Virtual Organizations

The Creation Process

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INTRODUCTION (i)

Collaborative network
To exploit a business opportunity

Agility
Rapidly find a set of partners

Non-availability of catalogs with normalized profiles
Lack of preparedness of organizations

INTRODUCTION (ii)

More than a matching process based on potential and abilities

Capacities
Competencies
Recommendations

Personal preferences and established trust based on previous experiences

PAST APPROACHES

Manual or computer assisted approach

Multi-agent based approach

Service federation based approach

Optimization approach
e-Contracting

(...)

ECOLEAD project is designing a VO creation framework that aims to minimize the difficulties faced in traditional approaches within the VBE context.

EX:

Manual or computer assisted approach

Multi-agent based approach

Service federation based approach

Optimization approach
e-Contracting

(...)
MANUAL OR COMPUTED ASSISTED APPROACH (i)

- Derived from traditional methods of human resources
- Based on “Competency” matching
- Description of tasks, activities and responsibilities characterizing a given job
- Find the right individual that best fits the job description
- Matching algorithm applied to candidate’s list based on its skills
- Filtering of candidates applying human behavior

MANUAL OR COMPUTED ASSISTED APPROACH (ii)

Electronic procurement
- Normalized procedures for public announcement of business offers, reception and management of bids
- Standardization
- Identification of
  - Potential suppliers / partners to be addressed
  - Adoption of normalized specification of requirements and bids
  - Decision support functionalities
- Little assistance
- No uniform information model and organization
- Derived from the traditional methods
- Based on “Competency” matching

MULTI-AGENT BASED APPROACH (i)

- Enterprises are represented by agents
- Geographically distributed and possibly not known in advanced
- Meet each other and cooperate in order to achieve a common business goal
- Market agent (Coordinator / Broker)
- Inserted in the MAS Community when a business opportunity is found
- Multi-round contract-net protocol is followed and the most favorable bids are selected based on a multi-criteria mechanism

MULTI-AGENT BASED APPROACH (ii)

- The broker agent is an assistant to the human broker
- The broker “builds” a set of possible consortia
- The final selection of the winning consortium is made by the human
- Lower cost
- Higher quality
- Higher availability
- ...
MULTI-AGENT BASED APPROACH (iii)

Yellow pages agents
- Responsible to accept messages for registering services

Agents design and developed independently
- Difficult to guarantee their coordination unless common rules ("social laws") are adopted

Agent-based approaches can lead to an interesting simulation tool
- Security issues
- Lack standardization & integration with legacy
- Difficult to guarantee their coordination
- multi-round, multi-attribute negotiation
- Several mechanisms such as: auctions, contract-net protocol, yellow pages agents, etc.

SERVICE FEDERATION BASED APPROACH (i)

Companies are considered as "service providers"

One entity that keeps a catalog of services where service provider companies publish their offers

Service Market
Service Promoter Node
Service Portal

Indirect selection of partners represented by the services they offer

SERVICE FEDERATION BASED APPROACH (ii)

Indirect partners’ selection
- What is selected are the services (not the provider)
  - Are the services always available?
  - How is the workload balanced?
  - What is the level of awareness of the service provider?
  - Can all skills be represented as services?
  - Does it make sense to consider specific services for the partner search / negotiation phase?

Limitations
- Lack of standardization
- Primitive or no negotiation
- Availability of services
- Fast developing technology
- Catalog of services

VO CREATION IN A VBE CONTEXT (i)

An association of organizations and their related supporting institutions, adhering to a base long term cooperation agreement, and adoption of Common operating principles and infrastructures, with the main goal of increasing their preparedness towards collaboration in potential Virtual Organizations (VOs)

Competencies
Products / services
Physic resources
Past Collaborations ...
**VO CREATION IN A VBE CONTEXT (ii)**

- **Preparation**
  - Long-term CN (e.g. Supply chain)
  - Collaboration Opportunity
- **Operation**
- **Dissolution**
- Short-term (e.g. Dynamic VO / VT)

**VO CREATION IN A VBE CONTEXT (iii)**

- VO & VBE creation:
  - Different drivers and criteria for search & selection
  - Different approaches & algorithms
  - Preparedness

**VO / VBE LIFE CYCLES**

- VO creation
- VO operation & evolution
- VO dissolution
- VBE creation
- VBE operation
- VBE metamorphosis

**VO CREATION FRAMEWORK**

- Preparatory Planning
- Consortia Formation
- VO Finalization
- Contract preparation process
PREPARATORY PLANNING (i)

**CO Identification & Characterization**

Identification & Characterization of CO

- External
- Internal

**Actors**

<table>
<thead>
<tr>
<th>Opportunity Broker</th>
<th>Customer</th>
</tr>
</thead>
</table>

**Collaboration modality**

- Collaborative BP
- Collaborative Project
- Collaborative Problem Solving
- ad-hoc collaboration

PREPARATORY PLANNING (ii)

**Rough VO Planning**

Identification of
- competences
- roles
- Capacities

**Actors**

- Opportunity Broker
- VO Planner
- VBE Member
- VO Coordinator

CONSORTIA FORMATION

**Partners search & suggestion**

- Definition of elements & tools
- Partners assessment
- Partners selection

**Negotiation**

- Objects of negotiation
- Negotiation protocols
- Representation of agreements

VO Planner
VBE Member

VO FINALIZATION

**Detailed VO Planning**

- Refinement of VO plan
- Definition of sharing principles
- Scheduling

VO Planner
VBE Member
VO Coordinator

**Contracting**

- Formulation and modeling of contracts and agreements
- Setting up of resources / activation of services
- Notification of involved members

VO Planner
VBE Member
VO Coordinator

**VO Launching**

- Configuration of infrastructure
VO CREATION APPROACHES (i)  

**Simplified VO Creation Process**

- CO Identification & Characterization
- VO Composition
- VO Launching
- VO Set Up

**Acquired Opportunity**

VO CREATION APPROACHES (ii)  

**Two-Phase VO Creation Process**

- CO Identification
- Rough Plan
- Select Key (core) partners
- Prepare Bid
- Acquired Contract
- Revise Rough Plan
- Select Additional partners
- VO Launch

**Quotation / Bidding**

**Pre-Agreement**

**Final VO Creation**

VO CREATION – SOME TOOLS  

**The ECOLEAD Example**

- CO Identification
  - Search and filter Calls for Tenders
  - Notify VBE / broker
  - Normalize representation
  - (Customer) Broker

- CO Characterization & VO rough planning
  - Required competencies
  - Required collaboration modalities
  - Model plan of activities
  - Broker VO Planner

- Partners’ search & suggestion
  - List of potential VOs
  - Risk analysis
  - Expected performance
  - Human-based final decision
  - VO Planner VBE members

- Negotiation wizard
  - Contract templates
  - Virtual negotiation room
  - Negotiation objects
  - CSCW approach
  - VO Planner VBE members

TOOLS FOR VO CREATION – coFinder (i)  

**Collaboration Opportunity Finder**

- **Goal:**
  - For a given VBE, find collaboration opportunities by crawling a list of pre-specified web sites with data about open tenders as a support to VO broker

- **coFinder**
  - VO broker
  - Internet
  - VMS
  - Tenders
  - Contracting CO
TOOLS FOR VO CREATION – coFinder (ii)

Input (two web sites):
- list of sites with calls for tenders
- VBE competencies

Output:
- web page – filtered COs

TOOLS FOR VO CREATION – COC-PLAN

Collaboration Opportunity Characterization & Rough Planning

- CO Characterization INPUTS
- PRODUCT Characterization INPUTS
- SERVICE Characterization INPUTS
- Description in COMPETENCE terms

Input:
- “CO Identification tool” output: filled XML template.
- Synchronization will be achieved through a good and coordinated interface development.

Output:
- The list of competencies needed
- The VO Rough Plan:
  - process structure definition (according to CO modality)
  - “ideal VO configuration” suggestion

TOOLS FOR VO CREATION – PSS (i)

Partners Search & Suggestion

I. Use of interactive methods that can help managers in the selection of the most suitable performance indicators for a given CO;

II. Search for partners in the VBE’s catalog which fits the performance requirements;

III. Trigger (non-linear) negotiations with the ones found in Stage II in order to reach agreements on the diverse negotiation objects. The sequence and order will be driven by the VO Planner;

IV. Generation and Suggestion of possible VO compositions, with performance according to weighted indices on the selected performance indicators;

TOOLS FOR VO CREATION – PSS (ii)

PSS Process View
TOOLS FOR VO CREATION – PSS (iii)

IDEFO for the PSS Process

- VO Planner
- Pre-selected organizations to Negotiation Wizard
- Selected VO Partners
- Historical information to VBE Manag. System
- VO Rough Planning
- CO requirements “constraints”
- VBE members’ Catalog
- VBE members’ Performance Indicators

TOOLS FOR VO CREATION – PSS (iv)

- Criteria Specification
- Partners Search
- Partners Selection

Input:
- The information about the macro structure of the CO
- The CO requirements
- VBE members’ performance

Output:
- Pre-selected enterprises to Negotiation Wizard;

TOOLS FOR VO CREATION – PSS (v)

PSS Sequence Diagram

- Rough VO Planning
- Partners Search
- Negotiation Wizard
- Generation of VO
- VO Suggestion

- Select Indicators
- Look for partners
- Refine Indicators
- 1st Neg. Round
- Agreements
- Generate VO
- Suggest VO
- 2nd Neg. Round
- Other suggestions
- Renegotiate
- New Possibilities
- Suggest VO
- Renegotiate

TOOLS FOR VO CREATION – WiZAN (i)

Wizard for Agreement Negotiation

- The negotiation wizard is aimed at providing computer-assisted support to the process of negotiation and reaching agreements during VO creation.

- Assistance to a process that is mainly conducted by human actors in a distributed environment

- Hardly structure process, as the flow and length of interactions depend on the decisions made by autonomous entities

- Attempt to reach organizational support in terms of “negotiation environment” and “information organization and integration”.

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As a support tool, the Negotiation Wizard aims at providing an automation level that provides as much support as possible, leaving the decision process to the human actors.

Focus on the internal consortium contract / agreement, rather then on the contract with the client.

Internal consortium contract / agreement is the result or synthesis of all agreements negotiated among the participants of the VO being created and that will support their collaboration.

Innovation in having an integrated approach/system environment where the manager can be assisted along with the whole process, starting at the reception of the CO till the VO configuration and launching.

Same negotiation support mechanism.
**TOOLS FOR VO CREATION – WizAN (vi)**

<table>
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<tr>
<th>VO Creation Tools</th>
<th>CO Identification</th>
<th>CO Characterization and Rough VO Planning</th>
<th>Partners Search and Suggestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support in detection of collaboration opportunities</td>
<td>Characterization of the CO and preparation of a more detailed structure of the VO and needed processes</td>
<td>Recommendation of potential VO configurations</td>
<td></td>
</tr>
</tbody>
</table>

**Inputs to wizard**

- CO identity, “customer” and other relevant data
- Collaboration modality
- Process structure / VO logical structure
- Suggestion of needed number of partners and the competences they shall have
- Definition of main processes to be carried out by each partner (according to competencies)
- Suggested list of most suitable partners (with accurate competences, criteria and performance indicators) to fulfill CO requirements

**Outputs**

- VO contract / agreement as the synthesis of all agreements reached among partners

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**TOOLS FOR VO CREATION – WizAN (vii)**

**Contract Template**

- **Main Part**
  - Identification of the parties
  - Duration
  - Terms
  - Law
  - Arbitration clauses

**Negotiation Objects**

- Price
- Quality
- Criteria
- Dates

**Technical Annex**

- Agreements
- Content of negotiation
- Initiator
- Start date
- Participants
- Agreement date

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**TOOLS FOR VO CREATION – WizAN (viii)**

**WizAN Main Functionalities**

- **CTR (Contract Templates Repository)**
  - Collection of contract templates and clause templates to support the contract creation

- **CE (Contract Editor)**
  - Uses the CTR and agreed negotiation objects to add new clauses to contracts

- **VNR (Virtual Negotiation Room)**
  - Virtual “place” where the negotiation participants can access the various negotiation objects and can “discuss” in order to reach agreements

- **SAE (Support for Agreement Establishment)**
  - With facilities for contract signing and notification to relevant parties, and repository/archive for its storage

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**TOOLS FOR VO CREATION – WizAN (ix)**

**A Scenario**

The full negotiation process involves a number of elementary negotiations, i.e. reaching agreements on a number of “negotiation objects”. A “negotiation object” (e.g. definition of the schedule and location for delivery of a prototype), once agreed by all parties involved will became part of the global contract.

Participants will then be invited to join the “room” (one in a bilateral negotiation or more in a multi-party negotiation), using standard collaboration tools (e.g. chat, forum, notification, file sharing).
CONCLUSIONS (i)

- Time and amount of resources consumed during the VO creation process whenever a business/collaboration opportunity is acquired, give a good indication of the level of agility of a collaborative ecosystem.
- Effectiveness mainly depends on the availability of the adequate information about potential partners and their level of preparedness for VO involvement.
- VBEs enables dynamic virtual organizations creation.
- The solution for VO creation should be based on Computer assisted with not fully automated solution but with main decisions made by humans.
- Considerations have to be made not only taking into account Competencies but also History, Preferences and Trust.

CONCLUSIONS (ii)

- Linear/sequential process vs. Parallel process.
- Supports Unilateral and multi-lateral negotiations.
- Integrated approach/system environment where the manager can be assisted along with the whole process, starting at the reception of the CQ till the VO configuration and launching.