Feature Requirements for KM in Public Administration

Roland Traunmüller and Maria Wimmer

Institute of Applied Computer Science, University of Linz, Austria
{traunm, mw}@ifs.uni-linz.ac.at

Abstract: The information society develops a novel and comprehensive vision of governance with knowledge as core part. For building KMS a mere transferring of concepts from the private sector to the public area will not suffice; approaches of their own are necessary. For this purpose, Public Administration in general as well as in typical applications is juxtaposed with main features of KMS. Focal question is how features of KMS technology can meet requests derived from administrative work. The outcome is a remarkable picture; it shows bright options and possibilities as well as shortfalls and indications for further development.

1. Knowledge as Prime Force in Public Administration

With the emergence of the information society, establishing an integrative approach to governance is of paramount importance. So it surpasses isolated solutions such as internet portals for citizen, moreover the proclamation is an unreserved claim for a profound rethinking of administrative work. In such a novel concept of governance the role of knowledge becomes dominant and is expressed in metaphors: defining administrative action as “knowledge work” is one statement, regarding public authorities as “knowledge networks” is another. Especially the idea of a network is demanding: it is more than claiming demand for information; moreover the idea of a network suggests a qualitative increase and intensification of relevant knowledge. So building a modern administration with novel patterns of co-operation is tantamount to changing the distribution of knowledge. Redistribution of knowledge must be designed and orchestrated carefully, and so managing knowledge becomes a major responsibility for officials. Boiling this down to leads to the concept “knowledge enhanced Government”. Without a doubt, prospects for KM in Public Administration are remarkable from the point of demand: nearly all administrative tasks are informational in nature, decision making is an officials daily bread, and for any agency its particular domain knowledge is an asset of key importance. In this contribution we treat a main question of introducing KM to Public Administration: how can main features of KMS meet the typical requests of administrative work.
2. Introducing KM

Introducing KM to the governmental domain is high on the agenda. First strategy that comes in mind is to rely upon proven concepts and systems which have been developed in the commercial sector. Yet, past experiences have shown that a plain replication from the private sector to the public one is questionable. Often in a simple transfer considerable hindrances have become apparent. A striking example has been given with the introduction of workflow management systems. Experiences drawn are clear: conceiving agencies as some sort of production plant transforming inputs into outputs has missed decisive aspects of administrative work; administrative processes differ significantly from most processes in the industrial and commercial area [3]. Hence, a strategy relying on a mere replicating concepts from the commercial sector is questionable. There are several inherent reasons - all closely connected with specific traits of administrative work. They are discussed in detail in the literature [1] [4], so here purely some demarcations are outlined in a brief way:

- The extraordinarily complex goal structure of Public Administration distinguishes the public sector from private business.
- Legal norms are a standard vehicle of communication between central authorities and executive agencies. Generally, public administrations are highly regulated by legislation which is enacted on several levels (supranational, national, regional, local).
- Neither the procedural nor the material law can fully determine outcomes – legal interpretation, deliberation and consensus building are crucial. Thus developing consensus and enter into negotiations are important modes of action.
- Legal norms give particular meaning to administrative structures. Examples are plentiful such as protecting the rights of citizens or safeguarding legal validity.
- Public Administration works via a complex tissue of cooperation of acting entities. For these reasons, replicating concepts and systems of the commercial domain can only be a part for a strategy that brings KM to Public Administration. Moreover, it has to be supplemented effectively by a second line of action: thoroughly regarding administrative work as knowledge work and subsequently deriving particular feature requirements. Only so, the genuine requests will be met.

3. Focal Point: The Knowledge Factor in Administrative Work

Administrative Work is knowledge work and officials are knowledge workers par excellence. After a decade that was preoccupied with processes a contrasting view has taken over. No more is reengineering towards low costs/skills the objective. Quite the opposite has become the motto: fostering and cultivating expertise. A new conviction begins to spread: work in agencies is expert work and depends on knowledge available there. Max Weber, one of the founding fathers of administrative science, addressed such knowledge in his notion of “Dienstwissen” – a term which we would call service knowledge or domain knowledge at the present time. This type of knowledge is a hard-to-define blend of different kinds of knowledge [9]:

- Knowledge about the policy field to be influenced
Feature Requirements for KM in Public Administration

- Knowledge about the evaluated effects of previous actions
- Knowledge about legal rules, standards, political attitudes of stakeholders and other political conditions commanding and constraining action
- Knowledge about one's own capabilities to act.

Such new directions mark considerable progress as they shift focus away from a discussion on structures and processes towards issues of content – so reaching the very heart of administrative work: taking decisions. In some aspect, this regained focus on decisions is going back to roots. It connects to cybernetic thinking which in the Sixties has been widely used for explaining control in the governmental realm [7].

4. Elaborating the KMS Framework for Public Administration

In an earlier investigation, we have treated administrative work as knowledge work as well as the sophisticated intertwining of process, legal norms and administrative domain knowledge in detail [6]. This contribution now goes one step further and confronts administrative knowledge work with the features offered by KMS. In concrete, the proposal on KMS features requirements established by [2] is used for this comparison. Hence the further discussion pursues the following division:

- Domain ontology
- Content repositories
- Knowledge dissemination
- Content integration
- Actor collaboration
- Security.

Above schema will be juxtaposed with administrative work considering both: administration requirements in common and three examples of specific applications. Administrative work in common has been discussed in depth in literature (e.g. [4] [5] [8]); here we only sketch those applications used for explanation in the later sections:

1. Application 1: Decision Making Centred on Individual Cases: For many officials it is the principal work activity consuming a large amount of their office time. Individualised case processing takes into consideration the particular circumstances of a situation and there are manifold cases in point: child allowances, tax cases, building permits etc. In praxis borders blurry: the same case that is routine for person A, for person B may become complex on special factual or legal grounds. Additional, interaction with stakeholders is often not foreseeable in detail at the beginning. To bring it to the point: there is a basic distinction between recursive production processes and complex decision processes. For later ones at the date of the initiation of the process the later stage cannot be anticipated, neither in its actual course nor in its accumulated complexity, getting advice from further experts or involving additional agencies may become necessary.

2. Application 2: Policy Formulation: Preparing processes of policy formulation is important for legislative and administrative work. Examples are bills of parliament, answers responding to parliamentary inquiries or complex political decisions. Also in the higher echelons of administrations cooperative decision processes are a
common way of work. Policy making and its complex processes represent a case of weakly-structured processing with quite unique constraints.

3. Application 3: Citizen Information: Citizen information is a core part of an integrated service access management as envisaged in online one-stop Government. As organisational mode several forms are possible: kiosks, municipal neighbourhood one-stop offices, multifunctional service offices as well as home and mobile access. Many particular functions are included such as: citizen information at various stages, choice of the favoured access channel, aid for filling in forms, matching of the citizen's demand with the administrative structure, invoking human mediators for help etc.

Having outlined the examples, attention is directed toward the KMS features starting with the prime component – domain ontology.

5. Domain Ontology

Administration Requirements in Common: For domain ontology a rich kit of methods for knowledge representation exists as listed in [2]: taxonomies, semantic nets, semantic data models, hyper links, knowledge based reasoning, time models and process graphs. Here we will raise the basic question of advantages and obstacles.

− Sizeable formalised ontologies are scarce: Regarding Public Administration, most needed features are taxonomies, semantic nets and semantic data models. In a concrete project¹ we have handled the task of modelling a sizeable ontology for the complex “life events and associated administrative processes”. Such a highly formalised description has become necessary - as request out of an international project whose software has to run in several countries. Modelling in an accurate way has further advantages as the domain under consideration is difficult: live events and processes have multiple relationships and in addition the processes have to cross various administrative boundaries. A lesson learnt is that the effort in modelling has been rather high. This experience leads to a core concern: administrative work in general lacks such precise descriptions. Being short of formalised ontologies is a key imperfection in present systems and causes multiple consequences.

− Lack of commitment: An obstacle is that - in contrast to e-Commerce where efforts have brought to bear ebXML² - Public Administration shows less commitment. Reasons are many: fragmentation of administration, competing claims on resources with high priority, intrinsic difficulties of the domain in question.

− Intrinsic features: Intricacy and complexity of law itself is one reason. So troubles start on the basis with legal terms themselves that all too often are not adequately defined. This is due to several reasons: vagueness that may be on purpose, genuine inconsistencies and fuzziness, dynamics in law, planned discretionary power of street level bureaucrats etc. Further, mapping administrative semantics is full of

¹ eGOV (an integrated platform for realizing online one-stop government), IST-2001-28471, http://www.egovproject.org/
² http://www.ebxml.org/
more or less inhibiting difficulties: profound differences in legal systems, adequate meaning of terms, different connotations of terms and non-existence of counterparts.

Application 1: Decision Making Centred on Individual Cases: This application depends heavily on internal and external data exchange. In reality this means using workflow and EDI as tools. Therefore domain ontologies are central:

− Formalised legal domain ontologies: Although this is an urgent request, scarcely work on such elaborate models can be found. Often rather coarse taxonomies and makeshift classifications are used deducted from the everyday work of users.

− Taxonomies need detailing: Sharpening is urgent as coarse classifications – although often used and sufficing for certain applications - are inadequate as requirement for KMS. Just to give an example, for running workflow a coarse grouping may do: distinguishing information objects whether they belong to the case and to the process (one class describing all the facts pertaining to a particular case, the other guiding the administrative process). Yet turning from workflow to KMS a more detailed distinctions becomes mandatory.

− Taxonomies for information gathering: Taking decisions means including all available information in the decision process that makes information gathering crucial. Aspects are described subsequently at multiple occasions: aspects of policy information in section 5; usage of internal memories in section 6; ways of legal information retrieval in section 7; knowledge portals in section 8.

Application 2: Policy Formulation: Turning towards planning the need for ontologies is apparent as well:

− Information gathering: For policy formulation the realm for information search and investigation is rather unlimited; collecting all relevant information might include exhaustive seeking for information sources. Collecting expertise and preparing information for decisions is a tough part: gathering as well internal and external information, furthermore both factual information as well as “deontic” information. Especially the latter one is crucial and manifold: norms, prior decisions, binding expectations etc.

− Taxonomies for documentation: For documenting negotiations and decisions is a small example is given concerning the legal status of the documents. References of legal relevance have to be marked in an unmistakable way: authorized status of minutes, binding character of decisions, liability of the decision body etc.

Application 3: Citizen Information: Following examples may give an idea about the need for a proper ontology:

− Automatically routing of citizen demands: The goal is an automatically routing either to relevant knowledge repositories or to the agency with competencies in the legal sense. The concrete target may be diverse: 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. Nowadays this is done in comparing key words, yet mapping requests by means of domain ontologies is preferential.

− Adding comprehension: Taxonomies must be “palatable” for citizens. There is no much use providing information on the web just in an exclusively administrative-legal wording. Web-design has to resolve conflicting demands: a) citizen’s requests commonly posed in a rather urgent situation, b) the need for an in-depth
6 Roland Traunmüller and Maria Wimmer

explanation in an unambiguous way, c) and the limited explanatory capabilities of the system.

- A basis for static and dynamic help: Support can be both, static and dynamic, yet an underlying ontology is needed anyway. Instruments for dynamic help are software agents or human mediators (discussed in section 7). A static support means thoroughly editing, commenting and illustrating the taxonomy in question.

- Continuous improvements for interaction: Perfection starts with small steps, so with working on better comments, drawing clearer scenarios, adding better help-functions. Considerable steps concern incorporating knowledge into software. Final developments will comprise intelligent multi-lingual and multi-cultural personal assistants being integrated in electronic public services portals.

6. Content Repositories

Administration Requirements in Common: As to content repositories quite a lot of KMS features aim at one goal - enabling the exchange of data between diverse administrative bodies. Here we consider two topics, data interchange features and the inclusion of internal repositories, and start with the former ones:

- EDI: Evidently, in a cosmos of increasingly fragmented public organisations data exchange between administrative agencies has become the rule. Inter-organisational linkage of content repositories has been a dominant concern since decades. There is a long history with EDI as most renowned pioneer. EDI has enabled smooth computer-to-computer exchange of standardised information items and of transactions.

- XML and RDF: Current interest points at other exchange features such as extensible mark up languages together with resource description facilities. With them it is possible to build standards for rather complex structured concepts.

Organisational learning needs several internal repositories. They act as internal memory and may assist in many decisions:

- Repositories filled by internal processes: Administrations also have to maintain their organisation and for this aim several supportive activities have to be taken. There is a pure occupation of an organisation with their own internal business and often this is a legitimate objective.

- Repositories filled by incomplete processes: Many observing and information-gathering activities take place without producing tangible results. Then observable facts (cf. section 5 with items a and b) go in an internal memory especially when incomplete processes are involved. So many collected pieces of information are valuable; although never used directly for action they may contribute to organisational learning within an agency. Observations gathered by pure chance are a good example and not even a rare one. Such pieces of information should be considered part of a puzzle game with one piece more added.

Application 1: Decision Making Centred on Individual Cases: Here two subjects are considered, interconnection of agencies and documenting the procedural states:

- Connecting administrative data: It is a key topic and is touched in several sections of this contribution. Data involved in a specific administrative decision are
dispersed over many locations, under the competencies of diverse agencies and residing on several systems. As for the central importance the topic has been tackled in several projects. They all aim at diverse aspects of information exchange and include a variety of approaches. The following selection of references may illustrate the diversity: eGIF\(^3\), IDA\(^4\), RDF\(^5\), XML PersonRecord in Austria\(^6\), OSCI initiative in Germany\(^7\).

- **Version control:** There are other vital matters as well. As a key point we present documenting the respective states of an official file during its procedural course. This objective is achieved via strict version control where all alterations of a document can be traced – a prime request for safeguarding legal validity.

### 7. Knowledge Dissemination

**Administration Requirements in Common:** Stating requirements on the general level is difficult: knowledge dissemination in Government is rather intricate and a lot of options and conditions have to be considered. Potential appearances and forms of design are numerous; in addition they are very depended on addressees and framing conditions. Here some parameters are listed that shape a concrete design:

- Tradeoffs between 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/knowledge bearers
- Routing of offer/demand according to administrative competencies
- Intricacies of the subject matters (legal norms and decisions)
- Translation from administrative/legal jargon to everyday world and vice versa.

The following applications 1 and 3 illustrate the dependency on users and circumstances. In the case of decision making the users are administrators and legal retrieval is a pull only situation; for the case of citizen information quite divergent aspects of dissemination come out as relevant: routing, assistance, comprehension etc.

**Application 1: Decision Making Centred on Individual Cases:** Main requests derives from the influence that is exerted by legal reasons on administrative decisions. Yet this demand is not easy to fulfil. Many legal information systems exists, yet the praxis shows little usage. Consequently new ways have to be explored:

- **Requests for advanced retrieval systems:** Poor usage of common retrieval is explicable because present systems are keyword oriented and lack any further elaboration in view of the particular circumstances of the case to be decided. To be frank, at the moment there remains only yearning and hope.

---

\(^3\) [http://www.govtalk.gov.uk/interoperability/draftschema.asp](http://www.govtalk.gov.uk/interoperability/draftschema.asp)

\(^4\) [http://www.ukonline.gov.uk/](http://www.ukonline.gov.uk/)

\(^5\) [http://www.w3.org/RDF](http://www.w3.org/RDF)

\(^6\) [http://www.cio.gv.at/](http://www.cio.gv.at/)

\(^7\) [http://www.osci.de/leitstelle/index.html](http://www.osci.de/leitstelle/index.html)
− Expecting new developments: Actually, one can find developments in the direction for retrieval that is case-oriented and handles analogy. Regrettably such approaches still belong to the scientific realm: case based retrieval, deontic logic, probabilistic measures, neuronal nets.

Application 3: Citizen Information: As stated before in the beginning of this section many options are open. For citizen information quite distinct design will result as treated in detail in [4]. To shorten the discussion, here we will only sketch a vision of an advanced system as to illustrate the ample capabilities:

− A vision as guidance: We envisage a advanced system using multimedia. A citizen may go to mediating persons at the counter of public one-stop-service shops. The mediators will use the system with its diverse repositories. In case the issue is too complex it is possible to invoke further expertise from distant experts via a multimedia link between the service outlet and back-offices: dialogue becomes trialogue. As the accessed expert himself may use knowledge repositories human and machine expertise become totally interwoven – knowledge enhancement at its best.

− Further expansion: Above scenario may be expanded on several sides: the citizen posing ma make contact from the home-site using multimedia; for the routing of demands using software guidance (avatars) is possible; the agency may act in proactive way setting the initial step.

8. Content Integration

Administration Requirements in Common: Regarding content integration two requests are central, coping with the heterogeneity and achieving comprehensiveness.

Heterogeneous data repositories: Content integration means handling a collection of rather heterogeneous data repositories containing data of diverse type format that are originated from different sources. Content integration involves all sorts of conventional ways of keeping data: files, databases, legacy information systems. Efforts for content integration are rather high and minor or major obstacles are common:

− Content integration needs sophisticated content management. A first step is making accessible the diverse data spread over various locations.

− Joining different content may be rather problematic. The semantics of data in a particular application often has been defined long time ago. Now with the Web, data originally used locally have to be used globally.

− Problems accrue in automatic processing (e.g. in data mining), when semantic inconsistencies in data may lead to statistical artefacts causing misinterpretations.

− Another point: With many diverse data types and formats involved rendering information visible is not easy.

Comprehensive integration – a systemic view: An important point is including data from all fields of administrative action. Being well aware of privacy restrains the question points at possibilities in general. For illustrating the wide span to be covered a systemic view on administrative work may serve. Accordingly the six basic stages in executive decision processes are regarded [4]: observation, substantiating facts,
decision to act, administrative intervention, execution for enforcement, evaluation. As the schema appears rather abstract some remarks may be useful:

- Above schema is conceptual and can hide a lot of complexity: e.g. substantiating facts is a stage where in reality the effort going into legal interpretation and negotiation may become massive.

- The actual weight of stages differs with the type of application. So observation and evaluation are mostly essential for policy making - yet rarely significant in decision making in individual cases. In contrary, for decision making in individual cases attention predominantly circles around substantiating facts and intervention.

- The means of administrative actions are a rich collection of various instruments: legal methods comprise norms, directives, permits, obligations; financial measures are impeding (duties and levies) or provide stimuli (allowances and grants).

- In some stages physical-technical actions can occur as well: observation via monitors; intervention by setting up of road-signs; execution in forcible way of tax collection.

The systemic view given here may illustrate both, the span of information sources and the variety of repositories involved. Some aspects are more detailed below.

**Stages, information sources and repositories:** Evidently the connections are plentiful such as to give some examples:

a) *Observation and collecting information:* Obtaining information is a key condition for governance in general such as to observe the behaviour of the society or a group of citizens. So sources are copious and countless diverse repositories are involved for capturing administrative information.

b) *Substantiating facts:* The material gained from such observations is evaluated in the light of legal and policy premises. In this way, by initiative of an agency a “case” is constituted as concrete action. In an alternative way, numerous cases are initiated by citizens themselves: claim for an allowance, request for a building permit, applying for civil marriage. In any case, substantiating and proving facts is a crucial and tough activity. In the course of action numerous dossiers are created and many repositories are involved. Repositories may concern observations (mentioned in a), may compile the data on citizens or may pertain to the internal memory (discussed already in section 6). More on b and c is pondered in application 1 below.

c) *Decision to act:* When enough material is collected and combined with the facts, administrators have to take a decision for action. The decision is documented and become part of the accumulated dossier. Decisions will go into several repositories due to the innate importance of decisions and their multiple consequences. Such repositories and their design have to mirror and balance quite differing aspects: integrity and durability of information; sensibility for privacy protection; decisions as precedence cases; access for organisational learning; freedom of information etc.

d) *Intervention:* Intervening in the fabric of society is the final goal of administrative action. This can be made by legal binding declarations of various form: granting permissions, declaring obligations, setting financial measures etc. For most administrative acts the results of the decision-making process are simply communicated to the addressees. In rare cases the intervention will mean physical action.

e) *Execution for enforcing:* If some addressees do not comply with the orders, an execution of the order may become necessary.
Evaluation: In the last step it has to be checked whether the action taken had the intended effect concerning the influence on the society. Opinion polls, case studies and claims management are examples. The results of this evaluation are collected in particular databases used for improving both, administrative decision-making and the rules guiding it. Here reference is given to section 6 discussing repositories used as internal memory.

Application 1: Decision Making Centred on Individual Cases: This application can be seen as a particular instance for the stages b, c, d. We discuss it for the life situation of civil marriage:

- Instantiation of the systemic view: Regarding above schema and taking civil marriage as example one gets a rather “simple case” that will commonly comprising initiation by citizens, proof of legal grounds, proclamation.

- Variety of transactions and repositories: Yet, it is just the opposite from simple when the view of on-line one stop service is taken. It is essential for one stop service that data are brought together from /disseminate to diverse data sources. This means that for the life situation of civil marriage a lot of transactions and number of repositories are involved. So before the event lots of documents located in different agencies have to be checked; afterwards a lot of updates on documents have to be made (change of name, civil status, common domicile etc.)

- Interstate e-Government: Making the example a little more complicated one may envisage two persons with different citizenship marrying in a third country. In this case the respective transactions cross state borders and so difficulties for on-line one stop service will build up.

Scenario 2: Policy Formulation: Out from several issues we will touch three:

- Knowledge portals: The diversity of knowledge sources, types and containers make the user feel uneasy. Hence, meta-information, the information about information, is needed and best moulded directly into the portal. This leads to the idea of dedicated knowledge portals that guide to the respective contents.

- Joining different types of knowledge: Combining the different forms of knowledge is not easy as hard and soft data have to be joined. For the former ones figures from controlling pose as example, for the later ones opinion polls and estimations.

- Unique browser: Even as it looks to be a mere technical problem it has to be mentioned. One has to ensure that a single browser copes with the multitude of heterogeneous data repositories and different data formats that are involved.

9. Actor Collaboration

Administration Requirements in Common: Actor collaboration features are essential in nearly every administrative scenario. Two basic requests are treated here:

- Blending different modes of cooperation: There is need for a wide spectrum of possibilities, depending whether strictly structured cooperation (workflow) is involved or more informal collaborative modes (message exchange, discussion fora, meeting rooms). A smooth transition between both modes and the inclusion of auxiliary functions such as filtering and calendaring is mandatory.
Feature Requirements for KM in Public Administration

− **Usability:** This is a key word and includes a list of particular requests. Each of them, taken for its own, appears to be rather minute; yet collectively they are important for smooth work. Examples of advanced attributes include: malleability of mechanisms as an adaptability to personal preferences; indicators reminding the basic status (such as what, where, how) when managing subtasks simultaneously; semantic conformity of notational primitives corresponding to the context of usage.

**Application 1: Decision Making Centred on Individual Cases:** The main request is to have phases of strictly structured cooperation (workflow) are interwoven with phases of informal collaboration:

− **Enabling informal collaboration:** A key priority for internal work due to the intention to reach consensual decisions and a tendency to have consistent decisions for similar cases. Also external negotiations with clients needs collaboration.

**Application 2: Policy Formulation:** Key requests emerge from two dominant characteristics:

− **Unpredictable amount of negotiations:** The amount of negotiations necessary, their length, their course, the amount of parties they involve are often not foreseeable. This is because policy formulation normally takes place through multiple processes of negotiation. The negotiated character permeates all phases of the policy process and spans diverse organisational boundaries.

− **Meeting support:** Most important to policymaking activities are meetings. In order to reach adequate support environments, one has to blend conventional decision support with collaborative functions. Support system should have a set of highly-modular components as the particular nature of a task is often not foreseeable.

10. Security

**Administration Requirements in Common:** Knowledge security features are obviously of high relevance for agencies. Consequently actual KMS should integrate diverse security components such as encryption, access control and electronic signatures.

**Applications 2 an 3: Policy Formulation and Citizen Information:** For both applications demands for safeguarding data security and privacy are stringent. These directives are not easy to fulfil as they sometimes contradict other demands such as planning needs for data integration. In the same way the need for privacy may conflict with other goals such as transparency and freedom of information for the public.

11. Conclusions

**First conclusion:** For administrative scenarios a broad part of common basic features exists. Furthermore the set of KMS feature suggested by [2] is fairly adequate

**Second conclusion:** Mostly for usage in Government and Commerce there is no need for distinction in technical matters is necessary.

**Third conclusion:** Generally, KMS have to be adapted to a particular application and also customising to the specific circumstance of usage might become necessary. In
this way non-technical factors expressing organizational and legal demands will exert a strong influence on design and implementation.

*Fourth conclusion:* There exists a number of features necessary that are really special for governmental work. Some examples have been mentioned: citizen card, legal retrieval systems, knowledge infrastructures for policy formulation, certain marks in citizen information, means for safeguarding privacy etc. Several features of this list still wait for adequate realization.

**References**