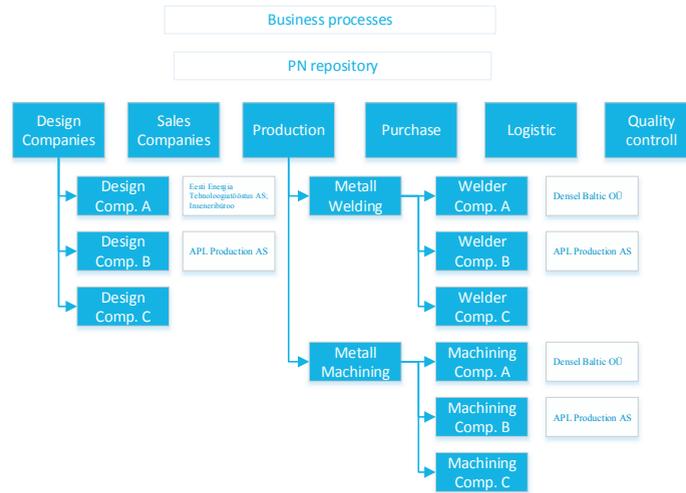


Fig. 4. PN formation stages.

Conclusion

The result of the current research is a development of conceptual model of sustainable realization of collaborative projects. The PN initiation step is covered by the first step of the model. Authors has tested the hypothesis defined in the introduction part of current paper. Authors verified by case study that the developed questionnaire speed up the initial data collection process for PN initiation and improve the cost efficiency.

The developed model gives a strategic interpretation of the PN and provide a direction for the development of algorithm for partner's efficiency measurement. The current research is limited due to the following reasons: prototype does not exist; level of details is not enough for prototype building. Due to this reason, the authors intend to validate the current model by mathematical model, which defines functionality of the collaboration ecosystem of independent entities. The aim is to make a mockup, to simulate it, to define the bottlenecks and improve it before authors will implement the current model in practice.

If the enterprises accept the idea of current research paper, then in future research work the authors will introduce how to compete successfully with large lean and agile companies. Business process awareness, make business collaboration more dynamic, enables to move to e-market, adopt the service cloud computing for enterprise needs and decrease the unneeded direct involvement of middle management personal into collaboration process establishment. At the same time, this project will decrease the amount of paper work done by enterprises, which is necessary to proceed with composition of collaborative project proposal. Approach is very powerful for the enterprises, but authors see the resistance to change from human natives as negative consequence of current research implementation.

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