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USING SOCIAL MEDIA TECHNOLOGIES FOR ENTERPRISE RESOURCE MARKETS ENGINEERING

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Abstract

The study evaluates possibility of using social media technologies for implementing a full-fledged artificial market model, called Enterprise Resources Market. The existent model allows real-time resource self-scheduling (information and physical) for Internet-based enterprises employing agent-based peer-to-peer publish and subscribe approach with semantic matching of offers and requests. The market-style self-scheduling systems are complex to design and adopt in real-world for well-established and conservative industries. The new practical model suggests using popular microblogging platforms as global societal communication frameworks, and semantic wikis for collaborative describing resources and services, with aim of building enterprise resource markets specifically for individuals and small enterprises/organizations.

Model of Enterprise Resource Market

The paper [1] describes a full-fledged artificial market model, the Enterprise Resource Market (ERM), that uses proven technology of industrial exchanges to accomplish the goal of self-scheduling resources allocation for Internet information enterprises (as well as other types of organizations). The user communities comprise individuals, organizations, databases and computing networks that have information, can process it and can be both providers and requesters of information resources to one another, communicating via asynchronous, message-based protocols. This approach differs from other market-style self-scheduling approaches with that it uses a new agent-based, peer-to-peer publish and subscribe model, a combination of ERM and the previous Metadatabase model resulting in Two-Stage collaboration solution, focusing not only on bids, but resource allocating for actual execution [1].

The existent model consists of six elements [1]: (1) Agent Model is a set of task-oriented, manageable software agents to publish requests and offers, and subscribe to enterprise resources; (2) the Blackboard matches requests and offers based on task characteristics, performs auction-negotiation if they differ; (3) Proxy servers enable peer-to-peer matching transactions (without need of global coordination), convert committed requests into jobs and queue them at providers' sites according to prices of tasks; (4) organization-specific Implementation model measures performance of the transactions and compares it with organizational goals, maintains artificial budgets, re-allocates resources and adjusts market behaviors; (5) Peer-to-Peer Negotiation: Proxy servers themselves can play role of mini Blackboards for negotiating; (6) Open Common Schema (a Metadatabase) realizes ability to openly represent data semantics of available in an enterprise resources for usage by ERM [1]. Enterprises can form supply/service chains (extended enterprises) which can recursively embrace multiple organizations, enterprise conglomerates, industry branches and even whole economies.

Challenges of practical realization and adoption of Enterprise Resource Markets

Although this revolutionary model has been streamlined and undergone successful cycles of laboratory prototyping in a many-years span of development, its real-world introduction is impeded due to significant amount of challenges. A fraction of them is addressed in this study: (1) overcoming inertia of industrial enterprises in starting to adopt such new technologies and processes, especially those requiring open, collaborative approaches; (2) necessity of having a common communication environment, desirably with global reach, to enable forming highly geographically distributed extended enterprises and better utilize intrinsic societal character of ERM; (3) complexities of engineering and querying the semantic Metadatabase, especially if it is used by open not specially educated user communities: semantic tools require specific skills to operate with, and semantic data are difficult to interpret, remember by heart and use; (4) user experience concerns: utility and usability of the ERM.

Introduction of Enterprise Resource Market based on social media

This study suggests a new solution with simplified functionality to easy practical introduction of ERM services, targeting the user segment of individuals, small enterprises and organizations rather than that of large enterprises and organizations. The former are more risk tolerant regarding their data sharing, use societal systems more willingly, and capable of quicker adopting new approaches. Already existent popular microblogging/RSS-enabled platforms (Twitter, Facebook, LinkedIn and alike) can be used as global societal frameworks for transferring brief human-readable (meta)data of suppliers and providers, committing business transactions, communicating results of the services as microblogging messages of a pre-defined format or/and linked to the messages data [3]. Microblogging platforms already have well-established infrastructures and culture of peer-to-peer collaboration, direct marketing, communicates metadata, and connects not only people but also third-party systems, that resonates with the concept of ERM and can facilitate its adoption faster. This study assumes and tests possibility of using emergings kinds of semantic tools, semantic Web page markup and semantic wikis, for collaborative descriptions of openly available schemata of resources, services and products (Metadatabase [1]) of the Internet-based enterprises and using the schemata (and resources they describe) via publish/subscribe mechanisms. The new decision to employ microblogging, nanofomats and semantic wikis imposes certain limitations on how to organize user interfaces and how to use such systems, however also it gives opportunity of arranging the system design in effective, popular and innovative ways.

Model of Enterprise Resource Market based on social media

The suggested solution is slated to comprise six standard components of ERM and differs from the existent model by usage of a set of already proven and novel tools and techniques peculiar for societal systems:

- 1) The social media ERM agents encapsulate publishing/subscribing query in correspondence with [1, 4], have three basic components: (1) the communicator - microblogging message-header of a pre-defined human-readable format, (2) the information content - linked to the message viewable/editable by humans and systems Web-based descriptions of products, services, information requests, offers, or tasks in RDF/RDFa format referring to items registered in Metadatabase, (3) the rule-base (conditions and actions) facilitating publishing/subscribing, conducting task and market integrity control, - realized as user-friendly SPARQL-based sequential semantical data filters that operate with items registered in Metadatabase [2]; the system also may employ other software agents not necessarily communicating via microblogging but using own transport layers, like JADE for Jason (an AgenSpeak's interpreter) or Erlang eXAT, supporting the social media ERM agents' functioning;
- 2) In the new model, a global Blackboard is associated with a node of societal system (has a microblogging user account) [3], performs matching and negotiating of requests and offers described with the agents in the system's own microblogging timeline or sent in direct messages by users the Blackboard is subscribed to, following query matching guidelines in [4] (it is possible to apply logic-based mechanisms similar to LogMap2 used for ontology matching, and adapting sequence aligning algorithms like Needleman-Wunsch or/and Smith-Waterman for identifying the complementary queries forming complex tasks [4]);
- 3) Proxy-servers are represented as nodes of societal system in the same way as Blackboards are [2]: by means of its instrumentary resource, providers and users create and process the agents (via own or centralized Agent Bases), communicate them asynchronously between the nodes in peer-to-peer mode, handle tasks as jobs following a local queue discipline, trigger resource (re-)assignments and control their performance, or just expose local resource views for information requests [2].
- 4) Organization-specific Implementation model is basically to realize in correspondence with [2] and [4], without new results expected to ensue from this study: the price-based mechanisms of defining perceived value, measuring transaction cost/cycle time reduction [5], measuring quantity of resources provided and utilized;
- 5) Peer-to-Peer Negotiation can be performed at the Proxy servers not involving global Blackboard(s), when they play role of mini-Blackboards as specified in [1]: the Proxy server of a publisher (supplier) reads own microblogging timeline and inbox of direct messages looking for user requests, performs their matching with own offers, and initiates negotiations of the offer parameters if necessary;
- 6) Open Common Schema (a Metadatabase) is constructed as (or on the base of) a semantic wiki (Wikidata or similar) which describes products, offers and other entities using globally recognized Schema.org markup, has options of regulating access to collaborative editing, view and reference; desirably able to govern effectively and efficiently RDF triplestores of cyber-infrastructure [5] for tracking events and fulfilling tasks in systems of connected users [3].

Conclusions

The study suggests a solution that uses popular microblogging (Twitter, Facebook, LinkedIn etc.) as a global communication frameworks, and semantic wikis together with semantic Web markup in RDF or RDFa format based on Schema.org for governing operations of full-fledged artificial markets of information and production resources, Enterprise Resource Markets. This model is designed specifically for persons, small enterprises and organizations, having limitations for using by complex production-oriented formations. The study demonstrates that such social media-based model possesses all necessary features of the initial agent-based peer-to-peer self-scheduling model, and able to facilitate practical introduction of Enterprise Resource Markets. The question of performance of such system remains critical, and available currently tools and techniques require optimization to fit ERM usage scenarios. This approach will assume even greater importance in the making of the federated social Web (possibly, based on RSS/Atom), with ERMs getting opportunity to span across many social networks.

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