



# Networked Virtual Organizations

**Wojciech Cellary**

Department of Information Technology  
The Poznan University of Economics

Mansfelda 4  
60-854 Poznań, POLAND  
e-mail: [cellary@kti.ae.poznan.pl](mailto:cellary@kti.ae.poznan.pl)  
www: <http://www.kti.ae.poznan.pl/>



# Current business

Features of electronic information and communication  
cause

**being „on-line“  
in space without geography**

getting information  
from everywhere in real time

possibility of being in contact  
with everybody anytime

**Dynamism and diversity**



# Dynamism

## Constant changeability:

- ⇒ **markets**
- ⇒ **finances**
- ⇒ **customers, suppliers, business partners**
- ⇒ **technology and methods of work**
- ⇒ **software used to work**
- ⇒ **work organization**
- ⇒ **law**



# Diversity

## Diversity in two scales:

### Macro-scale

- ⇒ geographic diversity
- ⇒ legislative diversity
- ⇒ cultural diversity
- ⇒ divers markets of products
- ⇒ divers markets of services

### Micro-scale

- ⇒ aspiration to realize holistic customers needs



# Proper organization

**Dynamic cooperation  
of diverse business and administrative units**

**NVO  
Network Virtual Organizations**



# Network Virtual Organization

**A set of diverse units  
cooperating via net  
presented to the clients  
as if they are a single organization**



# Two processes of organization transformation to NVOs

⇒ **Top down**

**Decomposition of hierarchical organizations**

⇒ **Bottom up**

**Integration of small and medium size units**



# Decomposition of hierarchical organizations

## Organizations in the paper era

- ⇒ In the paper era, when **information flow was slow, costly and geography dependent**, hierarchical organizations were efficient
- ⇒ It was reasonable and justified to assume **rigid roles and functions** of organizational units, as well as their hierarchical **structure**



# Decomposition of hierarchical organizations

## Organizations in the electronic information era

- ⇒ In the electronic information era, decisions may be made basing on **communication**, i.e., information exchange, instead of rigid rules and functions fixed in advance
- ⇒ Then, a **flat network organization** provides more opportunities for business process optimization and better possibilities to adapt organizations to rapid changes on the markets



## Integration of small and medium size units

- ⇒ **Inclusion of** small and medium size units to NVOs coming from decomposition of hierarchical organizations
- ⇒ **Self-organization** of small and medium size units into NVOs to offer more complex products and services on the market and to improve their competitive position



## **Main feature of an NVO**

**Focusing on improvement  
of own core competences  
and entrusting all other functions  
to partners**



# Functional transformation

well known method

## ⇒ Outsourcing

The outsourcing enterprise entrusts control of the entire process to a partner enterprise

relatively new method

## ⇒ Out-tasking

The out-tasking enterprise retains control over the scope and the way a process is performed by a partner enterprise



# Criteria of functional transformation

## Risk to business

Activities which, if performed poorly, pose an immediate risk to the enterprise

- ⇒ Enterprise **mission critical** activities
- ⇒ Enterprise **non-mission critical** activities

---

## Differentiation from competitors

Activities which directly contribute to the competitive advantage of the organization

- ⇒ Enterprise **core** activities
- ⇒ Enterprise **context** activities



# Transformation

**context  
activities**

**core  
activities**

**Partner  
(out-tasking)**

**Enterprise**

**Partner  
(outsourcing)**

**Partner  
(out-tasking)**

**mission  
critical  
activities**

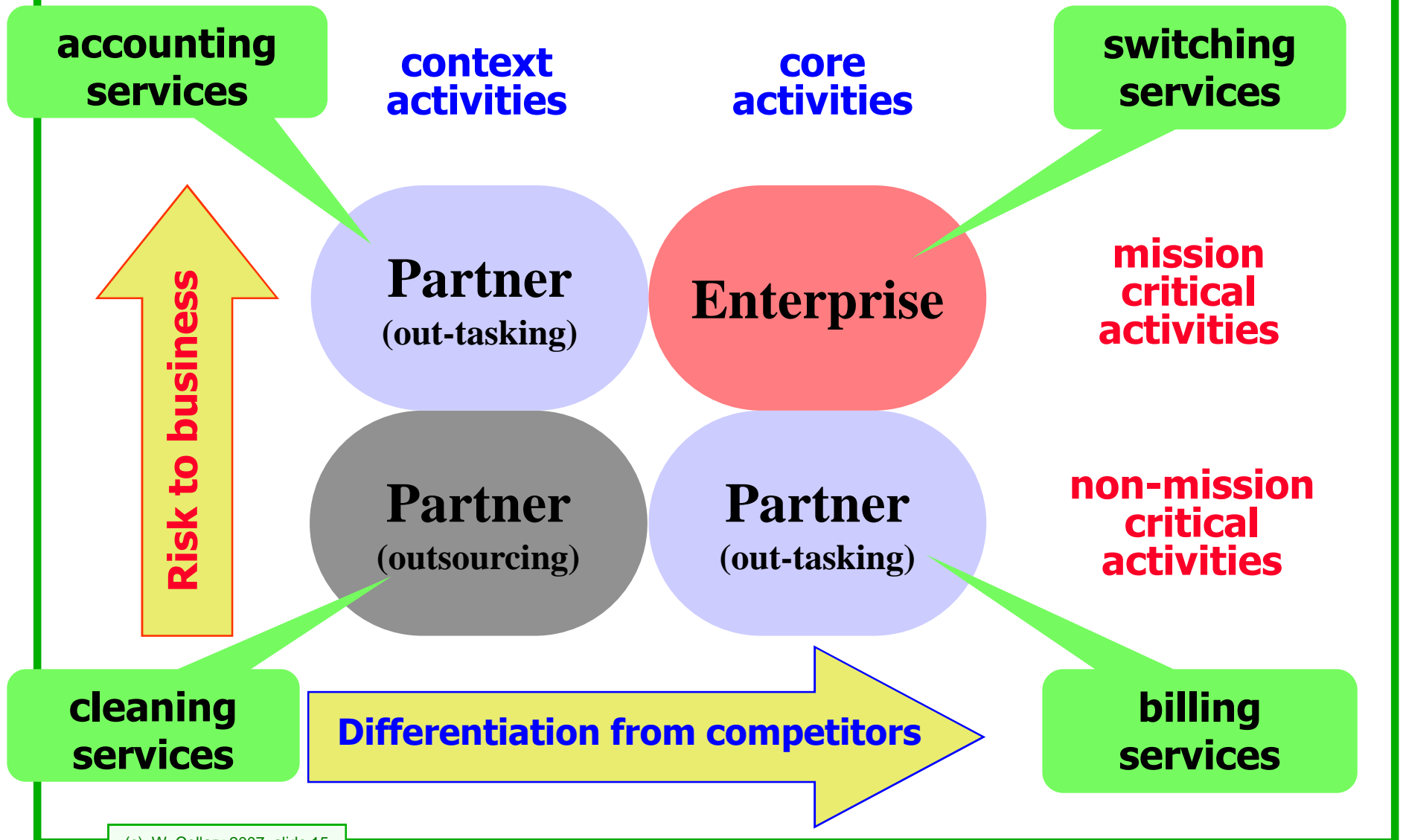
**non-mission  
critical  
activities**

**Risk to business**

**Differentiation from competitors**



# An example of a telecommunication operator





## Question

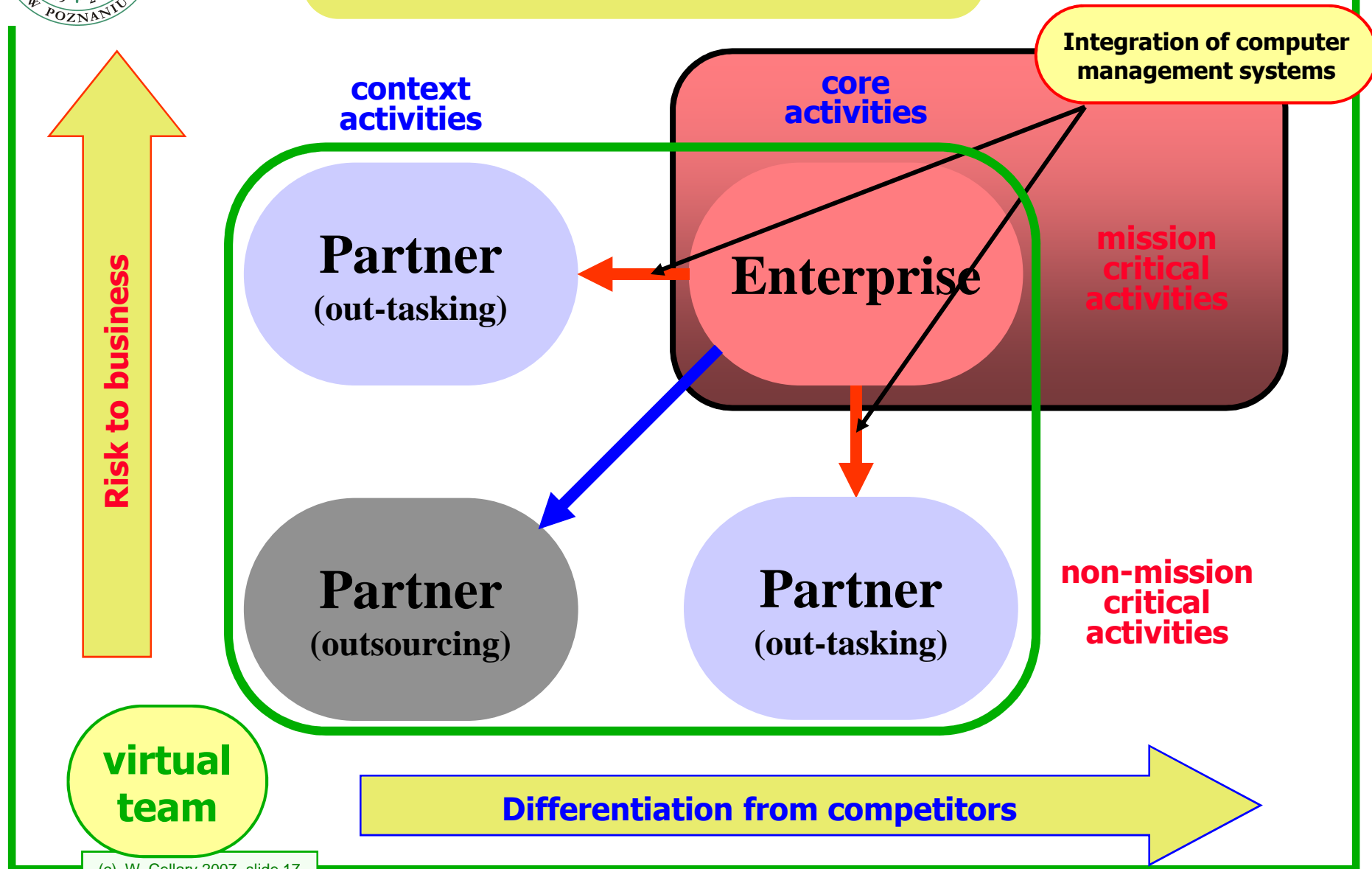
How to **out-task**,  
but **retain control**  
on the way a task is performed  
by an external partner?

## Answer

- ⇒ **By integration of cooperating computer management systems**
- ⇒ **By integration of cooperating people into a virtual team**



# A picture of an NVO





# NVO Integrative Portal

**Role of the portal:  
facilitation of e-cooperation by integration**

**at the  
organization  
level**

**integration of:**

- **data**
  - **systems**
  - **business processes**
- from different partner units**

**at the  
individuals  
level**

**integration of  
individuals  
from different partner units  
into a virtual team**



# **Integration at the organization level**



# Trust

⇒ To fulfill its role, the NVO Integrative Portal has to provide **trust** to the members of the NVO

**Without appropriate level of trust there will be no integration necessary for out-tasking**

- ⇒ Integration at the organization level is a **costly process**
- ⇒ A candidate for a partner need to trust that **benefits** of the integration are higher than **costs** of integration
- ⇒ **Cheaper** is integration, **shorter** cooperation within an NVO can be
- ⇒ The portal has to provide all information necessary to **evaluate benefits** versus **costs** of integration



# Approaches to integration

⇒ **Control of out-task processes requires integration of:**

- data
- software systems
- business processes

⇒ **There are two approaches to integration:**

- standardization
- intermediation



# Standardization

⇒ Standardization of:

- **data**
- **software systems, and**
- **business processes**

is far the best method of integration from the operational point of view

⇒ Standardization **eliminates** or **reduces intermediate processing** making integrated processing easy and cheap

⇒ Standardized is the NVO **middleware**

- **direct use** of middleware standards
- **translation** of partner unit standards to the middleware standards



# Standardization

- ⇒ If standards used in an NVO are **widely accepted**, standardization provides only **limited risk** to a unit
- ⇒ If the required standards are **internal de-facto standards** of the dominating partner within an NVO, **risk** for a partner unit related with the acceptance of those standards **is higher**
  - internal de-facto standards create dependence
  - standards accepted within an NVO are not necessarily optimal for activities outside the NVO
  - standard solutions reduce costs, but do not provide competitive advantages
- ⇒ Standardization is a good method of integration **tightly coupled NVOs**



# Intermediation

- ⇒ Intermediation is a good method of integration for **loosely coupled** organizations
- ⇒ Intermediation **conserves autonomy** of a partner unit and permits to **gain competitive advantages** following from its non-standard solutions



# Intermediation by software agents

**Software agent** is an autonomous program that independently performs given tasks at a given place and a given time according to the pre-programmed orders of its owner

⇒ In case of intermediation within an NVO, a software agent **observes** data of the partner unit, which reflect the current status of its business processes, and **reports** to the NVO management system all **interesting events**



# Flexibility of agents

- ⇒ Every partner unit may have a **different software system** and **different data**
- ⇒ For every partner unit an **“interesting event”** means something different
- ⇒ What is interesting, what is not, may be easily **redefined** in real time
- ⇒ Every interesting event may happen in an **arbitrary** moment



# Integrative NVO portal at the organization level

Portal responds to the question: How to integrate?

- ⇒ Description of the NVO **workflow**
- ⇒ Description of **objects** of integration:
  - data
  - software systems
  - business processes
- ⇒ Description of **methods** of integration
- ⇒ Description of **middleware standards**
- ⇒ Description of **software agents**
- ⇒ Description of **tools** of integration
- ⇒ Integration cost **evaluators**
- ⇒ Description of the **testbed**



# **Integration at the virtual team level**



# Virtual team

- ⇒ An NVO requires a **virtual team** of representatives of partner units who mutually **cooperate** via network to achieve NVO goals
- ⇒ A role of the Integrative NVO Portal is to **transform** a set of representatives into a virtual team providing them with appropriate **information**, **knowledge**, and **cooperation tools**
- ⇒ Cooperation tools are mostly the same as in the case of a collocated teams:
  - **Project** management tools
  - **Time** management tools
  - **Document** management tools
  - **Change** management tools
  - **Access** to NVO databases and knowledgebases
- ⇒ Difficulties come from the fact that partner units are by definition heterogeneous to achieve complementarities:
  - different **organizational** cultures and determining factors
  - often different **national** cultures and determining factors



# Two main problems

- ⇒ **Spread of tacit knowledge**
- ⇒ **Lack of direct communication**



# Role of knowledge

- ⇒ Ultimate goal of a virtual team is **common understanding** of arising problems by virtual team members to cooperatively provide them with **right solutions**
- ⇒ To correctly **interpret information** (about problems, opportunities and solutions) **knowledge** is required
- ⇒ Knowledge is divided into:
  - **explicit** knowledge (codified)
  - **tacit** knowledge (uncodified)



# Explicit knowledge

⇒ Explicit knowledge may be **learned**

- self-learned
- taught

**A role of an NVO Integrative Portal  
is to provide tools for  
e-learning of explicit knowledge  
and inserting right contents**



# Tacit knowledge

- ⇒ **Tacit knowledge** is acquired mostly by **experience**
- ⇒ In case of multiprofessional and multinational teams, tacit knowledge is **not common**
- ⇒ This means that the same information message may be **differently interpreted** by different team members depending on their tacit knowledge, which potentially leads to **misunderstanding** and **errors**

**A role of an NVO Integrative Portal is to provide tools for tacit knowledge transformation into explicit knowledge**



## Goals of knowledge management at the NVO Integrative Portal

- ⇒ Creation of common **organizational culture**
- ⇒ Creation of understanding of different **national cultures** and determining factors
- ⇒ Stimulation of **knowledge sharing**
- ⇒ Integration of **knowledge sharing** with **e-learning**
- ⇒ **Measurement** of knowledge level within a virtual team:
  - **tests** of explicit knowledge
  - ability of **problem solving** as a measure of tacit knowledge



# **Communications within a virtual team**



# Comparison of communications as the basis of collaboration

## face-to-face

- ⇒ Communication is **multimedia** and **multichannel** – verbal and nonverbal
- ⇒ 70% of information is transferred via **nonverbal** channels
- ⇒ Communication is **synchronous**
- ⇒ Communication is **duplex** (simultaneous transmission of information to/from both parties) via channels of different nature
- ⇒ Synchronous, nonverbal information **guides the course** of conversation (information exchange) improving mutual understanding, i.e., efficiency of communication

**efficient**

## remote

- ⇒ Communication is mostly **mono-media** (text, voice)
- ⇒ **Nonverbal** information is either not transferred or very limited
- ⇒ Communication is mostly **asynchronous**
- ⇒ Communication is **simplex** (interleaving messages to and from parties) mostly via one channel
- ⇒ Reaching mutual understanding is **difficult**, especially in complex problems

**less efficient,  
but unavoidable**



# Team collaboration

## In case of collocated teams:

- ⇒ **Tight collaboration** requires **loose coordination** (**moderation**)
- face-to-face: one-to-one, and **many**-to-many meetings (synchronicity)
  - efficient, multichannel communication
  - high level of mutual understanding (not necessarily agreement)
  - high probability to achieve productive results

## In case of virtual teams:

- ⇒ **Loose collaboration** requires **tight coordination** (**stimulation**)
- communication mostly by text (asynchronicity) complemented by voice
  - one-to-one, and **one**-to-many communications
  - observation rather than participation in remote conversations
  - often low level of mutual understanding
  - agreement without understanding
  - high probability of errors following from misunderstanding, and lack of tacit knowledge (wrong assumptions leading to wrong conclusions)



# Management of dynamic groups

- ⇒ A virtual team is **not monolithic**
- ⇒ Collaboration within a virtual team is **dispersed** among formal and informal **groups**
- ⇒ Groups are **dynamic**:
  - creating
  - expanding
  - dividing
  - merging
  - shrinking
  - disappearing
- ⇒ A challenge is remote **management of dynamic groups** within virtual teams



## Particular role of the NVO Integrative Portal with respect to virtual team management

- ⇒ **Collaboration stimulation**
  - shy people do not necessarily have less valuable ideas
- ⇒ **Building common organizational culture**
  - valuation of right behavior
- ⇒ **Facilitating experience sharing as a way to share tacit knowledge**
  - expression of tacit assumptions as a part of tacit knowledge
- ⇒ **Achievement of common understanding**
  - common understanding is different from agreement
  - explicit confirmation as a substitute of unavailable body language
  - the best way to confirm understanding is to say what to do
- ⇒ **Conflict management**
  - human mediation
- ⇒ **Providing a channel for non-orthodox ideas as a source of innovation**
  - “coffee machine” relationships



# Conclusions

- ⇒ NVO is a **right answer** to challenges of **globalized**, **diversified**, and **dynamic** economy
- ⇒ NVO needs more than **e-trade** and **outsourcing**, namely, it needs **e-collaboration** and **out-tasking**
- ⇒ Right tools to **integrate management systems** are available:
  - **middleware**, also: web services, service oriented architecture
  - **agents**
- ⇒ Right tools to **communicate** within **virtual teams** are available:
  - email
  - VoIP
  - communicators
  - teleconferencing
  - chats
  - videoconferencing
  - forums
  - wikis
  - RSS
  - blogs



# Conclusions

**A challenge is to develop  
a culture of e-collaboration  
in culturally diversified world**



**Thank you**

**Wojciech Cellary**