SRM: A tool for supplier performance

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ABSTRACT

Supplier Relationship Management (SRM) is an application that gives support to a company in the task of deciding which supplier to choose when a new supply has to be ordered. It is based on a measure of trust and provides several tools that visualize that measure and support its use on decision making.

Categories and Subject Descriptors

I.2 [**Artificial Intelligence**]: Distributed Artificial Intelligence—*Intelligent Agents*

General Terms

Performance

Keywords

trust, supplier performance

1. E-SOURCING

The goal of Supplier Relationship Management (SRM) is to stablish a technologic framework capable of giving support to the buying process. It evaluates the supply activity of a company in a process that is called strategic e-sourcing, and that is a fundamental element of any supply chain scenario.

The application SRM specifically focus on supplier performance. It evaluates past orders to support supplier selection.

Let us illustrate this with an example:

Imagine you are the person in charge of buying the office supplies for your company. You have ordered thirty pens of a certain quality, and you asked to receive them by tomorrow. You reach an agreement with the supplier 'The Happier'. Unfortunately, you receive sixty pencils two days late. You feel disappointed as you wanted pens, not pencils, and you needed them immediately, not two days latter. The supplier 'The Happier' is not trustworthy.

Your level of satisfaction with the outcome of the agreement will depend on: (1) how important was for you each order dimension –in the example: product, quality, quantity and delivery day–, (2) how different is what you got –the observation– compared with what you asked for –the commitment– and, of course, (3) which are your preferences.

In this demo we describe a trust model that can deal with all the previously enumerated requirements and that assesses a trust value to each supplier for a given order. The model is based on a knowledge base populated with past experiences with the suppliers. Each experience is composed of an order commitment and the observation of the execution of this commitment.

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2. TRUST

The model we use, allows an agent to measure the trust it has on another agent when the latter commits to do something. It is based on the work described in [1].

To compute a trust value, we first build probability distribution functions (PDF) that represent the agent's current knowledge on the state of the world. A key PDF is the relation between commitment[1] and observation. That is $\mathbb{P}(\psi|\varphi)$ represents the probability of ψ happening when a commitment φ is made.

These distributions evolve along time using relevant experiences, that is observations made after commitments. Understanding as relevant those experiences that have a commitment that is similar to the commitment under negotiation.

Each PDF is initialized as an equiprobable function and after that, it is updated as the minimum relative entropy PDF that satisfies the constraints expressed by equation 1 where n_{ex} limit the maximum influence of a new experience, S is a measure of similarity between commitments and *inertia* amplifies the impact of an experience.

$$Q(\psi \mid \varphi) = \mathbb{P}^t(\psi|\varphi) + 1/n_{ex} \cdot S^{inertia} \cdot (1 - \mathbb{P}^t(\psi|\varphi)) \quad (1)$$

Finally, we evaluate the trust that we have in an agent for a specified commitment using equation 2. For that purpose we define a preference function on orders.

$$T(\alpha, \beta, \varphi) = \sum_{\psi} \mathbb{P}(Prefer(\psi, \varphi)) \cdot \mathbb{P}^t(\psi|\varphi) \quad (2)$$

Besides, the model is able to simulate some memory loss as time goes by with the use of equation 3 that makes older experiences to be less influential than newer ones. ν sets how slow the probability distribution goes back to the default distribution $\mathbb{D}$, with $\Delta t = t' - t$.

$$\mathbb{P}^{t'} = (\mathbb{P}^t - \mathbb{D}) \cdot \nu^{\Delta t} + \mathbb{D} \quad (3)$$

[1]in SRM, a commitment is an accepted order by a supplier.

3. SRM

As an application of the trust model described in section 2 to eSourcing, we developed a set of tools able to manage the performance of suppliers. The features of these tools as well as the innovative aspects for SRM are described bellow.

3.1 Features

SRM provides four analysis tools: Trust, Supplier, Critical Order and Minimal Cost:

- Trust: to analyze the trust in a supplier for a given commitment. For this purpose, three charts are represented: a bar and a point similarity charts representing the $\mathbb{P}(\psi|\varphi)$ PDF, and a chart with the trust evolution over time.

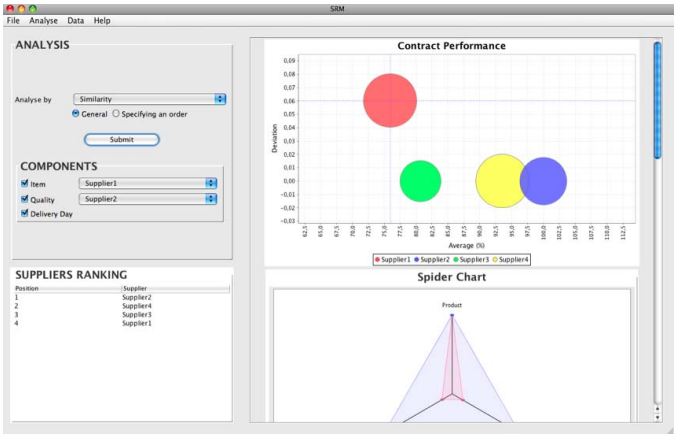

Figure 1: Supplier Analysis

- Supplier: to analyze suppliers by similarity or satisfaction in the historic of interactions. This tool provides a ranking of suppliers and a set of charts representing the comparison between two suppliers along each order dimension. Figure 1 illustrates a screenshot of this tool.
- Critical Order: to rank suppliers based on its trust for a desired order and the relative importance of each order dimension. In this way, a user can establish priorities between order dimensions.
- Minimal Cost: to obtain a split of orders along suppliers such that the split guarantees the levels of satisfaction that we want for each order dimension whilst minimizing the overall cost. The result is shown in a pie chart that you can see in figure 2.

3.2 Innovation

Several enterprise resource planning systems (ERP) are nowadays dealing with eSourcing. For example: iQuotes[2], SAP[3] and Ariba[4]. But no one is able to manage trust as we do it. In fact, most of the ERPs are more focused on data management than on decision support. Therefore, SRM is an innovation in the field of industrial strategic eSourcing that has its roots on an agent trust model.

[2]http://www.isoco.com/soluciones_es_iquotes_suite.htm
[3]http://www.sap.com
[4]http://www.ariba.com/

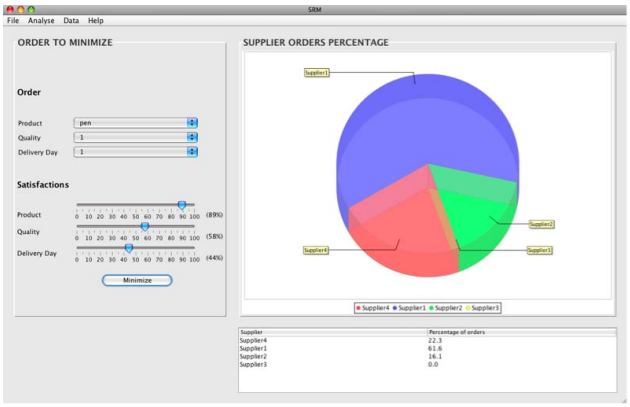

Figure 2: Minimal Cost Analysis

The project is focussed in the area of supplier performance which is not supported nowadays by any of above mentioned tools. Commercial tools only deal with giving support to the operative process of buying, to retrieve information and give some functionalities to knowledge management.

4. DISCUSSION

SRM gives support to a company in selecting the supplier that better fullfills its needs when an order has to be negotiated. For this purpose, SRM provides the tools described in section 3.1. They use a measure of trust that we compute taking into account (1) the passage of time, (2) past similar orders, (3) amount of previous interactions with the given supplier, (4) the company's preferences, as well as (5) the importance given to each of the dimensions that describe the new order.

In addition to its standalone use, SRM is being integrated in the iQuotes Suite of the company iSOCO. In fact, SRM will be a new module of the suite from which it will get information about past experiences. This is, information about committed orders and feedback about their respective execution observation. For example, the user can inform that the execution was late, the quality different than committed, etc.

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6. REFERENCES

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