

TOWARDS A REPUTATION MODEL FOR ONLINE COLLABORATIVE ERP PROJECTS

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Keywords: ERP, reputation model, e-collaboration.

Abstract: When companies engage in online collaborations, they may need to form alliances with partners that they have not worked with before, but who should be well placed in meeting end customer demands. Online reputation management systems play an important role in this case in choosing the right partners to collaborate with. Those systems facilitate the recording and dissemination of opinions of actors in an online community, with regards to other members of that community. The purpose of this paper is to report the research in progress carried out as part of the European Union (EU) co-funded project "PANDA", which examines amongst others potential reputation models that could be applied in online collaborations of Small and Medium Enterprises (SMEs) coming together to implement an Enterprise Resource Planning (ERP) system at an end customer.

1 INTRODUCTION

The use of reputation systems as a means to increase trust in online communities has been examined in the literature (e.g. Bolton, Katok, & Ockenfels, 2004; Brown & Morgan, 2006; Josang, Ismail, & Boyd, 2007). Well-known reputation systems are used by sites such as Amazon, eBay, Epinions, etc.

The use of reputation systems can equally well be applied in online collaborative environments, as a means of choosing the best partners to cooperate with. This research is concerned in particular with the collaboration amongst geographically dispersed actors in the European ERP industry, comprised of SMEs. The processes, tools and benefits of online collaborations of such actors are examined in the EU co-funded project "PANDA" (PANDA-Project, 2006).

The PANDA project includes the development of an e-collaboration platform for actors (such as SME vendors of ERP systems, their national representatives, dealers and consultants) in the European ERP industry. The platform provides users with the capability to locate suitable partners across national boundaries, form partnerships as a Virtual Organization (VO), online manage running projects, advertise the partners' experiences and expertise,

and share knowledge about previously completed projects. This paper reports the part of the PANDA project that is concerned in particular with reputation management to enable the selection of suitable partners to collaborate with in the implementation of an ERP project at an end customer.

In the sections that follow, section 2 discusses reputation management and the envisaged approach in the PANDA project. Section 3 presents future research regarding reputation management in the PANDA project. The importance of the reported research lies in examining particular reputation models that could be practically applicable in the European ERP industry of SMEs, and which could facilitate the efficient forming of strategic alliances amongst actors in that industry.

2 REPUTATION MANAGEMENT

2.1 Reputation in Online Communities

Reputation can be defined as:

*What is generally said or believed about a person's or thing's character or standing.
(Josang et al., 2007)*

Online reputation systems allow members of a community to submit their opinions (quantitative and/or qualitative) regarding other members of the community. This feedback is then analyzed, aggregated and made available to the members of that community.

Reputation mechanisms are well suited in online marketplaces, which are characterised by a large number of small players, often unknown to each other, and located around the world (Dellarocas, 2003). Contractual guarantees in this case are difficult to enforce, because of the number and geographical spread of its participants, which also makes repeated interactions less probable. As such, online marketplaces rely on the reputation of its players instead, given by other members over time, in order to have an incentive to cooperate well with other participants, even in a one-off deal.

2.2 Types of Reputation Systems

According to Olmedilla, Rana, Matthews, & Nejd (2006), the main issues with reputation systems are the trust metrics (how to model and compute the reputation), and the management of reputation data (how to efficiently and securely retrieve and compute the reputation). Regarding the last point, Josang et al. (2007) view two types of reputation systems: centralised and distributed. In centralised reputation systems there is a central authority that collects all feedback, processes it and makes it publicly available. On the other hand, in distributed reputation systems there are distributed stores where ratings can be submitted, or each online participant stores personal feedback locally, and provides this to other parties on request, which compute the reputation score themselves.

PANDA envisages following a mixed (centralised/distributed) approach, as the figure below shows. This approach is in recognition of the fact that companies that have direct experience of working with other companies in the past can use their own knowledge of the quality of collaboration with those companies, as reflected in their private ratings. If previous experiences with relevant companies are not sufficient to determine whether they wish to collaborate with them or not, aggregated ratings held centrally can be examined.

The advantage of this approach is that preference can be given to own experiences with other partners. In addition, as the central aggregated ratings are computed from the local partner ratings, biases on the aggregate ratings can be avoided.

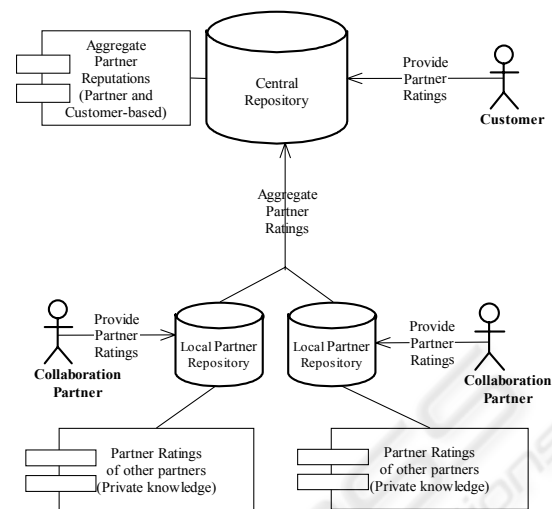


Figure 1: Reputation architecture in PANDA.

As can be seen from the figure above, partners rate each other with regards to their collaboration in an ERP project. They are also rated by the end customer (individually or for the project as a whole).

The customer ratings derive from responses to a questionnaire regarding the perceived quality of the supplied products (the ERP system and associated software, hardware and communications equipment) and services. Such services can include the initial implementation of the ERP system, upgrades, training, support, etc. Relevant metrics to measure customer perception of the quality of the supplied products and services can include as applicable (Krishnan, 1995; Stylianou & Kumar, 2000; Wu & Wang, 2006) the relationship of the customer with the project team, their technical expertise, the perceived quality of the end product, its perceived ease of use and usefulness, the success of any required Business Process Reengineering carried out, the level of disruption of existing business processes, the user involvement in the project, the overall project management by the implementation team, the documentation and training produced, the integration of the ERP system with other systems, the time required for implementation, etc.

The partner ratings for each other in the collaborative ERP project can then include as applicable the level of collaboration amongst the partners, the perceived business and technical expertise of the other partners, their business and cultural awareness of the context where the ERP was implemented, their leadership skills, their adherence to time schedules, etc.

2.3 Reputation Dimensions

Following the distinction of a reputation model into its individual, social and ontological dimensions (Sabater & Sierra, 2001, 2002), the following figure illustrates its relation to PANDA. The individual dimension consists of ratings that each company holds locally with regards to its own perception of other companies (corresponding to the distributed type of reputation). The social dimension consists of an aggregation of all such relevant local ratings (corresponding to the centralised type of reputation). Both of the individual and social dimensions are further differentiated into the ontological dimension, which can include the type of service provided (e.g. ERP installation, customization, upgrade, training, support, etc), the particular ERP/module concerned, the industry where the ERP was implemented, and the geographical region. Each of these dimensions can then be further subdivided into lower levels of detail.

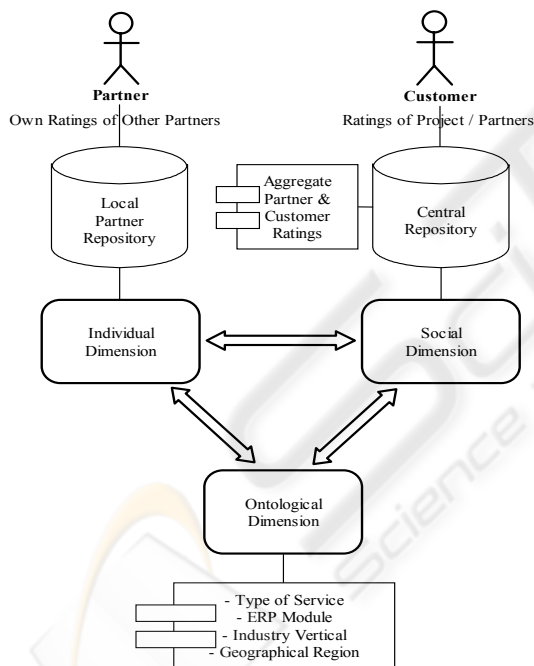


Figure 2: Reputation dimensions in PANDA.

2.4 The Role of Agents

Software agents are foreseen to aid in the management of reputation in PANDA, mostly when a critical mass of companies is involved. The agents in this case can aid in automatically determining the ratings of other partners. As before, the locally stored ratings can take precedence in determining

the rating of a potential partner. If those are not enough to confidently determine partner reputation, then other agents can be asked to give their own ratings of the particular partner. This approach then gives rise to questions of the reliability of those ratings, the trustworthiness of the relevant agents, the similarity with own ratings, and the potential confidentiality of other ratings (Huynh, Jennings, & Shadbolt, 2006; Mui, Halberstadt, & Mohtashemi, 2003; Yu & Singh, 2002). If this approach doesn't yield any satisfactory results, then as before the central repository holding aggregate ratings can be examined.

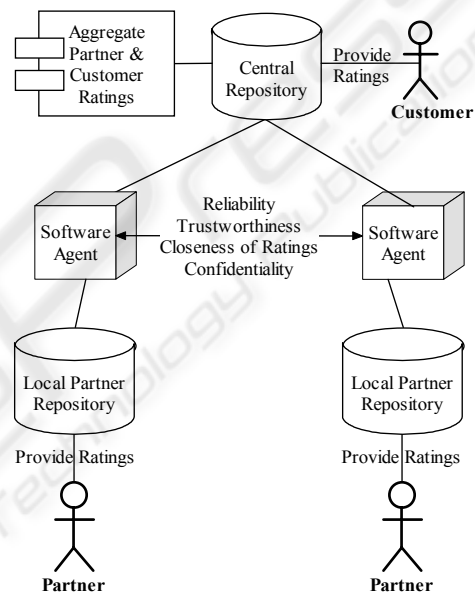


Figure 3: Role of agents in reputation management in PANDA.

3 FUTURE WORK

Regarding the engine or method of computation, Josang et al. (2007) cite some indicative models such as simple summation or average of ratings, bayesian systems, discrete trust models, belief models, fuzzy models and flow models.

The simplest one is to sum the number of (positive or negative) ratings and keep a total score. The advantage of this approach is that it is very easy for anyone to understand the approach behind the calculation; the disadvantage is that it is primitive and can give a poor picture of an entity's reputation score. A slightly more advanced scheme would be to compute the average of ratings, and a further refinement would be to compute a weighted average

of all ratings in order to determine partner reputation.

As a requirement for PANDA is to have an approach which is simple to understand by its users, a weighted average is envisaged to be used. This however brings in the question of the way that different weights are calculated and used in the reputation of partners according to ERP project particularities. This includes determining the importance and consequent weight of each project partner, the weights of different measurements items (as indicated in section 2.2), the weights of ratings given by the customer and the other partners, as well as the weights given to the ontological dimensions of a project (e.g. according to the type of service provided, ERP module, industry vertical and geographical region). Determining those weights and their combination is a complex process, which can be aided with the use of software agents once deployed.

When using software agents, the distributed computation of reputation would also include asking other agents for their ratings of a partner. This would then mean that the weights given to the ratings of other agents would have to be determined according to the trustworthiness and existing reputation of those agents, the age of their ratings, the distance between their ratings and the existing partner rating, etc. Although such aspects of agent behaviour have been addressed in the literature (e.g. Huynh et al., 2006; Mui et al., 2003; Yu & Singh, 2002), their practical applicability and business acceptance in an online environment is an interesting research problem to examine. To aid in initial tests of agent behaviour, simulations will be carried out, and user feedback (from European actors in the ERP industry) elicited. Amongst others, the research agenda also includes whether examining group reputations instead of individual reputations yields more trust in online collaborative ERP projects, e.g. by determining which types of partners work best with each other as a team as opposed to examining binary pairs.

Although the PANDA project is exemplified in the European ERP industry for SMEs, the currently researched reputation model could also be applied in other settings where online collaborative projects are implemented. This includes practically any business sector where business-oriented software solutions (i.e. software products coupled with value added services to form 'extended' solutions) are used. As such, the PANDA project is important in serving as a demonstrator and proof-of-concept for future

research and development in the area of online collaborative environments.

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