

## Tutorial at ICEGOV 2007

### Knowledge Management (KM)

Maria A. Wimmer      Roland Traunmüller  
wimmer@uni-koblenz.de    traunm@iwv.jku.at



## Agenda

- **Setting the scenery: KM in the public sector**
- KM activities
- KM system requirements
- Specificities for KM in eParticipation

## Some driving thoughts for the tutorial on KM

- To rearrange large volumes of data and information to locate and manage the residing knowledge, a good understanding from different perspectives is required
  - Go beyond the technical view when developing ICT support for KM
  - Change the perception of knowledge as some kind of information net enriched with some contextual information
  - Perceive the knowledge around us, embodied in tools and artifacts
  - Make benefit of using that knowledge!

10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

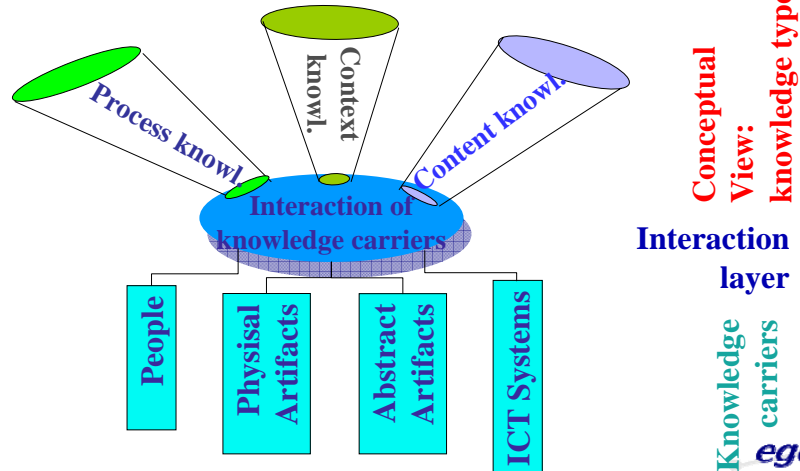
## Understanding the knowledge asset

- According to Edwards [1988], knowledge is distributed among many components belonging to a productive system
- Knowledge to be perceived as a basic resource
  - no matter of its physical shape or abstract form
- In performing any process, knowledge flows among components and objects belonging to that process
  - Such components may be among others:
    - ICT
    - process and workflow descriptions
    - physical artifacts such as manuals or signs, and
    - - most important – humans with their skills, know-how and culture

10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

## Concept to knowledge identification in Government



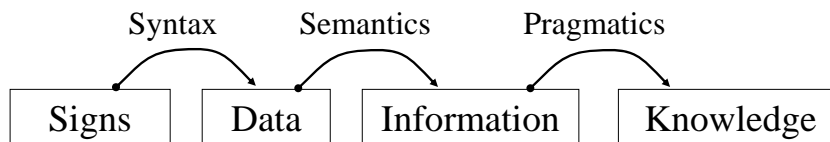
10th December 2007

Tutorial KM in the public sector - I V 2007  
© M. Wimmer, R. Traunmüller

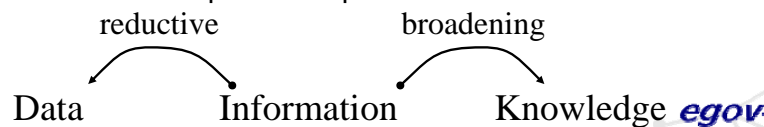
5

## Distinction among information and knowledge (1/2)

- Systems Theory: higher order terms are defined through lower order ones



- Information as the pivot of explanation



10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

6

## Distinction among information and knowledge: (2/2)

Notion	Level	Transformations between Levels
knowledge	humans, culture & society	<i>interpret, understand in context</i>
information	communication between groups	<i>Spread, exchange</i>
data	technology	<i>encode, decode</i>
signs		

10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

## Tutorial problem scope: Challenges of today's expectations (1/2)

- With the hype of the information society, a precarious factor arose:
  - ICT is supposed to solve nearly every problem
- Yet, ICT is developed by people and is shaped by the knowledge the developer embodied there
  - negligence that knowledge dynamically changes in an ever evolving society
    - Individuals adapt quickly to changing requirements through intellectual capabilities
  - ICT cannot migrate and develop on its own
    - maintained by humans

10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

## Tutorial problem scope: Challenges of today's expectations (2/2)

- Methods, concepts, tools and technologies of knowledge management required to
  - Continuously elaborate knowledge
  - Make knowledge accessible from everywhere
- Bear in mind that the explicit form of knowledge is not the only one to be dealt with

## Motivation for KM in the public sector

- Public sector deals with information and knowledge resources by large
- Government activities and results are by nature of information and knowledge
- Urgent request to properly understand the needs, the processes and the success factors for knowledge management

## Some expectations and opportunities of KM in government

- Providing proper information for planning and achieving better decisions
- Better information and services for citizens
- Civil servants empowered to improved work
- Surmounting organizational boundaries of public agencies
- Tailor-made service delivery for citizens or companies
- Citizen feedback as part of quality-oriented policies
- Measurable effectiveness and quality of public interventions
- Stakeholder participation in democratic processes

10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

11

## Questions of KM in the public sector

- What kind of knowledge and information are we treating in the public sector?
  - Especially in eGovernment and in eParticipation
- What purposes and rationale lay behind investigations and activities of eGovernment and eParticipation?
  - What implications do these have for effective KM in the public sector?
- Which tools and technologies of data and knowledge engineering can support Government and public sector actors?

10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

12

## The cosmos of knowledge types and repositories (1/4)

- First perspective: A coarse distinction in clusters
  - Registers
  - Legal databases
  - Management information

## The cosmos of knowledge types and repositories (2/4)

- Second perspective: A view on the layers of Government
  - Governance as strategic-political layer
  - Administrative bodies as tactical layer
  - Agencies as executive layer

## The cosmos of knowledge types and repositories in the public sector (3/4)

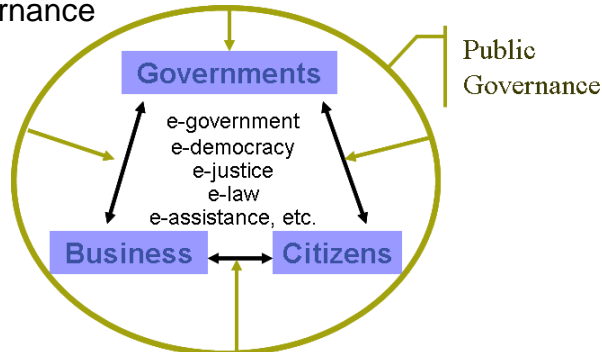
- Third perspective: a closer view on administrative action; Manifold types of knowledge
  - Knowledge about the policy field to be influenced
  - Knowledge about the respective context / environment
  - Knowledge on the own means and modalities of action
  - Knowledge on legal regulations
  - Knowledge on the effectiveness of various measures and about the evaluated effects of previous actions

## The cosmos of knowledge types and repositories in the public sector (4/4)

- Third perspective: a closer view on administrative action; Manifold types of knowledge
  - Knowledge how to protect basic citizen rights
  - Knowledge about standards
  - Knowledge about attitudes of stakeholders and other political conditions
  - Knowledge about one's own capabilities to act
  - Etc.

## Government and public governance need KM

- Knowledge as element key in Government and Governance

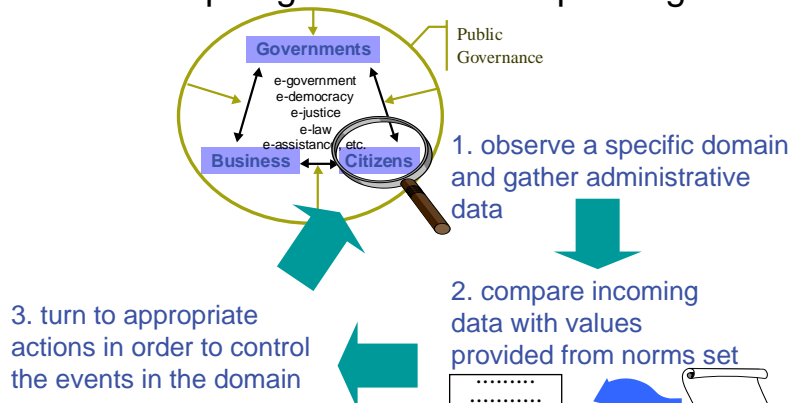


10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

17 egov-  
network

## Control loop in government and public governance



10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

18 egov-  
network

## Overall goals of KM in the public sector (1/2)

- Managing information and knowledge distributed within and outside Government settings
- Supporting Government activities by a lifecycle of knowledge production, integration and validation
- Organized transfer of know-how, skills and expertise in a proactive way
- KM as an ongoing and adaptive interaction with the instrument of a knowledge base

## Overall goals of KM in the public sector (2/2)

- Establishing an organizational memory with the support of
  - technical means (Knowledge Management Systems - KMS) to integrate diverse concepts and tools and to support the overall KM methodology
- Learning community / network of proactive and skilled stakeholders in
  - eGovernment, tGovernment, iGovernment
  - eParticipation
  - eGovernance, good governance
  - Mobile and ubiquitous Government

## Challenges of KM in the public sector

- Governments not mentally thinking of KM
  - Many administrators are not conscious that in their agencies respectable and extensive riches of knowledge – a real bounty of worth and benefit - is hoarded
  - Public servants do not see themselves as knowledge workers
  - Public servants have little concern for knowledge as an asset
- Not many public servants evaluate "their knowledge" in financial terms
- Others see themselves not responsible for that issue

## Agenda

- Setting the scenery: KM in the public sector
- KM activities
  - Cycle of KM activities & management process
  - KM repository / corporate memory
  - Visualizing knowledge
  - Managing processes
- KM system requirements
- Specificities for KM in eParticipation

## KM activities (1/4)

- Knowledge indexing and structuring
  - Knowledge in registers, databases, on the web, in wikis, in ontologies, knowledge portfolios, knowledge maps, etc.
- Knowledge search and retrieval
  - Search mechanisms, text mining, etc.
- Knowledge analysis
  - KDD, data mining, olap,

## KM activities (2/4)

- Knowledge creation and elaboration
  - Knowledge formulation, argumentation, externalization in discussions, debates, etc.
  - Case-based reasoning
- Knowledge dissemination, sharing and exchange
  - Knowledge delivery
  - Integration of knowledge sources in eParticipation processes

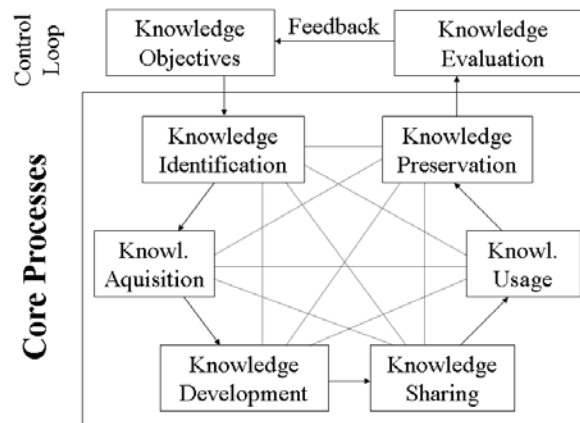
## KM activities (3/4)

- Knowledge visualization
  - Mental models of knowledge
  - Text, graphical, audio, video, etc. representations
  - content visualization in tools, etc.
- Knowledge storage
  - Databases, files
  - Repositories

## KM activities (4/4)

- Evaluation and assessment of knowledge assets
  - Value of knowledge per se
  - Value for whom
  - Validity of knowledge
  - Actuality of knowledge
  - Etc.
- Management of knowledge assets
- Advanced autonomous knowledge (intelligent) agents

## The knowledge processes [Probst et al, 2003]



10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

egov-  
network

## Technical support for KM

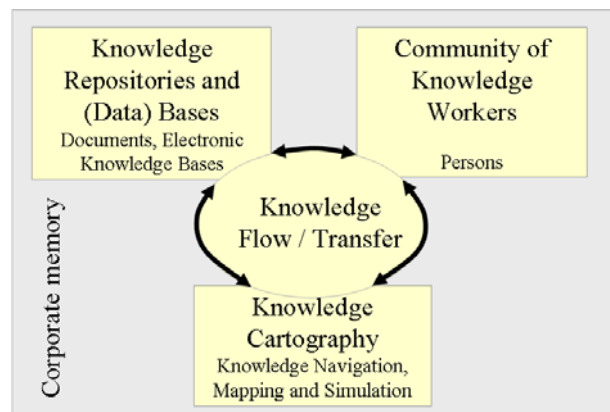
- Establishing knowledge repositories
  - KM as an ongoing and adaptive interaction with the instrument of a knowledge base
  - Organized transfer of knowledge, skills and expertise in a proactive way
- Technical means to support knowledge processes
  - Knowledge Management Systems
  - Integration of knowledge engineering tools and technologies

10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

egov-  
network

## Key elements of a comprehensive knowledge base



10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

29 egov-  
network 

## Needs for comprehensible visualization of knowledge

- Visualization runs in a familiar environment, e.g. in a standard web-browser
- Functionality does not overshadow usability
- The user is guided through the whole process

“Don’t make me think!”

Steve Krug

- Consider cognitive psychology
- Self-evident or at least self explaining

10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

30 egov-  
network 

## Requirements for effective visualization of knowledge

- A useful representation
  - Usable for all groups
  - Simple navigation
  - Effective search mechanism
  - Powerful visualization

10th December 2007

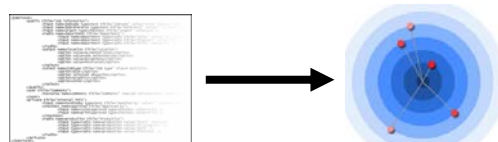
Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

31 egov-  
network 

## Example: ontology visualization

- Perceive huge amounts of information
- Search for information
- Browse and navigate through information

A graphical representation is essential for a fast and simple perception of knowledge



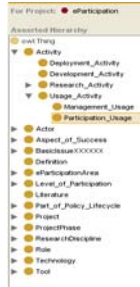
10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

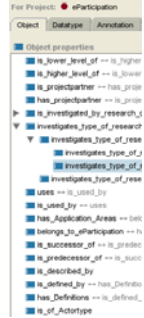
32 egov-  
network 

## Example: present visualization of ontologies (1/2)

### Class Hierarchy



### Relations



### Directed Graph



“Protégé is a an ontology editor [...] which allows domain experts to build knowledge-based systems “

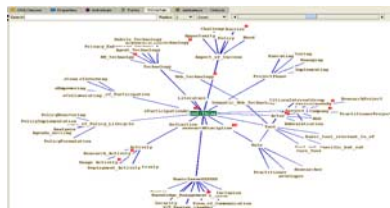
10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traummüller

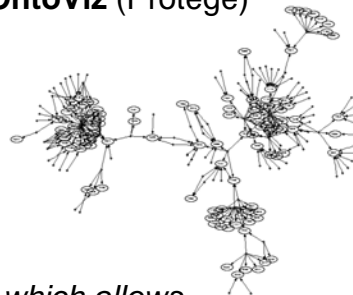
egov-  
network 

## Example: present visualization of ontologies (2/2)

### TGVizTab (Protégé)



### OntoViz (Protégé)



“Protégé is a an ontology editor [...] which allows domain experts to build knowledge-based systems“

Jambalaya introductory page

10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traummüller

egov-  
network 

## Problems with present visualization of ontologies

- Visualizations are generally used by developers
  - Specialized software needed
  - Mostly as part of ontology modelling software
    - e.g. Protégé with Jambalaya, TGVizTab, OntoViz
  - High functionality for effective modelling
  - Configurable structures and layouts
- No acceptable visualizations for lay people  
→ Not practical with web-based technologies

## Further requirements for knowledge visualization

- Customizable visualization with ideal representation for every target group
- Advanced tools to enable web-based work on knowledge and knowledge structures (e.g. ontologies) for authors and developers
- Enabling additional interfaces beside computers (especially requested in eGovernment and eParticipation contexts)
  - Allow access to groups with special needs / disabilities
  - Mobile use (mobile phone, PDA)
  - Digital TV
  - Kiosk systems (touch screens)

## Agenda

- Setting the scenery: KM in the public sector
- KM activities
- KM system requirements
  - Interdependencies among knowledge and processes
  - KM System feature requirements framework
- Specificities for KM in eParticipation

## The knowledge part in administrative processes (1/3)

- Interweaving knowledge and processes
  - Hard-to-define relationship between law, facts of the case, knowledge about law & facts, and decision-making
- The dynamics of legal knowledge

## The knowledge part in administrative processes (2/3)

- Categories of administrative processes
  - Recurrent and well-structured processes (somehow routine-processes)
  - Processes with decision-making on individual cases
  - Negotiation and advice processes
  - Weakly structured processes in the field of policy-making including democratic deliberation

## The knowledge part in administrative processes (3/3)

Process type	Issues in Information and Knowledge Management
<i>Routine processes</i>	<i>Knowledge from interaction and citizen information</i>
<i>Individualized decision making</i>	<i>Knowledge of law and “process memory”</i>
<i>Negotiations</i>	<i>Knowledge-enhancing platforms for group decision-making</i>
<i>Democratic deliberation</i>	<i>Basic civic information / structuring debates</i>

## Interdependencies processes - regulations - knowledge (1/2)

- Processes are shaped by legal rules
- External structuring of the flow is derived from the legal regulations
- Forms intertwine processes and data
- Material contents of the legal norms may determine the flow leading to open processes and to the creation of a "process memory"
- Data privacy or transparency may influence the workflow

## Interdependencies processes - regulations - knowledge (2/2)

- Workflows limit discretion rooms in multiple ways
  - Giving categories, declaring default variables, encircling indefinite law terms
- Former decisions influence later ones
- Consensual procedures request high collaboration
  - Convergence of opinions through internal discussions of the civil servants

## A KMS framework applied to public administration

- KM Systems framework based on [ICONS Project]
  - Domain ontology
  - Content repositories
  - Knowledge dissemination
  - Content integration
  - Actor collaboration
- Applications for explanation
  - App 1: decision making centred on individualised case processing
  - App 2: policy formulation

10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

## Common requirements on domain ontologies (1/2)

- Define sizeable, formalised ontologies
  - Most needed features are taxonomies, semantic nets and semantic data models
  - Life-event metaphor as a promising ontology concept
  - Life events and processes with multiple relationships
  - Processes crossing administrative boundaries
- Install commitment towards standards to overcome problems such as
  - fragmentation of administration, competing claims on resources with high priority, intrinsic difficulties of the domain in question

10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

## Common requirements on domain ontologies (2/2)

- Overcoming intricacy and complexity of law to adequately defining legal terms and finding reasonable trade-offs on
  - Vagueness that may be on purpose
  - Genuine inconsistencies and fuzziness
  - Dynamics in law
  - Planned discretionary power of street level bureaucrats etc.
- Inhibiting difficulties: profound differences in legal systems, adequate meaning of terms

## Ontology requirements from particular applications (1/3)

- App 1: supporting internal and external data exchange
  - Formalise legal domain ontologies
  - Detailing taxonomies (esp. for KMS)
  - Taxonomies for information gathering
- App 2: Policy Formulation
  - Urgent need for ontologies facilitating information gathering
    - Both, factual information as well as "deontic" information are necessary. Especially the latter one is crucial and manifold: norms, prior decisions, binding expectations etc.
  - Taxonomies for documentation

## Ontology requirements from particular applications (2/3)

- App 3: Citizen information calls for proper ontologies
  - Automatically routing of citizen demands to relevant knowledge repositories or to the agency with competencies
    - E.g. a plain data base, a sophisticated piece of software, a staffed service centre (e.g. a call centre) or an official in a particular agency
  - Adding online comprehension, where conflicting demands are resolved
    - a) citizen's requests commonly posed in a rather urgent situation
    - b) need for an in-depth explanation in an unambiguous way
    - c) limited explanatory capabilities of the system

## Ontology requirements from particular applications (3/3)

- App 3: Citizen information calls for proper ontologies
  - Providing basic support for static and dynamic help
    - Instruments for dynamic help are software agents or human mediators
    - Thorough editing, comments and illustrations of cases for static support
  - Continuous improvements for interaction
    - Improving comments, scenarios, help-functions, knowledge incorporation

## Requirements on Content Repositories

- Enabling the exchange of data between diverse administrative bodies (e.g. EDI as most renowned pioneer)
- Innovative exchange features such as XML, LeXML and RDF to build standards for rather complex structured concepts
- Organisational Learning supported with knowledge repositories to assist in knowledge intensive work

## Content repository requirements from Particular Applications (1/2)

- App 1: Decision making in individual cases
  - Connecting administrative data
  - Content repositories based on commonly agreed standardisation frameworks and ontologies: eGIF, IDA, RDF, XML, GovML, etc.
  - Version controls to trace all alterations of a document and guarantee legal validity

## Content repository requirements from particular applications (2/2)

- App 2: Policy making
  - Provide repositories filled by internal processes: There is a pure occupation of an organisation with their own internal business and often this is a legitimate objective.
  - Provide repositories filled by incomplete processes: Many observing and information-gathering activities take place without producing tangible results. Although never used directly for action they may contribute to organisational learning within an agency.

## Requirements on knowledge dissemination

- Knowledge dissemination calls for diverse options
  - Push- and pull-approaches
  - Choice of the access channel, which suits best
  - Diverse organisational forms and physical settings of demand (office, kiosk, home)
  - Balance of human and software mediators and knowledge bearers
  - Routing of offer/demand according to administrative competencies
- App 1: Decision making in case processing
  - Advanced retrieval systems based on cases and adequate ontologies

## Requirements on content integration (1/2)

- Common requests
  - Provide interoperability between heterogeneous data sources
  - A comprehensive integration is needed with a systemic view

## Requirements on content integration (2/2)

- App 1: Example is the life situation of civil marriage
  - Providing integrated information on the initiation by citizens, proof of legal grounds, proclamation, etc. on the civil marriage
  - Integrating a variety of transactions, dislocated documents, repositories and related services (e.g. change of name or address)
  - Making the application case available beyond national borders
- App 2: Policy formulation
  - Providing knowledge portals and unique browsers
  - Integrating different types of knowledge

## Requirements on actor collaboration (1/2)

- Blending different modes of cooperation
  - Smooth transition between structured cooperation and informal collaboration supported with auxiliary functions such as filtering, calendaring, etc.
  - Conformity with usability criteria

## Requirements on actor collaboration (2/2)

- App 1: Decision making in individual cases
  - Enabling informal collaboration
- App 2: Policy formulation
  - Support the unpredictable amount of negotiations
  - Support for meetings

## Agenda

- Setting the scenery: KM in the public sector
- KM activities
- KM feature requirements
- Specificities for KM in eParticipation
  - Motivation
  - Group discussions

## Motivation (1/4)

- Increased importance of ICT
  - in political participation in the Internet age and
  - in broadening and deepening citizen participation in the political decision-making process
- Participation of citizens in the political decision-making process requires access to information
  - citizens must be able to acquire the knowledge and information about governance needed to make informed choices

## Motivation (2/4)

- Sheer availability of documents is not synonym of accessibility
  - citizens need to comprehend and easily retrieve them
- Knowledge and semantic technologies are key enabling technologies for making explicit the information implicitly contained in documents

## Motivation (3/4)

- Transforming textual data into knowledge requires
  - the definition of ontologies as shareable structures for knowledge organization;
  - the possibility of semi-automatically populating and updating these ontologies with data coming from textual documents;
  - automated techniques for semantically marking-up documents

## Motivation (3/4)

- Role of R&D in
  - linking between ontologies and general lexicons
  - automatic or semi-automatic ontology learning and population
  - semantic interpretation of linguistic content, etc.

## The BIG question: does eParticipation need KM?

- Group discussions:
  - Group 1: What is the “knowledge” to be managed in eParticipation?
  - Group 2: Is KM mature enough in other domains to show its usefulness in eParticipation; and what features can be taken up, which ones won't work?
  - Group 3: Are there sufficient difficulties in eParticipation which call for KM techniques? If so, which KM techniques are needed?
  - Group 4: What are the implications, the challenges, the investments to be taken and the benefits (for whom) of KM in eParticipation?

## Presentations of results from group discussions

- Group 1
- Group 2
- Group 3
- Group 4

10th December 2007

Tutorial KM in the public sector - ICEGOV 2007  
© M. Wimmer, R. Traunmüller

Many thanks for your attention and most  
valuable contributions !

Your questions ...



wimmer@uni-koblenz.de  
<http://www.uni-koblenz.de/agvinf>