Virtual Organizations Breeding Environment (VBE)

Hamideh Afsarmanesh
University of Amsterdam
h.afsarmanesh@uva.nl

Lecture 4
20 November, 2012

FORMATION OF CNs
- Different kinds of CN

Long-term CN (e.g. Supply chain, VBE/PVC)

Preparation Opportunity

Preparation of VBE / PVC

Short-term CN (e.g. Dynamic VO / VT)

Short-term in a niche sector
ROLE OF BREEDING ENVIRONMENTS

Before you can configure and establish a VO, you need to know who is who in the potential environment to select from ...

- Need for pre-establishment of strategic alliances (VBE) in different application areas that can facilitate the VO creation.
A virtual organization is a temporary alliance of enterprises that come together to share skills, competencies, and resources in order to better respond to business opportunities, and whose collaboration is supported by computer networks.

**VIRTUAL ORGANIZATION (VO)**

**VO** is a dynamic goal-oriented Collaborative Network (CN)

VOs (Virtual Organizations - collaborating partners)

Cost-/time-effective creation of goal-oriented dynamic VOs/VTs requires an underlying strategic CN (i.e. VBE/PVC)

VBES (Virtual organizations Breeding Environments – cooperating)

Long term strategic CNs – VBEs and PVCs) provide necessary conditions

- required for effective configuration and formation of VOs/VTs at the strike of emerging collaboration opportunities
- prepare their members for collaboration in VOs/VTs

- Automated search and matching (with multi-dimensional ranking of groups of organizations/individuals) to best fit the required specificities of the Collaboration Opportunity (CO), e.g. a call for tender
- Measuring trustworthiness of actors
- Integration of legacy systems (DBs)
- Decomposing the CO into detailed characteristics, in order to compare against the qualifications/abilities of actors in the VBE/PVC

- long term agreements, common ICT infrastructure, common working/sharing policies
LONG-TERM ALLIANCES

"VO Breeding environment (VBE) – represents 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 rapid configuration of temporary alliances for collaboration in potential Virtual Organizations. Namely, when a collaboration opportunity is identified by one member (acting as a broker), a subset of VBE organizations can be selected to form a VE/VO

Professional virtual community (PVC) – represents an association combining the concepts of virtual community and professional community. Virtual communities are defined as social systems of networks of individuals, who use computer technologies to mediate their relationships. Professional communities provide environments for professionals to share the body of knowledge of their professions such as similar working cultures, problem perceptions, problem-solving techniques, professional values, and behavior.

SOME EXAMPLES OF VBEs

- **virtuelle-fabrik.com**
  - Metal-mechanics sector
  - Switzerland, Germany

- **iecos**
  - Engineering & Manufacturing
  - Mexico

- **ISOIN**
  - Aeronautics sector
  - Spain

- **CeBeNetwork**
  - Aeronautics sector
  - Germany

- **Swiss Microtech**
  - Watch industry sector
  - Switzerland, China

- **netWork Oasis / Science Park**
  - Finland

- **torino wireless**
  - Telecommunications sector
  - Italy

- **KER**
  - Engineering
  - Finland

- **TechMoldes**
  - Moulds industry
  - Brazil
Example: ISOIN (Aerospace)

Andalusian Aeronautical cluster

- **EADS**: 3 PLANTS
- **AIRBUS**: 1 PLANT
- **HÉLICE**: 93 SMES, 48 CORE

| Employment | 4,500 |
| Turnover M€ | 645 |
| 97% SMEs | 123M€ |
| (24% of Spanish SMEs) |

All of them currently in expansion to make room for new programs A400M, A380, etc

Example: Infranet-Partners (Telecommunication)

Infranet Partners is a network of small companies specialising in Infranet solutions based on LonWorks® technology. The network was established in 1999 with 4 founding members and today there are 10 participants in the network.

- Creating a comprehensive pool of Technology and Application resources.
- Serving customers as a single organisation offering locally adapted solutions from this shared pool.
- Combining Product range under the Infranet Partners brand.
- Providing a comprehensive product range and support backed by frequent cross training.
- Providing a comprehensive Training program across Europe.
- Sharing technical support and knowledge of different markets to provide solutions for customers.
- Sharing marketing information using an advanced dynamic groupware marketing tool to enable them to act faster to meet customer requirements.
Example: VIRTUELLE FABRIK (Electro-Mechanics)

Pool of SMEs
Machine building competencies
Switzerland & South Germany

Various sub-networks

Example: CeBeNetwork (Aeronotics)

Network:
- More than 30 co-operation partners
- More than 20 years aerospace experience
- More than 5000 highly skilled engineers, scientists and technicians
- EN 9100 quality management

Engineering services
- Prime contractor CeBeNetwork
- Best in class solutions for specific and non-specific design work

IT services
- 6 IT companies in France, UK and Germany
- High performance systems
- B2B solutions

Onsite experts
- 4 companies act as agents for international aerospace specialists

Integrated Portfolio for Product Engineering
- Testing & Aerodynamics
- Computer Aided Engineering
- Design Engineering
- Process & Technology Management
- Software Engineering
- Systems Engineering
Example: Supply Chain Shannon (Engineering Electronics)

Over 80 Engineering & Electronics Sub-Supply Companies in the Region

Sector Now Employing Over 4000

Large Multinationals located in the Region

Turnover in excess of €200m

Limited Export Activity Nationally or Internationally from Region

Competitive threats from economic downturn and low labour cost regions

25 companies in SNS

Example: CONSEN Euro-Group

Grouping of European SMEs who have agreed to cooperate as Euro-Cluster in Information Society Technologies projects, tenders and business throughout Europe

CONSEN is a non-profit, independent and international consulting firm constituted in November of 2004 in Barcelona.

Open-Source Software, Contents, Standards, Infrastructures and Information Society Technologies

A member of CONSEN Partners network Grouping owns shares and pays an annual fee and receives benefits in four major areas:

- research and innovation,
- marketing and promotion,
- network building, and
- organization.
Example:
**SWISS MICROTECH**

Enterprise Network (association):
- Azurea Technologies SA
- Boillat SA
- DIXI Cylindre SA
- Ravine SA
- Detech SA
- Groupe Estoppey-Reber SA
- ADAX SA

Micromechanics
Network established in 2001

Interest to create own products of the network

Collaboration to China considered (China strategy is being built)

---

**The DecoChina global network**

Customer

Connection Customer- VO
One interlocutor

Swiss Regional VBE
Swiss Microtech

DecoChina VBE

Chinese Regional VBE

---

**STUDY OF MORE THAN 100 EXISTING LONG-TERM NETWORKS / VBES (IN ECOLEAD)**

<table>
<thead>
<tr>
<th>Case</th>
<th>Members</th>
<th>Location</th>
<th>Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtuelle Fabrik</td>
<td>100</td>
<td>Switzerland, Germany</td>
<td>Mechanical industry</td>
</tr>
<tr>
<td>Kiesel</td>
<td>&gt;15</td>
<td>Germany</td>
<td>Services, Environment</td>
</tr>
<tr>
<td>Virtec</td>
<td>&gt;9</td>
<td>Brazil</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>CEFAMOL</td>
<td>136</td>
<td>Portugal</td>
<td>Plastic moulds</td>
</tr>
<tr>
<td>Virtual Enterprise Networks Yorkshire</td>
<td>&gt;25</td>
<td>UK</td>
<td>IT, Machinery, Bio-tech, e-Learning</td>
</tr>
<tr>
<td>Bipole Tisino</td>
<td>&gt;13</td>
<td>Switzerland</td>
<td>Life sciences</td>
</tr>
<tr>
<td>Virtual Biotech Company</td>
<td>&gt;150</td>
<td>Germany</td>
<td>Biotechnology</td>
</tr>
<tr>
<td>PVC</td>
<td>45</td>
<td>Australia</td>
<td>Plastics</td>
</tr>
<tr>
<td>Regional Net for Ontario</td>
<td>-</td>
<td>Canada</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>VIRFERBRAS</td>
<td>&gt;12</td>
<td>Brazil</td>
<td>Moulds</td>
</tr>
<tr>
<td>Fenix Cluster</td>
<td>&gt;250</td>
<td>Mexico</td>
<td>Electronics, metal &amp; plastic</td>
</tr>
<tr>
<td>Biotechnology cluster</td>
<td>411</td>
<td>USA</td>
<td>Biotechnology</td>
</tr>
<tr>
<td>Biotechnology cluster</td>
<td>&gt;160</td>
<td>Canada</td>
<td>Agro-food, biotechnology</td>
</tr>
<tr>
<td>Advanced Business Services</td>
<td>&gt;6</td>
<td>USA</td>
<td>Credit, lending, investments</td>
</tr>
<tr>
<td>Helsinki ICT cluster</td>
<td>79</td>
<td>Finland</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>CARPI</td>
<td>2068</td>
<td>Italy</td>
<td>Textile / clothing</td>
</tr>
<tr>
<td>Mining Cluster</td>
<td>-</td>
<td>Chile</td>
<td>Mining industry</td>
</tr>
<tr>
<td>Motorsport Valley</td>
<td>40</td>
<td>UK</td>
<td>Motor-sport</td>
</tr>
<tr>
<td>Verko A</td>
<td>12</td>
<td>Finland</td>
<td>Process industry</td>
</tr>
<tr>
<td>Automotive cluster</td>
<td>54</td>
<td>Slovenia</td>
<td>Automotive industry</td>
</tr>
<tr>
<td>Plastotechnics cluster</td>
<td>&gt;60</td>
<td>Slovenia</td>
<td>Plastics</td>
</tr>
</tbody>
</table>
### VBE CATEGORIES

**Main collaboration driver**

- **Customer induced** ... To qualify as a supplier
- **Capacity achievement** ... Too big a “problem” / market
- **Complement competencies** ... New markets, new products, also dimension
- **Regional ecosystem** ... To preserve local specificities, tradition, culture ... Benefit from government incentives

<table>
<thead>
<tr>
<th>Membership</th>
<th>Overlapping of competencies</th>
<th>Support institutions</th>
<th>Market access</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 Customer induced</td>
<td>Enterprises &amp; other</td>
<td>-Possible</td>
<td>-Limited</td>
</tr>
<tr>
<td></td>
<td>-Highly selective</td>
<td></td>
<td>-Extremely focused</td>
</tr>
<tr>
<td>A2 Capacity achievement</td>
<td>Organizations in</td>
<td>-Mostly</td>
<td>-Limited</td>
</tr>
<tr>
<td></td>
<td>same domain/sector</td>
<td></td>
<td>-Focused on a domain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(in general)</td>
</tr>
<tr>
<td>A3 Complement competencies</td>
<td>May cover various sectors</td>
<td>-Possible, limited</td>
<td>-Limited</td>
</tr>
<tr>
<td></td>
<td>-Basic adhesion rule</td>
<td>(regulated)</td>
<td>-Generic (as possible)</td>
</tr>
<tr>
<td>A4 Regional ecosystem</td>
<td>Specific sector (mostly)</td>
<td>-Possible</td>
<td>-Strong</td>
</tr>
<tr>
<td></td>
<td>-Regional basis</td>
<td></td>
<td>-Generic, with regional focus</td>
</tr>
</tbody>
</table>

### CN TAXONOMY

A **collaborative network** (CN) is an alliance constituted by a variety of entities (e.g. organizations and people) that are largely autonomous, geographically distributed, and heterogeneous in terms of their operating environment, culture, social capital and goals, but that collaborate to better achieve common or compatible goals, and whose interactions are supported by computer network.
A **collaborative network** (CN) is an alliance constituted by a variety of entities (e.g., organizations and people) that are largely autonomous, geographically distributed, and heterogeneous in terms of their operating environment, culture, social capital and goals, but that collaborate to better achieve common or compatible goals, and whose interactions are supported by computer network.

**LONG TERM STRATEGIC ALLIANCE - VBE**

**VBE – REQUIREMENTS ANALYSIS**

- **VBE cases & scenarios**
- **SoA on VBE’s earlier models and cases**
- **VBE elements**
  - Assets
  - Models
  - Functions
  - Life cycle
  - Actors & Roles
  - Member organizations

- **Code of conduct**
- **Interactions**
- **Collaboration agreements**
- **Asset Management**
- **Value systems**
- **Working & sharing principles**

- **Need to Revisit Business Perspective**

- **Need for advanced research in:**
  - Comprehensive characterization
  - VBE Typology
  - Reference modeling
  - Concepts/Functionality of VMS
  - Conc./funct. Of VO creation
SOME REASONS TO JOIN A VBE

Market-related reasons
- Coping with market turbulence
- Increase chances of survival
- More chances to compete with larger companies
- Lobbying & market influence (branding / marketing)
- Easier access to loans
- Cheaper group insurance
- Better negotiation power (e.g. Joint purchasing)
- Prestige, reputation, reference
- Access to / explore new market / product (e.g. Multidisciplinary sector)
- Expand geographical coverage
- Increase potential for innovation
- Economy of scale
- Achieve (global) diversity
- ...

Organizational reasons
- Management of competencies and resources
- Approaches to build trust
- Improve potential of risk taking
- Support members through necessary re-organization
- Learning & training
- Shared bag of assets
- Organize success stories & joint advertisement
- Help in attaining clear focus / developing core competencies
- ...

Preparedness
- Agility for opportunity-based VO creation
- Effective common ICT infrastructure
- Mechanisms, guidelines for VO creation
- General guidelines for collaboration
- Increase chances of VO involvement
- ...

WHY REMAINING IN A VBE?

The initial attracting factors are not exactly the same that keep members happy in the long run!

- Profit from businesses
- Benefiting from the existing infrastructure
- Better marketing possibilities (fairs, cheaper admission costs, better publicity/visibility (better location) …)
- Better strategic position through the VBE
- Easy access to complementary skills
- Explore new market / new product (multi-disciplinary-sector), expand geographical coverage
- Potential for innovation
- Continue profiting from the opportunities only available through the VBE
- Fight against a common enemy
- Better negotiation power
- Existing success stories and advertising
- Gain higher rank for more opportunities

Need for objective indicators!
SYSTEM OF INCENTIVES

**to attract and maintain VBE members**

**Example incentives:**

1. **For business related VBEs:** economic profit and knowledge:
   (i) Guaranteed participation in a given number of VOs during a given period of time (difficult to materialize in practice),
   (ii) Access to a set of basic tools etc. provided in the VBE bag of assets,
   (iii) Access to other members public profiles,
   (iv) Tutorials, Courses and Conferences to enhance productivity (and core competencies) in companies,
   (v) Initial evaluation of the member, and commitment to provide constructive suggestions/advice to better its status in a given period of time.

2. **For universities:** the openness of VBE projects, possibility for student practices, early introduction to industry practices, and better links between industry and academia

3. **For R&D organizations:** the exploitation of their technological advances, and links between research and market

4. **For government organization involvement:** directly related to the social and economic impact of the VBE, e.g.: increase in employment rates, increase in gross product, better infrastructures, and SME developments.

As a base incentive for VBE members, a set of rules that are defined to collect “points” (e.g. for taking active roles) to receive more benefits

---

**CREATION OF VO – 2 APPROACHES**

1.a **Getting ready to collaborate**

- Cooperation agreement
- Common infrastructure
- Common principles
- Base trust

1.b **VO Breeding Environment**

- VO planning
- VO partners selection
- Fast contract negotiation
- VO setup

2. **Open VO creation**

- Wide partners’ search & selection
- Establish common infrastructures
- Common principles
- Contract negotiation
- Collaboration agreement
- VO setup

© H. Afsarmanesh 2012

[Afsarmanesh, 2007]
VBE ACTORS, ROLES AND RIGHTS

Main roles:
- VBE Administrator (Manager/Coach)
- Opportunity broker
- VO planner (Integrator)
- VO coordinator
- VBE Member

Other roles:
- Support institution assistance provider
- Common tools/services provider
- Common Ontology provider
- VBE advisor (board)
- Public (guest)

One actor can play multiple roles simultaneously

Main roles:

- 3. VBE Administrator
- 6. VBE Advisor
- 4c. Ontology Provider
- 4b. Service Provider
- 4a. Inst. Support Provider
- 2c. VO Coordinator
- 2b. VO Planner
- 2a. Opportunity Broker
- 1. VBE Member Organization
- 5. Public (guest)

Incremental Propagation of rights
(Coinciding with the increase in member’s responsibilities)

[Afsarmanesh, 2007]

SOME DIFFICULTIES IN COLLABORATION

- **Resources** – ownership and sharing of resources is a typical difficulty, whether it relates to resources brought in by members or resources acquired by the coalition for the purpose of performing the task.

- **Rewards** – finding a fair way of determining the individual contributions to a joint intellectual property creation is a rather challenging issue. Intellectual property creation is not linearly related to the proportion of resources invested by each party. At the very base of this issue is the need to reach a common perception of the exchanged values, which requires the definition of a benefits model and a system of incentives, based on a common value system.

- **Commitments** – whenever there is an attack or any other obstacle to the collaboration do parties respond as a whole, facing the consequences together, or do each one try to “save its neck”?

- **Responsibilities** – a typical phenomenon in collective endeavors is the dilution of responsibility. A successful collaboration depends on sharing the responsibilities, both during the process of achieving the goal, and also the liabilities after the end of the collaboration.

These issues must be settled by a set of common working and sharing principles.
THE MAIN ICT NEEDS

What ICT support is needed for CNs?

ICT infrastructure:
- Safe communications, Information sharing, Coordination
- Interoperability and legacy systems integration
- Collaboration platform
- ...

ICT services: (Supporting all phases of CN life cycle)
- Creation: Planning, partners selection, negotiation, contracting, ...
- Operation: Management, Conflict resolution, Performance management, ...
- Evolution: Partners search, reconfiguration, ...
- Dissolution: Inheritance mechanisms, ...
- ...

VBE LIFE CYCLE FUNCTIONALITIES

Life cycle stages of VBE

Required Life cycle functionality

1. Creation of necessary databases
2. Enter data for assisting administrative tools
3. Register founding members
4. Load the existing ontology / thesaurus
5. Parameterize domain & setup necessary links
7. Advanced assisting tools for VBE members
8. Assisting tools to deal with support institutions
9. Register new members
10. Traceability: History / past records

Operation & Evolution

1. Set up & running the VBE system
2. Search competency & past-performance for partner selection
3. Advanced assisting tools for VBE members
4. Creation & registration of a VO in the VBE
5. Ontology for sector-dependent competency / resources / products
6. Regular submission of VO performance data
7. Submission of VO records to be kept & protected
8. Assisting tools to deal with support institutions
9. Traceability: History / past records

Evolution

1. Transfer collected knowledge to another organization
2. Transition to new organizational structure
3. Revision & organization of gathered knowledge
4. Creation & registration of a VO in the VBE
5. Ontology for sector-dependent competency / resources / products
6. Regular submission of VO performance data
7. Submission of VO records to be kept & protected
8. Assisting tools to deal with support institutions
9. Traceability: History / past records

Dissołution

1. Revision & organization of gathered knowledge
2. Transition to new organizational structure
3. Transfer collected knowledge to another organization
4. Creation & registration of a VO in the VBE
5. Ontology for sector-dependent competency / resources / products
6. Regular submission of VO performance data
7. Submission of VO records to be kept & protected
8. Assisting tools to deal with support institutions
9. Traceability: History / past records
VBE management system – Main sub-systems

3 SUBSYSTEMS SUPPORTING VBE

VBE Information Sub-Systems

- Ontology management
- Profile & Competency management
- Trust management
Unified VBE ontology specification

4 levels of abstraction

4 levels of abstraction:
- Meta (1)
- Core (1)
- Domain (N)
- Application (N*M)

10 sub-ontologies
(complementary VBE knowledge partitions)

GUI for VBE ontology management system

Ontology Discovery and Management System

Core VBE concepts

Search for concepts

Definitions

(Inspired by Protégé, but simpler and tailored for VBE actors, to navigate, edit, and use for discovery)
The **VBE profiles** provide structured descriptions (mostly textual content) about the VBE entities, addressing their **qualifications**, and the records of their related past activities and achievements.

**VBE profile**
- Introduction to the VBE members
- Evaluation of the VBE performance
- Introduction / advertising in the market / society

**VO profile**
- Promotion towards new members and customers
- Provision of up-to-date information about the VBE to the VBE members

**Organization profile**
- Creation of awareness inside the VBE
- Selection of partners for new VOs
- Evaluation of members by the VBE administration
- Introduction / advertising in the market / society

---

**VBE Competency model – Supporting dynamic / agile VO creation**

- *Currently large VBEs fail chances to respond to emerging collaboration opportunities due to inability to dynamically process and analyse the competencies (i.e. qualifications and abilities) of their member organizations*

- *For dynamic/agile configuration and creation of a VO, competencies of the VBE actors must be matched against the detailed specificities of the CO to which it is planned to respond*

---

**Example call for tender**

<table>
<thead>
<tr>
<th>Bidding Type</th>
<th>International Competitive Bidding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name</td>
<td>CAIRO NORTH COMBINED-CYCLE POWER PLANT PROJECT (THE EGYPTIAN ELECTRICITY HOLDING COMPANY (EEHC), A JOINT STOCK COMPANY ESTABLISHED BY LAW NO. 164 YEAR 2000 (FORMERLY EGYPTIAN ELECTRICITY AUTHORITY), HAS SECURED A LOAN FROM THE ARAB FUND FOR ECONOMIC AND SOCIAL DEVELOPMENT AND HAS REQUESTED THE PARTICIPATION OF THE EUROPEAN INVESTMENT BANK (EIB) TO FINANCE THE PROCUREMENT OF MATERIALS AND ASSOCIATED SERVICES FOR SEVERAL PACKAGES OF THE CAIRO NORTH COMBINED-CYCLE POWER PLANT PROJECT)](\text{\textcopyright} H. Afsarmanesh 2012)</td>
</tr>
<tr>
<td>Financier</td>
<td>Not Provided</td>
</tr>
<tr>
<td>Tender Notice No.</td>
<td>Not Provided</td>
</tr>
<tr>
<td>Description</td>
<td>DESIGN, FABRICATION, FURNISHING, DELIVERY, INSTALLATION, TRAINING, TESTING, START-UP AND COMMISSIONING FOR 2 X 250 MW (ISO) GAS TURBINE GENERATORS AND AUXILIARIES (TWO 250 MW (ISO) COMBUSTION TURBINE GENERATORS, AND ONE 250 MW (NOMINAL) STEAM TURBINE GENERATOR), INCLUDING ALL MECHANICAL AND ELECTRICAL WORK REQUIRED FOR A COMPLETE OPERATIONAL SYSTEM.</td>
</tr>
</tbody>
</table>

A collaboration Opportunity (CO)
We have identified the generic set of elements constituting VBE members' competencies, i.e. with the 4C-model (including the Capabilities + Capacities + Costs + Conspicuitues), that comprehensively specifies the needed information from VBE member organizations, in order to be selected for the VO creation.

Functionality for matching between the offered competencies by VBE actors, against the CO specificities (weighted multi-dimensional match), supported by other applicable functionalities from ontology engineering.
TRUST IN VBEs

WHY TRUST?

Based on earlier research…
- 50-80% of inter-organizational relationships fail
- Trust as a critical factor in inter-organizational relationships

It is important to understand trust…
- nature of trust
- dynamics in trust
- how to build trust?
- how to measure trust?
- trust building tools?

[Blomqvist, 2004]

TRUST – WHEN NEEDED IN VBEs

WHEN IS TRUST NEEDED?

The higher the uncertainty...
- emerging technologies
- emerging markets
- economic situation
- risky projects
- new business models

The higher the turbulence...
- blurring industry boundaries
- convergence
- consolidation
- law of increasing returns
- dominant market position
- fast-track projects

The higher the need for speed...
- systemic products
- inter-disciplinary knowledge
- switching costs
- web of partners is needed
- complementary knowledge
- diverse actors
- different cultures
- different power

The higher the asymmetry...
- knowledge-workers
- complementary knowledge
- voluntary nature of innovation
- commitment

...the higher the need for trust

[Blomqvist, 2004]
TRUST IN VBEs

- How to establish and promote trust in VBEs:
  - Among member organizations in the VBE?
  - Between the organization and the VBE administration?
  - Between the customer and the VBE?

- How can the VBE management system (VMS) assist member organizations in:
  - Assessing current trust levels of other organizations in the VBE?
  - Foreseeing their trustworthiness in the coming time?
  - Establishing trust relationships with each other?

Trust level assessment & management

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Requirements</th>
<th>Trust criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Structural</td>
<td>Structural strength</td>
<td>Size, Competencies, Personnel experts</td>
</tr>
<tr>
<td></td>
<td>Business strength</td>
<td>Geographical coverage, Workload allocation, Joint ventures</td>
</tr>
<tr>
<td>2. Social</td>
<td>Community participation</td>
<td>Activities participated, Service contribution</td>
</tr>
<tr>
<td></td>
<td>Community compliance</td>
<td>Standards complied</td>
</tr>
<tr>
<td>3. Economical</td>
<td>Capital</td>
<td>Cash, Physical capital, Material capital, Cash in, Cash out</td>
</tr>
<tr>
<td></td>
<td>Financial stability</td>
<td>Cash out, Profit/Loss, Operational costs, Cash in, Cash out</td>
</tr>
<tr>
<td></td>
<td>VO - financial stability</td>
<td>Cash in, Profit/Loss</td>
</tr>
<tr>
<td></td>
<td>Financial standards</td>
<td>Awaiting standards, Awaiting frequency</td>
</tr>
<tr>
<td>4. Technological</td>
<td>ICT - Infrastructure</td>
<td>Network speed (Broadband), Interoperability</td>
</tr>
<tr>
<td></td>
<td>Technology standards</td>
<td>Availability, Protocol standards, Software standards, Hardware standards, Security standards</td>
</tr>
<tr>
<td></td>
<td>Platforms</td>
<td>Operating systems, Programming languages, VO based experience</td>
</tr>
<tr>
<td></td>
<td>Platform experience</td>
<td>External project based experience, Duration field</td>
</tr>
<tr>
<td>5. Managerial</td>
<td>Stable management</td>
<td>Years in power, Management structure, Frequency of power change</td>
</tr>
<tr>
<td></td>
<td>VO - Collaborative behaviour</td>
<td>VO opportunistic behaviour occurred, VO successful collaborations, VO participation as organizer leader</td>
</tr>
<tr>
<td></td>
<td>Reliability</td>
<td>Quality, Adherence to delivery dates</td>
</tr>
</tbody>
</table>

Set of trust elements
Trust assessment – Causal analysis

- Analyzing causal influences among trust criteria, intermediate factors and known factors
- Translating causal influences into mathematical equations

Applies concepts inspired by system dynamics discipline

\[ PC = SZ \times WA \times \frac{CP}{RCP} \times CT \]

PC: Production capacity
SZ: Size
WA: Workload allocation
CP: Competency
RCP: Required competencies
CT: Centers

Trust management system GUI

Analysis of the base trust level for the VBE member

1. VBE member organization name: IEC087
2. Partial results towards analysis of trust level (relative values)

<table>
<thead>
<tr>
<th>Managerial trustworthiness details</th>
<th>Social trustworthiness details</th>
</tr>
</thead>
<tbody>
<tr>
<td>VO collaborative behavior: 4.9</td>
<td>Community standards: 2.45</td>
</tr>
<tr>
<td>Management stability: 3.45</td>
<td>Community participation: 3.675</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Structural trustworthiness details</th>
<th>Technical trustworthiness details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization size: 4.9</td>
<td>ICT infrastructure: 3.947</td>
</tr>
<tr>
<td>Competence: 4.9</td>
<td>Technical standards: 4.9</td>
</tr>
<tr>
<td>Centers: 3.002</td>
<td>Platforms: 4.9</td>
</tr>
<tr>
<td>Workload allocation: 4.9</td>
<td>Technical experience: 4.0</td>
</tr>
</tbody>
</table>

Economical trustworthiness details

Capital: 4.93
Financial stability: 1.985
VO financial stability: 4.411

3. Base score for each perspective

<table>
<thead>
<tr>
<th>Technological</th>
<th>Managerial</th>
<th>Social</th>
<th>Economical</th>
<th>Structural</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.722</td>
<td>3.75</td>
<td>3.125</td>
<td>3.709</td>
<td>3.125</td>
</tr>
</tbody>
</table>

4. The base trust level results

<table>
<thead>
<tr>
<th>Org ID</th>
<th>Name</th>
<th>Trust Level</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>IEC087</td>
<td>More trustworthy</td>
<td>3.686</td>
</tr>
</tbody>
</table>
ECOLEAD: VMS ARCHITECTURE & USERS

Main subsystems of VBE management system

Data transfer:

Main users/editors of data in the systems / tools:

© H. Afsarmanesh 2012
Conclusion

- Collaborative Networks manifest in a wide and growing range of application scenarios.
- Pre-establishment of supporting long-term strategic alliances, can provide the needed environment for creation of cost- and time-effective dynamic virtual organizations and virtual teams.
- Gathering up-to-date information on wide variety of aspects are necessary for efficient creation of dynamic opportunity-based collaborative networks.
- A main challenging criterion for the success of collaborative networks is the effective management of the wide variety of information that needs to be handled inside the CNs to support their functional dimension.
- Advanced CN support platforms require modeling and management of heterogeneous and incomplete & imprecise information, which calls for a combination of approaches such as federated databases, ontology engineering, computational intelligence, and qualitative modeling and reasoning.

To read more on CNs

More details on many of the mentioned subjects can be found in the following two books generated through the results of ECOLEAD project:

Methods and Tools for Collaborative Networked Organizations

Collaborative Networks: Reference Modeling