EURIM Briefing No 36
Modernising Government Theme

September 2002

THE EUROPEAN INFORMATION SOCIETY GROUP EURIM

Interoperability - Joined Up Government Needs Joined Up Systems

Introduction

The Modernising Government White Paper of 1999 lists an ambitious set of reforms aimed at implementing 'joined-up government in action', and includes the specific target of making all dealings with government available electronically by 2005. Getting computer systems to work well together is difficult and failure to do so presents one of the biggest single threats to achieving the Modernising Government agenda. Properly interoperating computer systems, both within government organisations and between them and the private sector would, however, make a major contribution to realising these intentions.

This briefing paper outlines some of the factors involved in getting computer systems to interoperate and shows that, rather than being purely technical issues, they are fundamentally issues of management structure and policy. Interoperability is therefore an area in which informed policy makers can make a real, and positive, impact on achieving the government's targets and in building a new government culture. Conversely, in the absence of clued-up decision making, 'joined up government' initiatives are doomed to eventual failure.

Recommendations

- Make interoperability a deliverable for all information and communications projects, not an add-on.
- Do not allow IT suppliers to see interoperability as someone else's problem.
- Ensure that the following recommendations are integral to any new system, project, programme or contract:

Managerial

1. Accompany technical frameworks with administrative frameworks.

In the absence of an effective administrative framework, interoperating systems will fall apart when they hit problems, no matter how good they are at the ICT nuts and bolts level.

- Accountability should be absolutely clear.
- Ownership of systems must come with a responsibility to see them used; systems and data should be treated as assets whose value to the citizen should be maximised.
- Share the benefits equitably. The benefits of interoperability are often asymmetrical.

Technical

1. Define technical architectures at a high level in terms of frameworks.

Over-specification is a recipe for failure over the long term, even if it can mean success in the short term.

- Don't get bogged down in unnecessary detail.
- Accept that interoperation is a brown-field exercise; a 'mixed economy' is inevitable.

2. Embrace and enforce standards that actively ease interoperability issues.

- Mandate open standards.
- Accept de-facto standards as they emerge.
- Use the e-GIF standards; when things change, get them updated, don't abandon them.

3. Accompany interface standards with data management standards.

The government is taking steps with regard to the management of personal data. Proper consideration of other types of data is needed as well if interoperability is to work.

- Data management standards – ownership, security, quality, sourcing - are as critical as interface standards – format, protocols, and process.

What is Interoperability?

The term 'interoperability' refers to the ability of information and communications systems, as well as organisations and processes, to work together. The e-GIF (Government Interoperability Framework) defines interoperability as '*the coherent exchange of information and services between systems*'.

The potential benefits of interoperability are large and generally fall into one or more of the following categories:-

Data Consistency

If many systems each hold data about the same thing there is a strong likelihood that data in one or more of the systems will be wrong. Attempting to avoid this and keep the data consistent and correct by copying changes to all other systems can itself be a considerable overhead. Properly designed interoperation can reduce this burden and improve consistency; each new system can contact the system that holds the 'master' copy when it needs data.

Process Consistency

If many systems each hold rules about how to conduct some process then the likelihood is that one or more of the systems will be wrong. Conflicting descriptions or partial descriptions of processes can result in Catch-22 situations for the end users. Properly designed interoperating systems can minimise or eliminate such situations by coordinating these processes.

Coordination for Individual Users

It can be very useful to build a coordinated view of what is happening with regard to an individual citizen in various government departments and agencies. This may be done by simply funnelling system interfaces and data to one place (a portal) or it may be a consequence of integrated design at a deeper level.

Coordination for the Administrators

Having many independent systems can make it hard to gain a realistic view of how efficiently policy objectives that cut across those systems are being met, and can also makes it harder to effect changes. Properly interoperating systems can provide the necessary data and also provide the levers of change.

What Are The Problems?

Making computer systems interoperate means overcoming a multitude of technical and managerial issues. It doesn't happen naturally. Effort is needed. Fortunately interoperability is not a new goal. Sections of industry have been integrating or attempting to integrate computer systems for many years. The nature of the problems involved is well known, and so is the nature of many of the solutions.

Most of the technicalities, although fascinating to technologists, are something of a distraction. The general approach that should be taken can be summarised fairly easily in a handful of bullet points, and is done so in the recommendations. This paper contends that most of the important interoperability issues are administrative in nature and therefore lie within the domain of policy makers.

Interoperability is seen as an add-on

Making sure a group of systems can interoperate is work that is often seen as an overhead by the owners of the individual systems involved. The bulk of the effort is often borne by one or two systems only, with the bulk of the benefits going to other systems, perhaps systems not yet built or funded. The pressure on the people delivering each individual system is to concentrate on their central deliverable - that is, on their particular system, and to give interoperability issues a lower priority, if it registers as a priority at all. Interoperability problems can end up being designed into systems rather than being designed out.

This issue can be addressed by defining interoperability as a standard deliverable within government and public sector computer projects. Developers should be required to follow open standards for interoperability, primarily those standards detailed in the e-GIF. Mechanisms exist to keep the e-GIF relevant and up to date, which should be used as new requirements emerge.

Management also needs to take a lifecycle view of systems.

Interoperability involves multiple systems

By definition, interoperability projects are projects that involve more than one computer system. Getting these systems to interoperate requires an over-arching management structure that coordinates all the important elements in a joined up way. Accountabilities need to be clear, and there must be processes for proactively addressing and resolving cross system issues. Failure to have such management coordination typically results in situations where interoperability problems are orphaned and allowed to accumulate until the whole structure is threatened. This at heart is a programme management problem. We strongly advise following the recommendations in EURIM Briefing 33, 'Modernising Government and Programme Management'.

Ownership is defensive

Ownership of a system or of data is often understood in terms of control and exclusion. Instead, ownership of a system or of data should be viewed as being primarily a responsibility to deliver for the public benefit the maximum possible utility from those assets. Those administering such assets should be rewarded accordingly.

Legal Issues

Legal obligations are imposed on the owners or stewards of data. These stewardship duties cannot be fudged and their implications will extend into the interoperability architecture, often constraining the technical approach. These issues need therefore to be clearly understood from the beginning.

Ossification

One of the benefits often hoped for in interoperability initiatives is flexibility. This can indeed be a benefit but it must be realised that the opposite situation, inflexibility, can also arise.

Interoperation can mean interdependence. Interdependence can result in rigidity and fragility. Potentially useful changes may be difficult to make because of widespread and perhaps poorly understood effects elsewhere in the network of interdependent systems.

Data Management

It is probably true to say that the real problem areas within interoperability have shifted from interoperability standards to data management and ownership issues. A good example of this is the debate over personal identities: where should this data be held, how should it be accessed, what security measures need to be in place? Interoperation is often discussed entirely in terms of processes, and tends to ignore the data aspects of interoperability. Thought needs to be given to the data management issues from the earliest point of any interoperability initiative.

Semantics

This is an important technical issue but is one that is almost invisible outside technical circles. What it boils down to is that the meaning of apparently identical terms (such as 'address') can differ in significant ways between systems. Such differences normally make it more difficult to make systems work together. The differences can be minimised if systems are designed using agreed data formats. Most new data in practice looks like data already found in some system or other, but definitions can be hard to find and most new systems end up 're-inventing the wheel'. The rise of XML (a standard for labelling and structuring data) will ease this problem somewhat, but only if action is taken to make the formats available. The UK government maintains a 'Government Data Standards Catalogue' (GDSC) which is aimed at making formats public. As with the e-GIF, mechanisms exist to keep the GDSC up to date.

Conclusion

Interoperation is often defined as a technical problem, to be addressed in terms of information, communications and computing standards, protocols, and middleware architectures. But the technical problem of linking systems together is accompanied by an administrative problem, which is at least as important. When government requires computer systems to interoperate it must commit itself to constructing – and maintaining - an appropriate administrative environment for those systems. It will be the nature and quality of that administrative architecture that will play the greatest part in determining the success or failure of the initiative.

References

1. Modernising Government White Paper. Cabinet Office, 1999.
2. Modernising Government and Programme Management – The Critical Success Factor. EURIM Briefing 33, 2002.
3. e-Government Interoperability Framework. Cabinet Office.
4. Privacy and Data Sharing. Performance and Innovation Unit, April 2002.

Annexes containing a technical overview of interoperability issues and citing a number of relevant case studies are available on the EURIM website or can be sent to you on request in electronic or hard copy form. Please contact Kate.Norman@eurim.org, fax: 01984 618383

Glossary of Interoperability Terms

- **e-GIF**

Government Interoperability Framework. Run by the Cabinet Office. Documents available from www.govtalk.gov/uk

- **Interoperability**

The ability of ICT systems to work together. The e-GIF (Government Interoperability Framework) states that if "..the coherent exchange of information and services between systems" is achieved then the systems "can be regarded as truly interoperable". (Note that to be e-GIF compliant the system must not only satisfy this interoperability test, but also "..it must be possible for any component or product used within an interface to be replaced with another of similar specification and the functionality still be maintained"".) (Taken from e-GIF Part One Version 4.0 Section 4.5, April 25th 2002).

- **Loosely Coupled Integration**

A design approach that recognises interoperating systems as semi-independent entities, both functionally and organisationally. This is perhaps the only robust approach when trying to integrate many systems and system owners, but it does lay itself open to problems when things absolutely have to happen immediately and simultaneously throughout a set of systems. Changes within a loosely coupled set of systems will eventually percolate through to all systems but this may not be good enough or fast enough.

- **Meta Data**

Data about data. In order to understand and make proper use of the streams of data passing between systems it is necessary to have formal descriptions of that data.

- **Middleware**

Infrastructure software that ties other software together. A very wide term, covering a range of technical issues and approaches. The appropriate middleware approach in any situation depends on what, exactly, is being held together; there is no 'one size fits all' middleware solution.

- **Portal**

A portal is a gateway to system functions. Someone may need access to various systems in order to do their job; a portal would collect and present the interfaces to the different systems, and it would often provide other useful tools as well.

- **Tightly Coupled Integration**

A design approach that tries to construct a single integrated system of the interoperating systems. Within a tightly coupled set of systems a change made in one system (crediting an account, for example) will be propagated to all other interested systems immediately and simultaneously. This is in some ways an ideal situation, but the downside is that this is not always technically practical. Also, making one large system out of many small systems may tend to 'ossify' the systems it integrates. Management issues become more complex, and changes and enhancements more problematic.

- **Service**

A service, in computer terms, is some functionality that is provided by one system for the use of other systems. It is very similar to the concept of 'software component' but in usage tends to refer to a business view rather than a technical view of the functionality.

- **Standards**

Common conventions for accomplishing a task - e.g. representing data, or invoking a procedure, etc. etc. Some standards are owned by corporations, some are owned by industry consortia, some by international standards organisations (such as the ISO). Currently many of the most important standards are not 'standards' as such at all; the World Wide Web Consortium for instance, responsible for such things as HTML, XML, calls all its specifications 'recommendations' rather than standards, in recognition that it cannot mandate them and it does not wish to mandate them.

- **Web Service**

This is the latest 'hot new thing' in computing. The basic idea is that computer integration both within and between organisations should use the Internet and standards based around the world wide web. The more ambitious web service pundits see a world in which software functions are automatically accessed as and when required from best-of-breed (or best value) suppliers directly over the Internet.

- **XML**

This stands for 'Extensible Markup Language', a standard way of annotating data files so that the recipient of a file can know what the various items of data are meant to mean. It is important because it means (at least in theory) that data can be easily shared with *anyone* else. Historically, working out the meaning of items of data was not much of a problem because interoperability initiatives tended to be *within* rather than *between* organisations and systems tended to be bespoke rather than off-the-shelf packages; the programmers involved could just meet up and agree file formats. But the increasing importance of eBusiness and the increasing prevalence of packaged applications has meant that problems are not so easily solved and a more general and robust way of defining data is needed. Hence the importance of XML. XML is a central part of the web services approach to interoperability (see above) and is increasingly important in just about all interoperability efforts.