Inter-organisational e-government: From four levels of interoperability to seven dimensions of co-governance

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Abstract

This paper is concerned with inter-organisational information systems (IS) in e-government. Inter-organisational IS are usually considered to establish information exchange between public agencies. However, there may also exist other types of inter-organisational e-government. Different public agencies can cooperate on shared digital resources of diverse kinds (shared websites, shared IT components, shared back-office systems). This paper develops a conceptual framework on four different types of inter-organisational e-government. Study of inter-organisational information exchange is usually made by the aid of the concept of interoperability and the four defined levels of interoperability (legal, organisational, semantic and technical). When broadening the view to other types of inter-organisational e-government, besides information exchange, it is also necessary to broaden the concept of interoperability. This concept is in the paper replaced by the concept of co-governance dimension. A conceptual framework is formulated with seven co-governance dimensions: normative, regulatory, performative, relational, semantic, presentational and technical.

The four types of inter-organisational e-government and the seven co-governance dimensions are pivotal parts of a conceptual framework within a research project studying eight important digital resources in the Swedish public sector.

1 Introduction

E-government is not only about single IT systems in a single public agency. E-government is often about several related IT systems in several public agencies. One IT system (in one public agency) can send messages to another IT system located in another public agency; and this can be labelled information exchange. This phenomenon has often been called inter-organisational information systems. The concept of inter-organisational often means what is done *between* organisations. However, when we study information technology that concern more than one public agency, there may be other IS constellations than information exchange (Pardo & Tayi, 2007). Inter-organisational e-government can also be about shared IT resources between different public agencies. Different public organisations can have an interest in the same kind of digital resource. It can for example be a shared website between different public agencies.

The governance of inter-organisational egov resources is a challenging task. Several public agencies need to collaborate on goals, functions and use of the shared digital resource. Public agencies need to collaborate not only about the shared egov resource; they need also to collaborate on how to collaborate since cooperation forms are seldom given, and needs to be designed. Cooperation between public agencies concerning shared digital resources has been claimed to be one of the largest demands in public administration in Sweden (E-Government Delegation, 2013). Based on this insight a research project was established and conducted during 2014. The project[1] was assigned by VINNOVA (the Swedish Governmental Agency for Innovation Systems), the E-government Delegation and the Swedish Association of Local Authorities and Regions. Four researchers from Linköping University and Uppsala University conducted this research[2]. We conducted eight in-depth case studies of large egov resources in Sweden and based on these case studies we have performed comparative cross-analyses (Goldkuhl et al, 2014).

This paper presents the basic conceptual frame for this research. It investigates different types of inter-organisational e-government and ways to conceptualise such digital resources as a basis for empirical studies. It especially inquires the notion of interoperability in relation to different types of inter-organisational egov constellations. Interoperability and its division into four levels are applicable for information exchange situations, but how are these concepts useful for other types of inter-organisational egov constellations? The paper further develops the four levels of interoperability and it does so through an alternative conceptualisation (seven dimensions of co-governance). The paper is driven by a knowledge need on inter-organisational digital resources in the public sector, especially concerning the co-governance and co-use of such digital resources. Driving research questions have been: How should we view inter-organisational digital resources in the public sector? What different types of such digital resources can be categorised? How should we view co-governance and co-use of such digital resources?

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[1] The focus of the research project was "Co-governance and co-usage of shared digital resources in the public sector". We used the project acronym RESONANS (Goldkuhl et al, 2014).
[2] The four researchers were the two authors of this paper and Anders Persson (all from Linköping University) and Owen Eriksson, Uppsala University.

This is a conceptual paper investigating and clarifying
- Different types of inter-organisational e-government
- The use of the concept of interoperability and its classical division into four levels for the study of different types of inter-organisational e-government
- The conceptualisation of seven dimensions of co-governance concerning inter-organisational e-government

The developed conceptual framework has been used for empirical studies of inter-organisational e-government as described above (Goldkuhl et al, 2014). The conceptual framework has been further refined through these applications. It has also been used for theorizing concerning inter-organisational e-government (ibid). It is beyond the scope of this conceptual paper to present any thorough empirical grounding or further theorizing. We refer to Goldkuhl et al (2014). We give here only minor empirical illustrations of the developed and used concepts.

2 Four types of inter-organisational egov resources

There is a great need among public agencies to share information with each other; e.g. one organisation may need to get information from another organisation in connection with the handling of cases (Andersen, 1998). This is often called information exchange. However, there are also other collaboration needs regarding digital information resources. Sometimes public agencies interact through common websites or by exploiting common IT components of any kind. Collaboration through such a joint co-use often means that no information exchange occurs between agencies. The agency interaction is instead conducted *about* the common digital resource.

This conceptualisation of governmental digital resources goes thus beyond information exchange. Besides information exchange we also include common digital resources. We have made a differentiation between front-office and back-office resources as two main categories of digital resources. This division has been made to emphasize that some digital resources (front-office) are intended for direct use by external users (citizens in different roles), while some digital resources (back-office) are intended for internal use within public agencies (only use by its employees). We have made a division into four categories of inter-organisational digital resources:
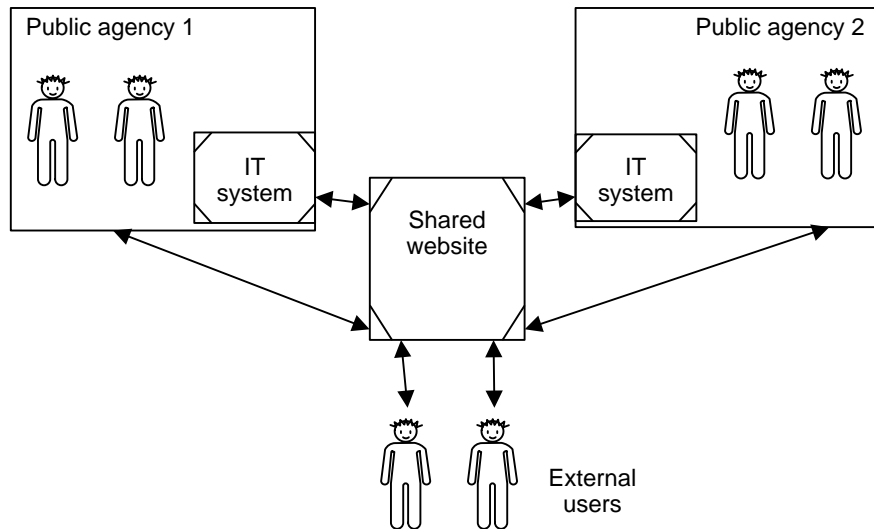- Shared website
- Common digital component in websites
- Information exchange between agencies
- Common/similar IT system

The first two are of front-office character and the last two are of back-office character. We describe these different types of inter-organisational e-government below.

2.1 Shared website

There are many life events (situations) for citizens that are beyond what a single governmental agency is responsible for in the form of information and services (Haraldsen et al, 2004). Therefore, it has emerged a need for inter-sectoral websites with information and

services from multiple public organisations. Such a website then becomes a common digital concern for several organisations (figure 1).

Figure 1. Shared website (front-office)

Shared websites are examples of front-office functions, constituting a common digital resource for the participating agencies. It requires cooperation between the agencies involved in the governance and management of such digital resources. A shared website means that different types of information and services are co-located and accessible to users at one place. It does not necessarily imply that any direct service integration has been achieved, only that they are co-located. However, there are often aspirations to achieve a higher degree of integration of different services from different agencies in the same website (Layne & Lee, 2001; Klievink & Janssen, 2009).

Different parts of the shared website may have information exchange with the internal IT systems of the public agencies that are responsible for the website. The management of a shared website implies certain challenges. The different owners of the website may have various visions for the website. It can also be difficult for different agencies to keep pace with each other in development of the website.

2.2 Common digital components in websites

Websites (of different agencies) may contain certain IT components, which are common. One example is authentication services used by several agencies. Other examples include various e-services in local governments. These are often based on standardized digital solutions from external IT vendors. Such digital components can then be embedded as parts of agency websites (figure 2). Such a common digital component will be a shared digital resource between several public agencies.
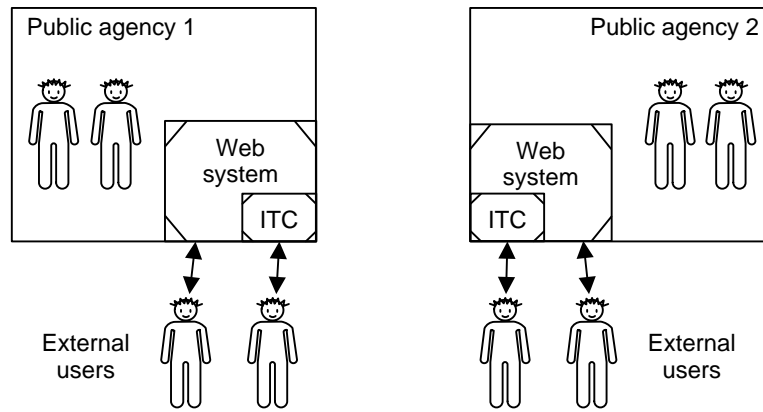
*Figure 2. Common and embedded digital components ('ITC')
in different IT systems (websites/front-office)*

2.3 Information exchange between agencies

When there is digital communication between public agencies there arises a shared digital concern between such agencies (Andersen, 1998; Ziaee Bigdeli et al, 2011). If there are only two individual agencies that exchange information the coordination is probably fairly easy. But if several agencies are involved, the situation becomes more complex with demanding requirements for joint development and management of the digital resources. The digital information exchange can be performed in different ways (figure 3). Sometimes it can be machine-to-machine, i.e. a direct communication between the IT systems of different agencies. And in some cases it may be human-to-machine, which means that there are people in one agency, through a digital user-interface, sending information to or obtains information from an IT system of another public agency.
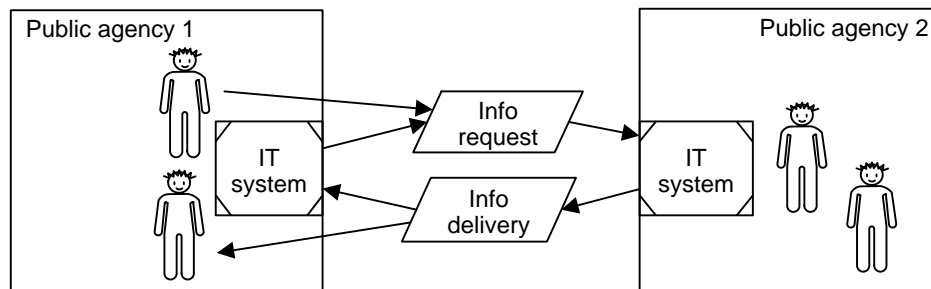

Figure 3. Information exchange between public agencies (back-office)

2.4 Common/similar IT system

As shown above, there are examples of common websites and web components. In these cases, there is a cooperation between agencies about front-office solutions. However, there are several examples of similar digital functions in internal governmental operations (back office). This is particularly evident in local governments. Within such organisations there are similar workpractices based on a common mission and a common set of regulations. These organisations conduct similar workpractices with the same basic mission and the same set of regulations. The same type of workpractice means that it is possible and appropriate to use IT systems that are similar or even common (Figure 4).

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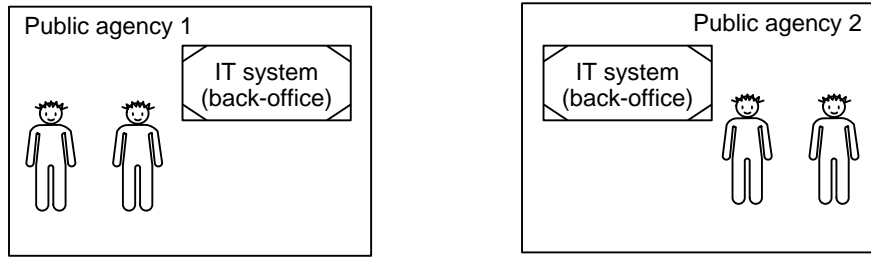
*Figure 4. Common or similar IT system (back-office)
in different public agencies*

2.5 Empirical application

These four categories of shared digital resources have been used for selection of cases and the empirical studies of these cases in the mentioned research project (section 1 above). Eight digital resources have been investigated. Initially we planned to study 10-12 cases based on 2-3 cases of each category. But later we modified this selection strategy. It showed that several cases of digital resources covered more than one category of digital resource. We applied a continual selection approach, i.e. we did not select all cases at the same time and initially in the project. We selected some cases and started to investigate them empirically. Experiences from these early cases influenced our later selections.

Through the initial cases, we saw the need and potential to go into more depth to obtain rich and adequate data as a basis for comparison, analysis and abstraction. As for the breadth, we stopped at eight case studies, but we have gone in considerably more depth in each case than our initial plan. We have obtained a richer material than we had imagined beforehand. Our eight case studies are significantly deeper than we had originally thought and planned. Since each case covered more than one type of egov category, we obtained empirical cases covering more than two examples of each egov category through these eight cases.

Our selected cases are mentioned below in table 1 showing which categories each case belongs to.

Selected digital resource	Type of egov resource	Societal sector
Common system used for documentation of students' academic information within higher education.	Common back-office system	Academic education
E-prescription: information exchange from medical prescribers to pharmacies.	Information exchange, common/similar back-office system	Heath care
Information exchange for social welfare allowances.	Information exchange, common/similar back-office system	Social welfare
Joint system for admission to upper secondary schools in municipalities of the Stockholm County	Shared website, information exchange, common/similar back-office system	School
Joint message transfer system to citizens.	Shared website, common digital components in websites	Cross-functional
Platforms for municipal e-services (for applications from citizens).	Common digital components in websites	Municipal services
National business link portal.	Shared website	Business support
National health portal.	Shared website	Heath care

Table 1. Selected case study objects

3 Seven dimensions of egov co-governance

3.1 From four levels of interoperability to seven dimensions of co-governance

The concept of interoperability is often used in connection with digital interaction. Interoperability means the capability of organisations/systems to work together. Four levels of interoperability are usually distinguished as: legal, organisational, semantic and technical (see e.g. EU, 2010; Scholl & Klieschewski, 2007; Goldkuhl, 2008). Legal interoperability means that the interaction can take place in compliance with various regulations. Organisational interoperability means that the interaction can be achieved through efficient work processes and a clear division of responsibility between the parties (specified actor relationships). Semantic interoperability is interoperability through a common and well-defined language. Technical interoperability means that the interaction can take place in a secure and accurate way by using technical components.

We have taken these different dimensions of interoperability as a point of departure for our investigation. But we have made another conceptualisation and division to meet our research objectives better. Instead of levels of interoperability, we will talk about the different *dimensions of co-governance* concerning inter-organisational egov resources. The concept of interoperability is deeply associated with the notion of information exchange. Since we have broadened inter-organisational egov to cover other types of digital resources, as described in section 2, we need a modified construct instead of interoperability.

The legal dimension is expanded into two dimensions; one *regulatory* dimension that also includes other rules and agreements than strictly legal; and a *normative* dimension including goals and values. We divide the organisational level into two dimensions; one dimension concerning work processes (called *performative*); and one dimension concerning responsibilities and stakeholder relationships (called *relational*). We keep the *semantic* level/dimension, but we single out a *presentational* dimension. The semantic dimension is concerned with linguistic meanings. The presentational dimension is concerned with how presentation and interaction is done through user-interfaces. This aspect is necessary to include when we should characterize digital resources such as shared websites. In table 2, we have shown the correspondence between the four levels of interoperability and our seven co-governance dimensions[1].

Levels of interoperability	Division into co-governance dimensions
Legal	• Normative (value base) • Regulatory (regulations)
Organisational	• Performative (work processes and procedures) • Relational (stakeholder relations with roles and responsibilities)
Semantic	• Semantic (linguistic meanings) • Presentational (presentation/interaction on user-interfaces)
Technical	• Technical (digital components and their structure and relations)

Table 2. Connections between levels of interoperability and dimensions of co-governance

3.2 Values and regulations

All public administration is based in law. This applies also the activities performed by digital resources. The law is a fundamental prerequisite for the development of IT systems in the public sector. We have here broadened formal law by using the concept of regulatory and this includes (in addition to regulations) even policy declarations, contracts, agreements, etc. The concept of regulatory includes elements that have an explicit governing and regulatory function. To formulate regulations is the way for the legislators to codify what it desirable.

However, not all values are codified in laws and other regulations. There is always a set of implicit core values in society that shape people's actions and activities (Scott, 1995; Schatzki et al, 2001). For e-government it is necessary to have a broader (normative) focus on fundamental values and not just be limited to what has been codified in regulations (Hedström, 2007; Flak et al, 2009; Persson & Goldkuhl, 2010; Persson & Rose, 2012). This means that the dimensions of regulatory and the normative are partly overlapping (those values that are codified in public regulations). Regulations may also contain various rules and other "technicalities" that cannot directly be seen as values, but rather as regulatory consequences. As mentioned above, there are also "implicit" values that have not been codified in explicit rules. The connection between the normative and the regulative is illustrated in figure 5.

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[1] Goldkuhl (2008) can be seen as a fore-runner to this new conceptual division since it divided interoperability in partly similar ways, although using other labels.
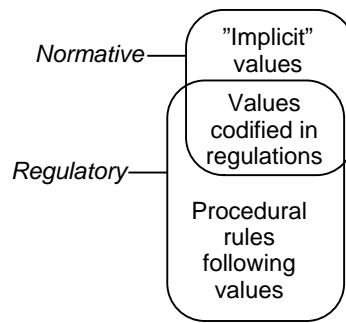
Figure 5. Relation between the normative and the regulative

3.3 Work processes and actors

E-government is based on how public administration practices are organized; how work processes and activities are structured, and how relations between different actors are defined. Implemented IT systems are often based on existing work procedures. But IT systems can also imply a change of old ways of working into new ones. This means a combined work practice and IT system design in order to establish new desirable processes. Sometimes, new IT systems reconfigure the distribution of responsibilities and tasks between different organizational actors. The organisational level (from the interoperability framework) has here been expanded into two dimensions: 1) a performative dimension (regarding processes/procedures) and 2) a relational dimension (regarding actor relationships and roles); see figure 6 for illustration.
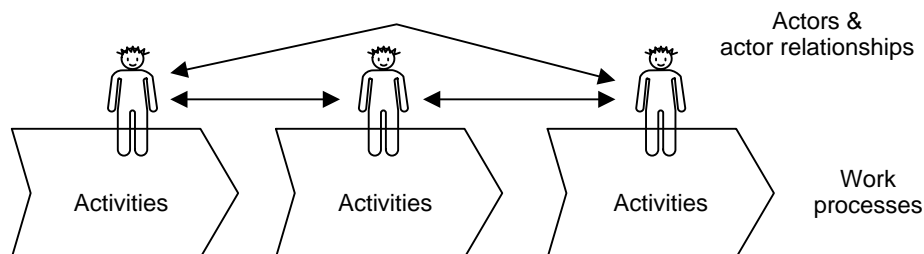

Figure 6. Relations between the relational and the performative

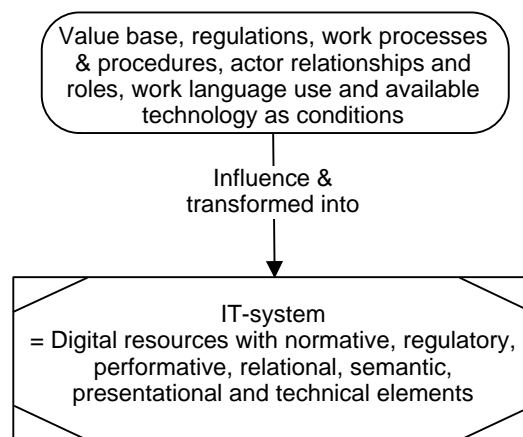### 3.4 Language, information and technology

Users utilise the IT systems in order to be informed and to communicate with others. IT systems are systems for information management, i.e. the use of words/terms with different meanings. This belongs to the semantic dimension. Semantics refers to the concepts and the terminology used. This also includes the fundamental and established ways to identify various phenomena in society (e.g. social security number, organisation number). Concepts and terms need to be organized and presented in understandable and useful ways for different users. A user-interface of an IT system is the media ("information place") used for the organisation and display of concepts and terms. This presentational dimension is an important part of public digital resources.

Besides these aspects, technical conditions (issues of hardware/software) play important roles for e-government. The technical dimension includes the technological environment in

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terms of which various digital components there are and how they are structured in relation to each other (i.e. the digital landscape). The technical dimension in our conceptual framework has thus a focus on architectural issues.

### 3.5 Egov systems as multi-dimensional carriers

Value base, regulations, work procedures, actor relations, and language use are thus important workpractice conditions for cooperation and interaction through digital resources. There must be a congruence between digital resources and such external conditions of normative, regulatory, performative, relational and semantic character. One can thus speak of digital resources as carriers of values, regulations, work processes and procedures, actor relationships and roles, and workpractice language that IT systems are based on (see figure 7). Changes in external conditions (such as legal development, process development and semantic development) need to go hand in hand with the development of IT systems as digital resources.

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│ Value base, regulations, work processes │
│ & procedures, actor relationships and   │
│ roles, work language use and available   │
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│            IT-system            │
│ = Digital resources with normative, regulatory, │
│   performative, relational, semantic,   │
│   presentational and technical elements  │
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Figure 7. Digital resources as carriers of elements from external conditions

This view on IT systems as carriers of workpractice conditions is congruent with the view of "IT artefacts as social structure" (Orlikowski, 1992; Orlikowski & Iacono, 2001). In this view, the IT system is seen as embodying rules and social resources. The division into different work dimensions above render a proposal of how to closer categorise IT system as carriers of social structure and workpractice conditions. This has been indicated through figure 7 and it is further clarified through figure 8.

An IT system as a digital resource consists of hardware, software and digitized information. The software code can be viewed as a digital operationalization of these different workpractice conditions (value base, regulations, work procedures, actor relationships and roles, workpractice language). Different values, rules, roles, work procedures and language use are built through the software code into the digital resource and can then be expressed in information storage (its workpractice memory), information processing (operations), information transport (to/from other digital resources) and information presentation/ interaction towards users.
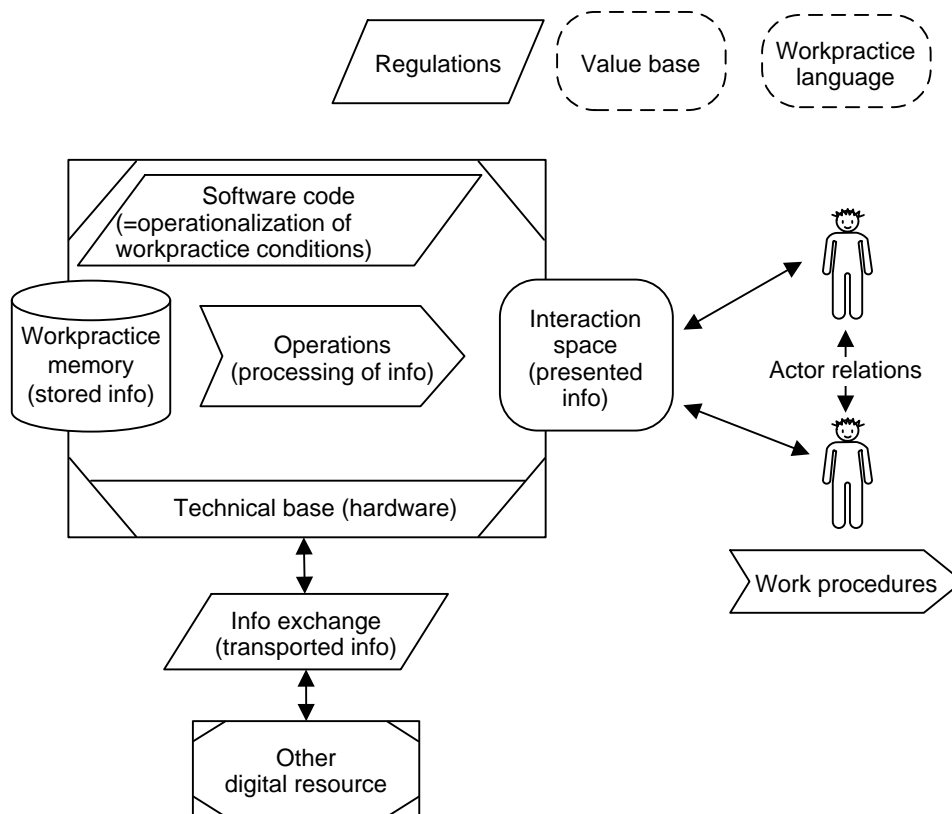
Figur 8. A digital resource's constituents and its interplay with other digital resources and human actors in workpractice contexts

The above description of digital resource, and its visualization in figure 8, shows a fairly comprehensive digital resource that includes storage, processing, presentation/interaction and exchange with other digital resources. All digital resources are not complete in such a manner. There are digital resources that may lack one or more of the functions of storage, presentation and exchange. For example, there exist message transfer services that do not have any information storage or any presentation interface to the user. A website has interaction space to its users as a primary ingredient, but may lack its own information storage.

3.6 An empirical illustration

We will here give a brief illustration of the seven co-governance dimensions. We use one of the egov cases from the above-mentioned research project: information exchange for social welfare allowances. Table 3 shows the seven co-governance dimensions for this (set of) digital resources. This table gives just an overview; for more detail we refer to Goldkuhl et al (2014).
A brief description of social welfare allowances as a background[1]: The responsibility for social welfare allowances resides within welfare boards of municipalities. The municipal welfare officers need to check the total economic situation including other allowances for an applicant. The social welfare officers should contact different national agencies and inquire if other allowances are given to the client. Earlier this was done by telephone; nowadays there exist IT systems for a dedicated and formalized digital information transfer between national

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[1] This case has earlier been described in Eriksson & Goldkuhl (2013).

agencies (e.g. the Social Insurance Agency and the Board for Study Support) and the municipalities.

Co-governance dimension	Information exchange for social welfare allowances
Normative	Fast & easy information gathering. Complete and safe access to economic information. Correct decisions on economic assistance. Protect personal information.
Regulatory	Highly fragmented legislation on information protection and transfer (several laws and statutes); this creates uncertainty in the legal application.
Relational	Weak designed collaboration between national agencies and municipalities. Weak designed collaboration among municipalities. Dispersed ownership of digital resources among the actors involved (which complicates governance).
Performative	High digital process integration among national agencies; queries from municipalities are handled completely automatically by the various agencies and compiled into one single response. Among municipalities there are clear gaps concerning digital seamless transfer.
Semantic	Weak conceptual coordination. Deficiencies in the metadata and transparency, which creates problems for designers and public administrators.
Presentational	There exist different systems with separate user-interfaces (a query system and a social welfare system) that the social welfare officers must alternate between.
Technical	Complex digital landscape. National agencies have separate system-to-system services for the retrieval of information from their own registers to provide answers. Two (partly overlapping) message transfering components exist. Several different competing social welfare systems exist (from various IT vendors).

Table 3. One example of a digital resource (information exchange for social welfare allowances) described according to seven co-governance dimensions

4 Conclusions

What has been achieved in this paper is a conceptual contribution. We have challenged that inter-organisational e-government is only about information exchange between public agencies. Collaboration between public organisations occurs also due to other types of shared digital resources. We have defined four types of inter-organisational egov resources:
• Shared website
• Common digital component in websites
• Information exchange between agencies
• Common/similar IT system

This means an argumentation that inter-organisational e-government is broader in scope than just information exchange. Inter-organisational e-government should be seen as a shared interest on common digital resources, i.e. *shared digital concerns*.

Information exchange is usually characterized in terms of interoperability and different levels of interoperability. As we have made a conceptual expansion beyond information exchange, we needed also to redefine interoperability to be the main characterizing concept for inter-organisational e-government. Instead of four levels of interoperability we have introduced the concept of co-governance dimension. Seven such dimensions have been distinguished:

- Goals and values (normative dimension)
- Regulations (regulatory dimension)
- Actor relations and roles (relational dimension)
- Work processes and procedures (performative dimension)
- Linguistic meanings (semantic dimensions)
- Organisation and appearance on user-interfaces (presentational dimension)
- Structure and relations between digital components (technical dimension)

This presented conceptual framework has been applied and refined in a large research project. Eight important digital resources in Swedish public sector have been studied and compared using these concepts (Goldkuhl et al, 2014). This means that we have conducted a 7*8 analysis (seven dimensions and eight cases). See figure 9.
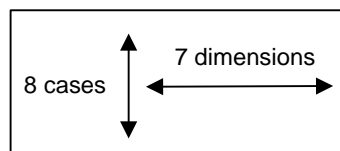
*Figure 9. A 7*8 analysis conducted in the research project*

Future research will go into more detail concerning these different dimensions and how they can be applied for data collection and analysis and for comparison and cross-analysis between different cases.

Acknowledgements

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