Collaboration behavior enhancement in co-development networks

Shadi, M.

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Summary

Organizations increasingly encounter change and challenging situations outside their control, and find themselves unable to individually gain business opportunities in the market. Traditional organization structures are therefore shifting to Collaborative Networks (CN) of organizations, one form of which is the Virtual Organization (VO), which is short-term and goal-oriented. VOs need to dynamically and fluently configure and establish, in order to address a market emerged opportunity, and compete with large organizations. The pre-existence of a strategic alliance among organizations in a sector to provide the necessary base conditions and mechanisms has proved to be required to facilitate dynamic creation and successful operation of the VOs. This long-term CN, called the Virtual organizations Breeding Environment (VBE), already manifests in many industry sectors.

The analyzed data gathered from collaborating organizations in VOs illustrate that most VO failures are caused by organizations' behavior. Consequently, besides understanding and designing well-founded models for organizations' behavior, some mechanisms are needed to monitor and control these behaviors. As a main contribution of the thesis, our VO Supervisory Assisting Tool (VOSAT) applies two specific measurements to each VO partner organization: the past collaborative behavior of each partner in the VBE, mostly calculated from its long term behavior monitoring during previous VOs, and current collaborative behavior of the VO partner, calculated through monitoring of each partner's behavior against the defined norms in this VO.

For measuring past organization's behavior in the VBE, four specific quality-behavioral dimensions are considered, including: the organization's integrity, courage, agreeableness, and openness, each of which is modeled by a set of traits. A quantitative causal approach is then defined to inter-relate some known factors from the environment with the traits of these four behavior dimensions. Some formulas are derived from the causal relationships, computing the Individual Collaborative Behavior (ICB) degree for each organization. This measure constitutes

one criterion in our proposed approach for evaluating collaborative trustworthiness of each partner organization, as needed to be known during the VO operation phase.

To address current partner's behavior quality in the VO, we propose a new normative multi-agent model for VOs, within which four specific kinds of behavioral norms are distinguished: (i) Socio-regulatory norms, (ii) Co-working norms, (iii) Committing norms, and (iv) Controlling norms. Our proposed model is therefore called the S3C model to handle the norms. Our approach to committing norms and co-working norms introduces new formalization and mechanisms, based on individual- and joint-promises that are made between VO partners. Therefore, VO partners commit themselves in a bottom-up manner to perform tasks, as opposed to the VO coordinator who assigns tasks to partners in a top-down manner. The bottom-up approach is much more fitting the collaboration nature in VOs, resembling federated partnership among organizations. Furthermore, based on the results of monitoring the socio-regulatory norms, co-working norms, and committing norms, as well as the partner's ICB, the trust level of each partner is calculated. This is done by applying the AHP-fuzzy comprehensive evaluation method. The controlling norms apply three specific measurements related to characterizing VO partners, i.e. their trust level, workload, and communication level. If any of the controlling norm is violated by a VO partner, then VOSAT identifies it and warns issues the VO coordinator. The violation of a controlling norm is a source of failure risk in fulfilling the VO goals. Considering these measures, a Bayesian network is created to measure the probability of failure in each of the planned sub-tasks, tasks, sub-goals, and the general goal of the VO.

Furthermore, VOSAT provides suggestions to support decision making on potential intervention in planned tasks to prevent VO failures to promote collaboration in VOs; thus greatly enhancing the success rate of VOs. For instance, as one example, it can support the VO coordinator during its operation phase, with altering a risky sub-task, e.g. through suggesting alternative suitable partners among those that may volunteer to take over that sub-task. A second example of how VOSAT can assist the VO coordinator with enhancing the collaborative behavior and thus the success rate of VO, during its operation phase, is through recording and ranking the VO partners' performance and collaborative behavior in order to apply it for some reward distribution at the VO. A third example of how VOSAT facilitates the tasks of the VO coordinator is for selection of most suitable partners during the formation/creation phase of the VO. This case is exemplified in the thesis for the VOs in service industry, demonstrating that for creation of a new integrated value-added services in the VO, how both the past and current behavior of candidate partners can influence their potential selection for involvement in the new VO. Consequently, the thesis designs and develops assisting mechanisms, tools, and systems to support VO coordinators with increasing both the resilience and the success rate of the VOs.