**European Public Administration Network
eGovernment Working Group**

Key Principles of an Interoperability Architecture

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Preface

European Union Member States are quite diverse in the way in which their Public Administrations are organised (using many and varied configurations of central, federal, municipal, regional, district, county, city and town levels of government). This diversity is also reflected in Member States structures, laws, procedures and processes.

It is against this backdrop of diversity that the eGovernment Working Group of the European Public Administration Network has defined and outlined principles for "National Interoperability Architectures".

Recommending a single implementation approach to all aspects of Interoperability is not feasible in such a diverse environment. Therefore this report offers suggested implementation approaches for each principle. While it is recognised that the principles of Interoperability remain true across all Member States, the suggested implementation approaches will need to be tailored to fit within the organisational and legislative structures of each Public Administration.

Executive Summary

Introduction

In the Information Age, public administrations are striving to leverage modern information and communications technologies to radically improve the quality of their services to customers and the efficacy of their operations. In a European Union context, they are also endeavouring to collaboratively make Europe the most competitive and knowledge-based economy in the world and to develop the provision of pan-European services. However, at present, most interactions with Government bodies are not provided on the basis of customer requirements (i.e., in the context of life/business events); they require numerous disparate transactions across multiple departments/agencies; and they are not aggregated across organisational boundaries. Therefore, Government bodies need to interoperate with each other to a greater extent than has been the case to date. Such interoperability can only be achieved using an agreed common architecture.

Definition

Interoperability is the ability of a system or process to use information and/or functionality of another system or process by adhering to common standards. An "interoperability architecture" is made up of a range of complementary technical specifications, systems, standards, guidelines and polices. There are five interlinked layers in an interoperability architecture as set out at Figure A with specific principles at each layer.
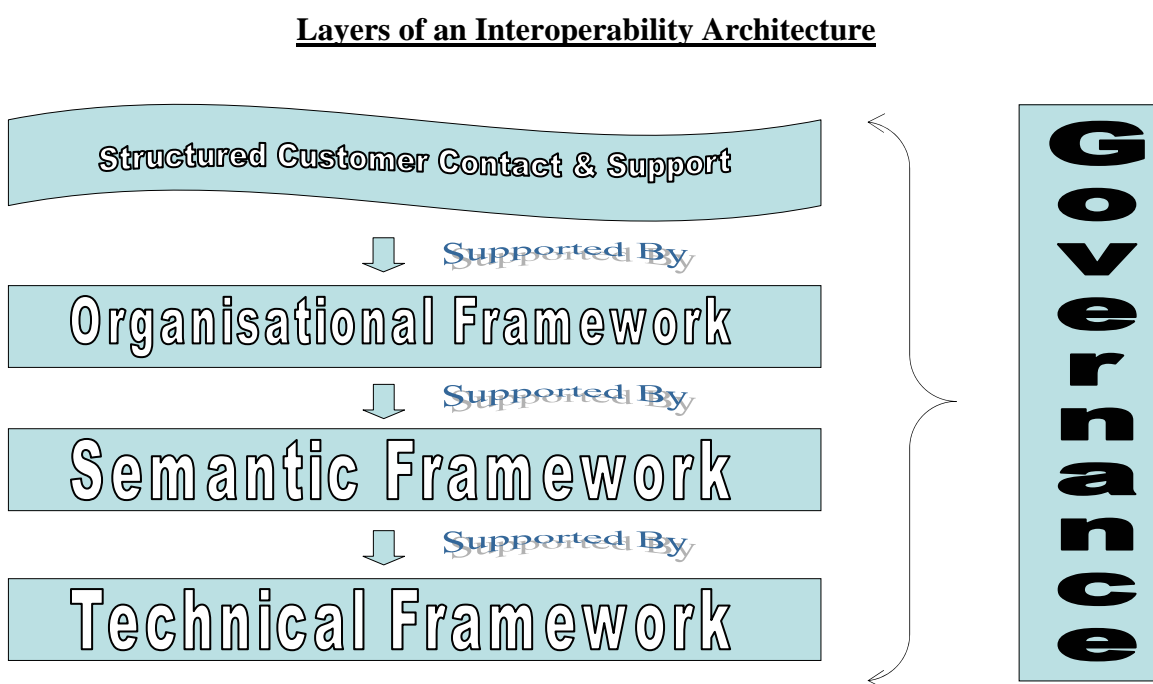
Layers of an Interoperability Architecture

Figure A

Purpose of Report

This Report suggests possible approaches that could be taken at each of these layers in the implementation of **a national interoperability architecture**. In so doing it lists the benefits of the suggestions made. It also highlights some of the drawbacks with its suggested approaches. However, these are either perceived (rather than real), or could disappear as soon as solutions become evident, or are outweighed by the benefits set out.

Structured Customer Contact & Support

This is concerned with the provision of a standardised, consistent and efficient support service that offers the customer multiple channels to choose from, defined points of contact for public service interactions, defence from the complexities of a public administration, and the ability to use self-service and call-centre facilities. To ensure that customers get a consistent experience that is based on very best practices and intensive leveraging of modern technologies, it is suggested that administrations **develop one or more customer contact centres as shared services across all agencies** at a sectoral, regional and/or public administration level. Such contact centres should have the desired qualities set out at Section 3.3 and should facilitate automatic performance measurement. Such an approach could result in significant savings for public administrations and fulfilment agencies through greater use of self-service and the potential for outsourcing non-core activities. In addition, it could allow public administrations to increase their focus on core activities such as strategic policy and planning.

Organisational Interoperability

This is concerned with the co-ordination and alignment of business processes and information architectures that span both intra and inter-organisational boundaries. The full business benefits of any interoperability process can only be achieved when all parties to the information exchange can incorporate and harness the information to suit their own organisational processes, procedures and structures. However as part of this process, a full examination of organisational processes, procedures and structures is required to determine better ways of doing business and to identify and address/remove any possible barriers, including legislative ones, to aggregated services. Co-ordination of business processes across organisational boundaries is essential if a single, aggregated view of a service from the customers' perspective is to be achieved. It is suggested that administrations could develop an **exemplar scheme** that would define standard approaches to each of the main requirements of any public service and use this exemplar to benchmark all other services; that **common functionality could be provided on a shared basis through a broker service** to reduce development, deployment and operational costs to the public administration and to each service fulfilment agency, and to ensure consistency of experience for users of services across all agencies in the public sector through the use of agreed standards across all services; that

expenditure reviews could be undertaken to ensure that financial priority is given to those schemes that comply with the structured customer support services set out above and with interoperability standards; and that each administration could develop **a central programme of organisation development assistance and funding** to bring this change about.

Semantic Interoperability

This is concerned with ensuring that the precise meaning of exchanged information is understandable by any person or application receiving the data. To be of value, an interoperability architecture must allow agencies to effectively exchange data, combine it with other information resources, and subsequently process it in a meaningful manner. To achieve this, agreement is required on the context and precise meaning of the exchanged data. It is suggested that administrations develop pan-public service **registers/catalogues of standardised business elements that are described and published with a subset of XML Version 1.0.** This ensures that each element of data is standardised and registered once only and consequently will endure. Legacy systems will not need to be re-engineered as transformations using the registered standards can be developed. These standards can be prescribed to the market when purchasing new technologies or development services, thus ensuring that all future developments and solutions incorporate interoperability standards from the outset.

Technical Interoperability

This is concerned with the technicalities of connecting computer systems for the purpose of exchanging information or using functionality. Setting principles, standards and guidelines for a common transfer mechanism, developing standardised metadata (data about data) and using a common language are all required to achieve technical interoperability. To support the interchange of data and use of system functionality in the provision of services, a suggested approach is the development of **hub-based standardised XML messaging architectures and XML Web Services.** Such an architecture has all of the desired qualities set out at Section 6.2. It is simple and easy to maintain. Each organisation can connect with a single, standardised interface. Data/information need be supplied once and once-only to the hub, i.e., special interfaces do not need to be designed, built and maintained. It accommodates the use of virtual services. It also facilitates the use of common or shared services. It is infinitely scalable using hierarchical modelling. The core of the architecture is extremely light facilitating maximum flexibility in terms of technology choices for all value-added functions and services located on the periphery of the hub.

Governance of Interoperability

This is concerned with the ownership, definition, development, maintenance, monitoring and promotion of standards, protocols, policies and technologies that make up the various elements of an Interoperability Architecture. To ensure that service delivery maintains a pan-public service perspective; that common functionality is developed once and used by all; and that standards are developed, sustained and policed, it is suggested that administrations develop a **structured pan-public service governance model.** Within this model, *"technical" and "semantic" interoperability standards* **could be the responsibility of a single agency** that has the desired qualities set out at Section 7.3 and is appropriately underpinned by primary legislation (where required) that defines its establishment, purpose, responsibilities, powers, accountability and redress mechanisms. This agency could also have responsibility for the provision of the common functionality at these layers – although it could outsource the development and operation of them to another competent agency or to the private sector. It is **not possible to be prescriptive about the governance of the organisational interoperability layer** of the architecture because of the different organisational structures in place across Member States. Therefore, while it is suggested that each administration individually determine which agency is best suited to governing each element in the layer, the Ministry/Agency charged with policy responsibility in that area may be the obvious choice.

Roadmap for Development/Implementation

An Interoperability Architecture is not a static concept. It will change and grow as administrations develop interoperable services, as technologies change, and as administrations become more experienced in organisational change. Implementation of all of the principles of an Interoperability Architecture will take time and may require tailoring of the possible solutions to take account of legislative and/or organisational differences in each Member State. Consequently, to prove the concepts, to develop early successes, and to engage support for the approach, it is suggested that **a bottom-up, small and tightly-controlled pilot is developed.** Such a pilot would help a public administration to minimise the risk inherent in the development of an interoperability architecture, ensure the undertaking is manageable, provide the foundations of an infrastructure that could be expanded and enhanced, and help to initiate the thinking required to develop the organisational structures and responses set out in this report.

1.   *Introduction*

In setting a vision for eGovernment, most public administrations endeavour to -

- provide best customer service in terms of the range, quality and ease of use of services;
- develop the most efficient and cost-effective ways of working within the public service;
- comply with international obligations;
- enhance their ability to compete internationally;
- develop and support pan-European eGovernment services to support the single market; and
- adhere to the principles of the Lisbon strategy of making Europe the most competitive and knowledge-based economy in the world.

In terms of customer service, it is becoming more common for services and information to be organised around the customers' view of the world, i.e., life/business events. However, at present, many interactions with Government require numerous disparate transactions across multiple departments/agencies. If Government is to provide services and information in a way that is meaningful to the customer it must be capable of aggregating services between and across organisational boundaries. There is also a growing demand from the private sector for interaction with public administrations, *viz.*

- private sector individuals or businesses providing contracted public services (or portions thereof), e.g., private doctors providing public health care; and
- private sector organisations providing benefit to the citizen on foot of public sector information, e.g., motor insurance companies giving reduced rates to holders of "clean" driving licences, i.e., with no penalty points for driving offences.

Therefore, government bodies need to interoperate with each other to a greater extent than has been the case to date. Such interoperability can only be achieved using an agreed common architecture.

The objectives of this paper are to -

- highlight the necessity of interoperability in achieving the goals of eGovernment and public service modernisation; and
- identify the elements of an interoperability architecture, setting out -
  - ➢ the reasoning for each;
  - ➢ a possible approach to implementation;
  - ➢ the benefits of this approach; and
  - ➢ the issues to be resolved.

The paper does not purport to answer all of the questions about interoperability. It is focused on defining principles for a national interoperability architecture. Suggestions for dealing with interoperability at a European level are dealt with by IDA through the development of the European Interoperability Framework.

In producing this paper, the Presidency has drawn on -

- the work on interoperability frameworks being carried out by various Member States;
- the work of policies and programmes of the European Commission on interoperability;
- expert input from a world renowned consultant in the field of interoperability; and
- internal research projects and consultations,

and has attempted to respond to the -

- **Commission Communication - The Role of eGovernment for Europe's Future**[1] which states that eGovernment services should be designed to be open to users in other Member States and accessible seamlessly, regardless of whether the service is under the responsibility of a local, regional or national public administration, or a European institution or agency;
- **Council Conclusions on - The Role of eGovernment for Europe's Future**[2] which invites the Commission, the Member States and the Acceding States….. to ensure that the creation, development and implementation of these services should be accompanied by joint actions to build up experience and validate advanced solutions concerning common approaches to key aspects of seamless pan-European eGovernment service provision such as accessibility, user identification, security, interoperability, including data definitions and procedures;
- **EPAN Mid-Term Work Programme**[3] which highlights that studying the possibility of forms of cooperation between the back offices of administrations belonging to the member states and the related interoperability questions (architecture models, open standards), is a key activity for completion by the end of 2005; and
- Various themes of the **Work Plan of the eGovernment Working Group**[4], specifically -
  - ➢ Inter & intra governmental collaboration, interoperability and pan-European services;
  - ➢ Organisational changes, skills and the role of leadership required by e-Government; and
  - ➢ Delivering on user needs.

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[1] http://europa.eu.int/information_society/eeurope/2005/doc/all_about/egov_communication_en.pdf
[2] http://register.consilium.eu.int/pdf/en/03/st14/st14487.en03.pdf
[3]

http://forum.europa.eu.int/Members/irc/euradmin/dgadmintest/library?l=/2/2/5sitaly/meetingssduringsitalians/01sdecembers2003&vm=detailed&sb=Title
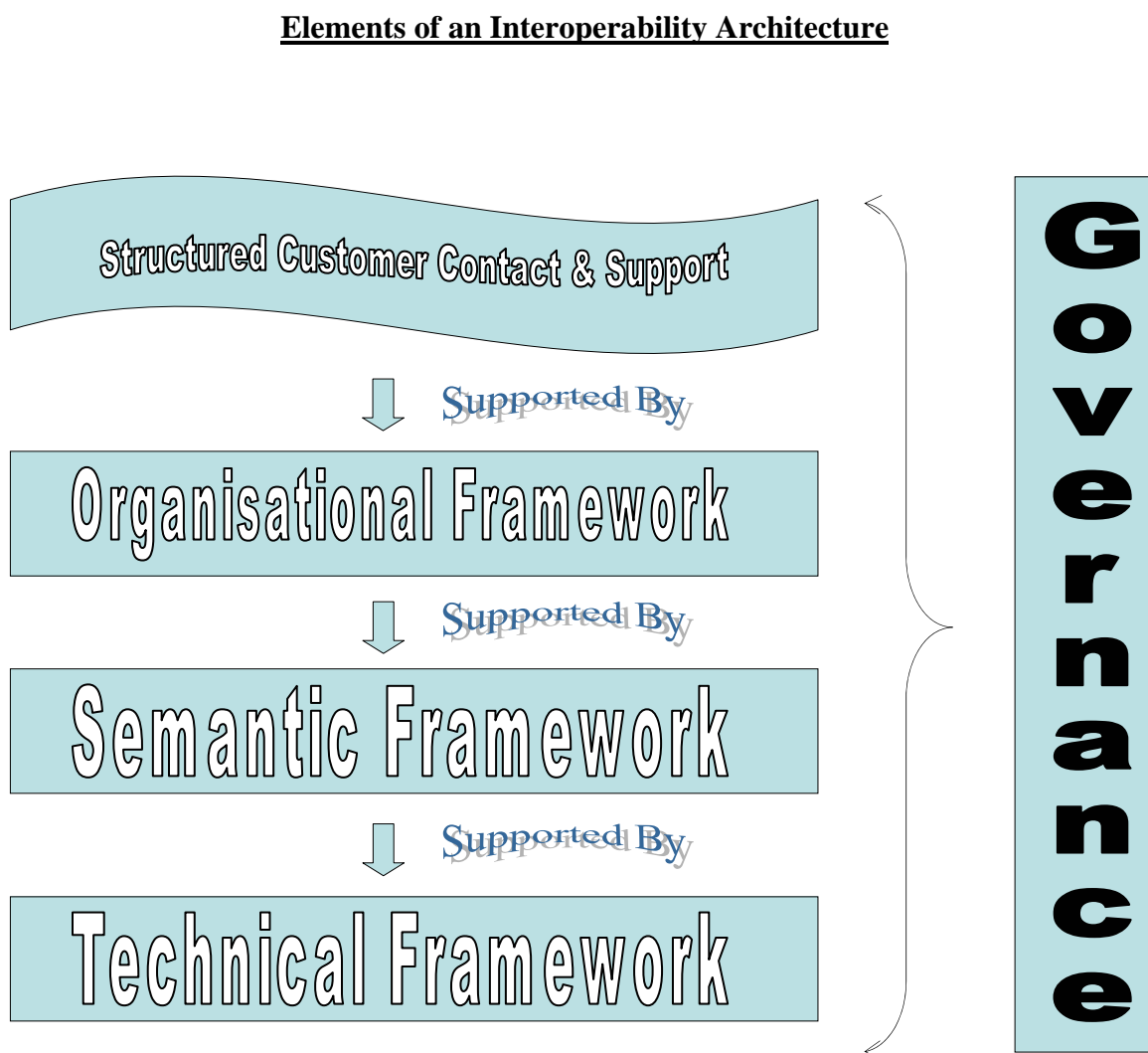[4]

http://forum.europa.eu.int/Members/irc/euradmin/dgadmintest/library?l=/6/2/5susefulsdocuments&vm=detailed&sb=Title

2. Definitions for Interoperability

Interoperability is the ability of a system or process to use information and/or functionality of another system or process by adhering to common standards.

An "interoperability architecture" is made up of a range of complementary technical specifications, systems, standards, guidelines and polices. There are five interlinked elements in an interoperability architecture as set out at Figure 1 with specific principles at each layer. This paper is structured around the five elements of the architecture.

Elements of an Interoperability Architecture

Structured Customer Contact & Support

Supported By

Organisational Framework

Supported By

Semantic Framework

Supported By

Technical Framework

Governance

Figure 1

Structured customer contact and support is concerned with the provision of a standardised, consistent and efficient support service that offers the customer multiple channels to choose from, defined points of contact for public service interactions, defence from the complexities of a public administration and the ability to use self-service and call-centre facilities.

Organisational interoperability is concerned with the co-ordination and alignment of business processes and information architectures that span both intra and inter-organisational boundaries. The full business benefits of any interoperability process can only be achieved when all parties to the information exchange can incorporate and harness the information to suit their own organisational processes, procedures and structures. However as part of this process, a full examination of organisational processes, procedures and structures is required to identify and address/remove any possible barriers to aggregated services. Co-ordination of business processes across organisational boundaries is essential if a single, aggregated view of a service from the customers' perspective is to be achieved.

Semantic interoperability is concerned with ensuring that the precise meaning of exchanged information is understandable by any person or application receiving the data. Technical interoperability brings little added value to existing regimes if agencies cannot effectively exchange data, combine it with other information resources, and subsequently process it in a meaningful manner. To achieve this, agreement is required on the context and precise meaning of the exchanged data.

Technical interoperability is concerned with the technical issues of connecting computer systems for the purpose of exchanging information or using functionality. Data is the cornerstone of any information-based administration. Although public administrations have used ICT extensively over the last 30 years to develop information systems, in the main these systems have been developed primarily to solve single agency-based problems and consequently can and have become technology "islands". Interoperability between these systems at a technical level is not pervasive. Setting principles, standards and guidelines for a common transfer mechanism, developing standardised metadata (data about data) and using a common language are all required to achieve technical interoperability.

Governance of Interoperability is concerned with the ownership, definition, development, maintenance, monitoring and promotion of standards, protocols, policies and technologies that make up the various elements of an Interoperability Architecture.

3.   Customer Contact and Support

3.1   Principle

To achieve the vision set out in the Introduction, one of the principle aims of an eGovernment programme must be the development of a **structured customer contact & support model.**

3.2   Rationale

To ensure a customer-centric approach to service provision and to improve the efficacy of the public service, organisations need to address a number of key questions, *viz*.

- What do my customers want from a service?
- What is important to them in dealing with Government?
- How do they want to interact with Government?
- What am I asking from them for delivery of a service?
- What am I asking of other agencies for delivery of a service?

Various surveys and analyses (see Appendix 1 for a sample of statistical responses from Irish citizens) have consistently shown that customers wish to -

- deal with Government as a single entity without having to understand its complex internal structures;
- deal with public servants who have the necessary information and knowledge to process a query;
- have a single point of contact to complete a service without "being passed along" to other agencies (because the service is fragmented across agencies); and
- deal with agencies through the channel of their choice.

Public service agencies tie up significant resources dealing with mundane, transactional issues that can impact negatively on policy development and strategic planning.   The different approaches to customer service by individual agencies result in an inconsistent experience for the customer.   In addition, transactions tend to be most expensive when conducted on paper, less expensive when conducted with an agent by phone, and cheapest when conducted through self-service mechanisms (studies show an average costing ratio of 100:10:1).

By way of example (see Figure 2), analyses of support queries has shown that, typically –

- 66 % can be resolved by self service;
- a further 28% can be resolved by a call centre representative;
- 5% more can be resolved by investigation and subsequent call back; and
- less than 1% impact on and contribute to strategic policy, thus requiring high-end expertise/skill/knowledge.
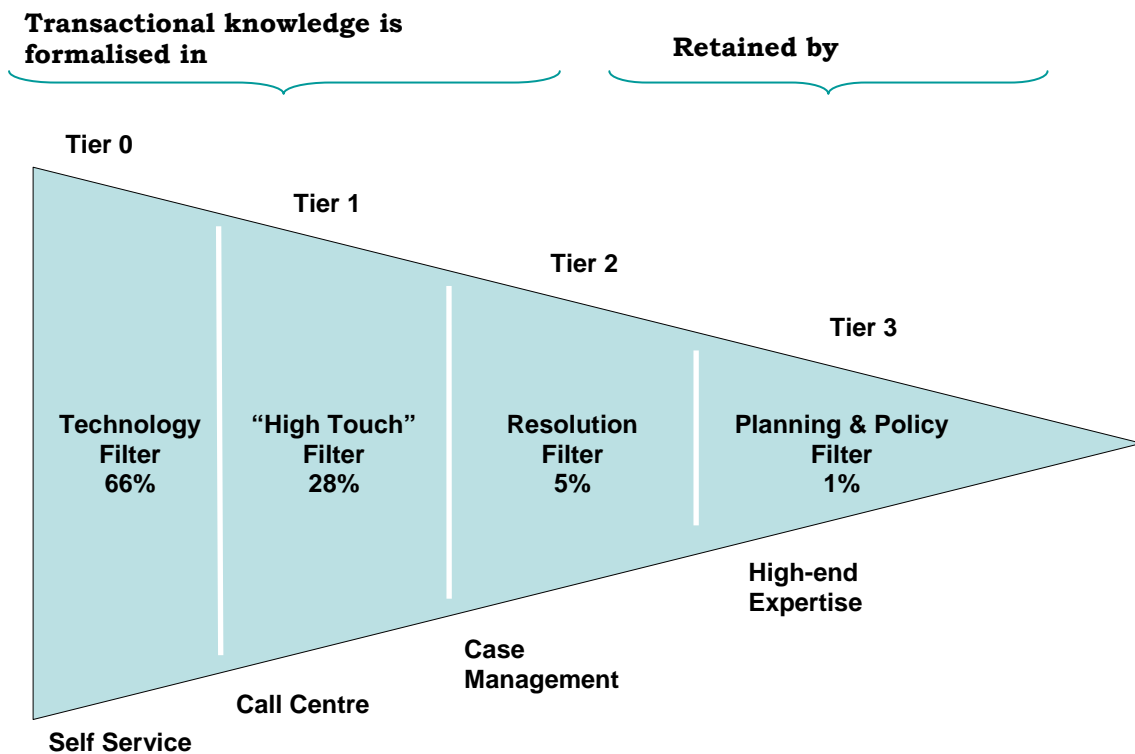
Figure 2

 A "structured customer contact and support service" ensures a consistent, high-quality and efficient approach to customer contact.

3.3   Possible Implementation Approach

A possible approach to implementing this principle could be the development of a customer contact centre as a shared service. Alternatively, depending on the organisational and legislative structures in place in each Member State, a series of regional or sector-specific contact centres may be considered more appropriate.

Tiers 0 and 1 (as shown in Figure 2) are definitively in the domain of the customer contact centre/s. Elements of Tier 2 could be in either the customer contact centre/s or in the back-end agency. Only Tier 3 is definitively in the domain of back-end agencies.

Such a contact centre/s should –

- be a separate organisation with business-style behaviours; *viz.*
  - ➢ only task is to provide the shared functions as cost effectively as possible;
  - ➢ private-sector-type accounting and baselined costs;
  - ➢ two-way Service Level Agreements; and
  - ➢ staff focused on Quality Customer Service competencies;
- have appropriate organisational structures and costs (flat structure, small expert capacity, low cost locations, appropriate salary mix); and
- use a Structured Customer Contact Process.

3.4   Benefits

The benefits of this approach include -

- consistency of experience from the customer's perspective;
- achievement of best practice through standardised processes, procedures and infrastructures;
- reduced costs through highly structured customer contact processes, intensive use of technology and getting customers to use self-service via multiple channels;
- quick identification of difficult cases and processing of simple cases more efficiently;
- shared services, tools, resources, experience and specialist skills;
- opportunities for outsourcing or co-sourcing non-core activities;
- freedom of agencies to focus on, and drive forward, their core business activities; and
- automation of performance measurement.

3.5   Drawbacks

Potential drawbacks could include -

- perceived loss of branding and/or control by individual agencies if outsourced or co-sourced;
- initial expenditure outlay in setting up call centres, training staff and/or outsourcing; and
- possible inability to tailor specific or once-off services.

4.   *Organisational Interoperability*

4.1   Principle

A key element to delivering on the eGovernment vision is the development and implementation of a **service delivery modernisation programme.**

4.2   Rationale

Organisational interoperability facilitates the fusion of business processes across intra-organisational boundaries and between partner organisations. This level of interoperability is critical to the provision of aggregated services where the customer can interact with the public service based on their view of the world, i.e., life or business event.

This is a real challenge for organisations as they look for more efficient and effective ways of working that bring real benefits to their customers. The ability to exchange information and provide a cohesive service to the customer, while taking into account the different internal organisational and operational models of each participating agency, is a true measure of eGovernment.

Implementing an organisational interoperability architecture on top of existing processes, procedures and structures is unlikely to provide added value to either the customer or the agency. Therefore, to ensure a customer-centric approach to service provision and to improve the efficacy of the public service, organisations need to evaluate their own internal processes, procedures and structures.

Analyses of various customer surveys and a range of schemes/services provided by various levels of Government have identified many organisational barriers to the provision of aggregated and seamless cross-agency delivery of services, *viz.*

- scheme complexity;
- means testing, i.e., the level of income, disposable income, ability to repay, etc.;
- supplementary documentation or certification;
- delivery channels;
- payment channels;
- levels and methods of authentication;
- requirements for signatures;

- custom & practice – lack of standards;
- legacy systems; and
- staff training.

The proposed Directive on Services in the Internal Market[5] requires Member States to –
- "screen" their regulations and legislation that govern the establishment or authorisation of service providers;
- identify "prohibited requirements" (as listed in the Directive) that need to be eliminated; and
- identify "requirements to be evaluated" (as listed in the Directive) that may need to be altered or eliminated,

before transposing the Directive.

The proposed Directive also defines the establishment of "*single points of contact*" at which service providers can complete the administrative procedures relevant to their activities, and requires Member States to make it possible to complete these procedures "*by electronic means*".

Therefore, a programme of organisational modernisation needs to address, inter alia -
- how services are delivered;
- possible common functionality across services;
- means of providing any such common functionality;
- means of multi-channel service delivery;
- legislative and regulatory barriers to customer centricity;
- funding of service delivery initiatives; and
- appropriate mechanisms for managing the change processes.

4.3   Possible Implementation Approach

4.3.1 Service Delivery Analysis

It is suggested that a thorough analysis of schemes, forms, delivery channels, regulations, legislation, business processes and job functions is carried out to identify best practices, common functionality and barriers to customer-centric service delivery.

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[5] http://europa.eu.int/comm/lisbon_strategy/pdf/COM2004_002_en.pdf

Arising from this analysis a best practice template (exemplar scheme) could be developed. Such an exemplar scheme would define approaches to dealing with each of the main requirements of any public service scheme, *viz.*

- registration;
- authentication;
- supplementary documentation;
- notification of stages or status;
- application processing;
- support handling;
- payment processing or issuing of funds;
- requests to other agencies for information, including the private sector; and
- cross-division and/or cross-agency workflow.

Each agency could then audit the necessity for and the operation of each of its own schemes using the exemplar scheme as a base benchmark.

### 4.3.2   Common Functionality

Analysis has shown that most schemes require a base set of "sub" services to operate. These include, but are not limited to –

- a customer registration process;
- a process of identity management;
- authentication protocols with different levels to meet scheme needs, e.g., the tScheme[6] process;
- front-ending to allow for self service where applicable;
- electronic forms production and management;
- case tracking and status reporting;
- auditing & logging;
- electronic payment system;
- search and retrieval;
- information service;
- customer to government e-Mail system; and
- a security regime.

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[6] http://www.tscheme.org/about/index.html

This common functionality could be provided on a shared basis to back-end fulfilment agencies by a broker service (see Figure 3) in accordance with negotiated Service Level Agreements and usage guidelines. This approach would ensure a consistent experience for users of services across all agencies in the public sector; guarantee a consistent implementation of defined standards across all services; and reduce development, deployment and operational costs to the public administration and to each service fulfilment agency.
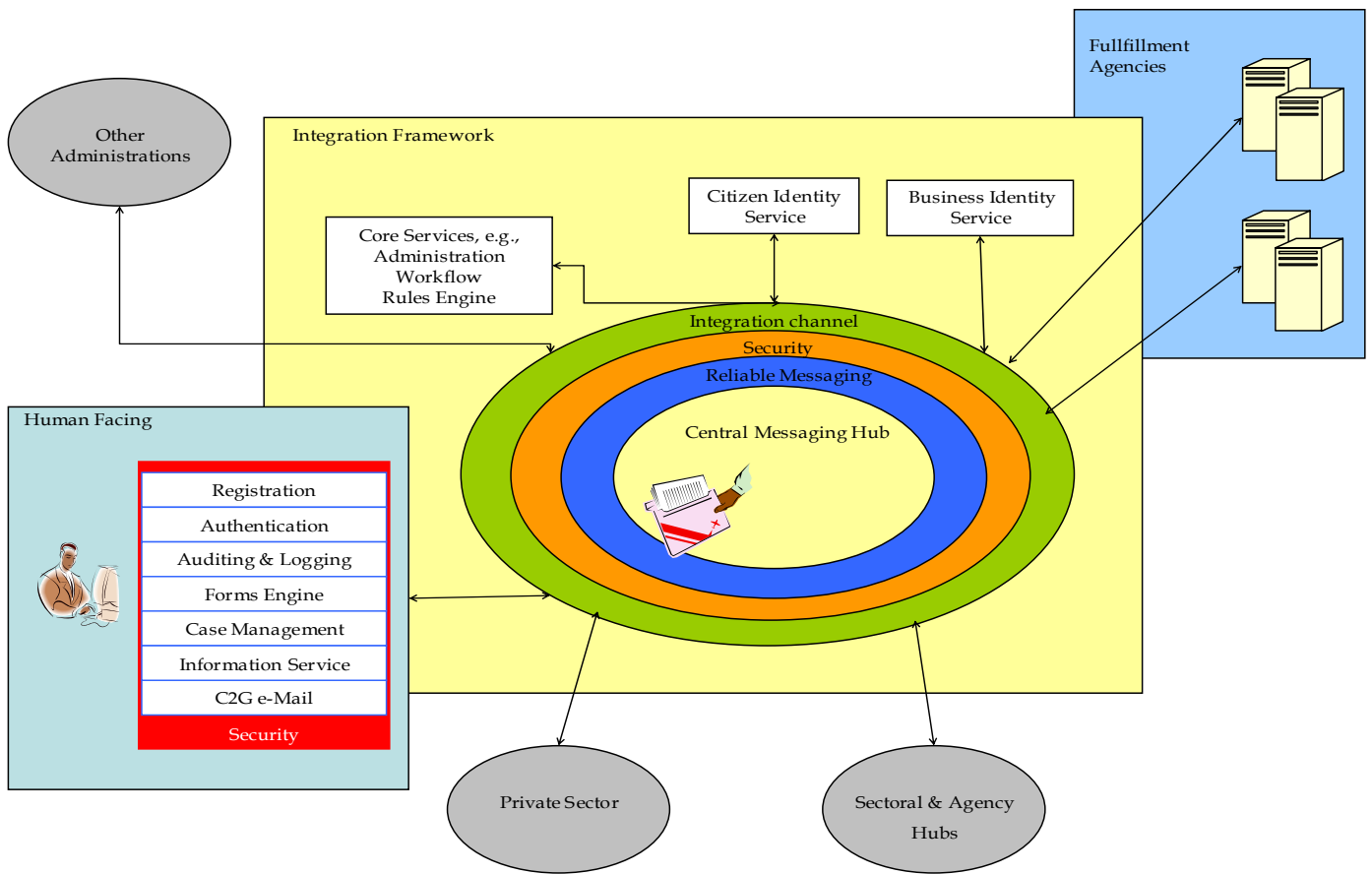
Figure 3

4.3.3 Expenditure Reviews

Agencies have to strike a balance between committing resources and funds to restructuring existing services, developing new services, and carrying out the policy and legislative analysis within their remit. If public administrations are to embrace modernisation and eGovernment programmes, then a central policy of support for initiatives could ensure that financial priority is given to those initiatives that comply with, and adhere to, the principles of interoperability.

A central funding programme to allow agencies to develop the necessary infrastructure required to support interoperability could also be made available. This programme, along with the development of common functionality and full change management support from central Government, would ensure that agencies could concentrate their expenditure on their own agency specific issues.

4.3.3 Change Management Programme

As not all agencies will have the necessary organisational development skills to carry out service, regulation and/or legislative reviews effectively, a central programme of support and assistance could be developed. Such a programme should include an organisational development (OD) element to assist agencies in examining their own work practices and ensuring that best practice in the area of OD is brought to bear on their modernisation programme. Also, a pan-public service change management initiative to ensure a smooth transition to, and acceptance of, new ways of working would greatly benefit agencies in implementing the required programme of change.

4.4 Benefits

Some of the benefits to this approach are that -
- all services will, over time, become more customer focused;
- barriers to this customer-centricity will be identified and reduced, if not removed altogether;
- funding can be channelled to those services that comply with a pan-public service vision of eGovernment;
- new and innovative opportunities for service delivery will be identified;
- agencies will be able to harness shared or common functionality and services, thus reducing their own expenditure; and
- service delivery agencies will be able to harness new technologies to enhance efficiency and effectiveness.

4.5 Drawbacks

Possible drawbacks to this approach are that -

- agencies will require time and significant resources to complete all analyses;

- progress may be slow;

- some legislative or regulatory barriers may still exist; and

- agencies may have to acquire or develop the appropriate skills to manage this level of change.

5.   *Semantic Interoperability*

5.1   Principle

To support organisational change, public administrations need to develop pan-public service **registers/catalogues of standardised business elements.**

5.2   Rationale

A real business benefit of interoperability to organisations is the ability to exchange data, combine it with other information resources, and subsequently process it in a meaningful manner.

Standardisation is necessary to facilitate this exchange of data, its re-use over time and across multiple agencies, and to prevent lock-in to proprietary tools or formats.

When developing standards, it is essential to define a common understanding and consensus; not only for the format and structure of the data, but also for the information content and its meaning. A successful standard is one that is used and accepted by all participants. Therefore, co-operation across all agencies in a public administration is required, i.e., all stakeholders should have some level of participation in the definition of standards.

Systems and infrastructures that are built using standards that are agreed and maintained across the public service are more likely to endure and have a long life. The added benefit to this approach is the ability to prescribe these standards to the market when purchasing new technologies or development services. This ensures that all future developments incorporate interoperability standards from the outset.

5.3   Possible Implementation Approach

5.3.1 Language

The emergence of XML over the last few years has made it the obvious choice as the language to describe the exchange of information between disparate systems. XML can be used to describe the content of the "packet" of information to be exchanged and also the "packet" itself, i.e., the source, destination, payload, etc. (metadata). A set of standards should be defined for the information being exchanged, *viz.*

- the syntax of XML;
- the message wrapper or envelope; and
- the business meaning of the information.

5.3.2 Syntax

At this stage, XML is not sufficiently standardised for the purposes of true interoperability because XML Version 1.0 is relatively loose and is interpreted differently by each vendor. To ensure interoperability among public service agencies, a subset of XML Version 1.0 should be defined for use within the architecture.

5.3.3 Message Wrapper

A standard envelope of metadata is required to route, store and manage information messages in transit. This envelope must contain sufficient information to ensure that the message gets to its destination successfully, can be audited, held where the recipient is offline, and repurposed or transformed if required for multiple recipients.

5.3.4 Business Meaning

Defining standards for the precise business meaning of the information being exchanged is a mammoth task given the volume and diversity of business information in the public sector. Consequently, it is suggested that a "just-in-time" approach is taken to defining standards in this area, i.e., the unique business information around a service will only be standardised as the service in question is made available online. This facilitates natural growth of the standard as more and more services are made available through the architecture.

5.3.5 Communities of Practice

To define a standard for an item of business information, it must be examined in the context in which it is gathered/created and the uses made of it. Communities of practice that define requirements and agree ways of dealing with them are well understood and extensively used in the fields of information and knowledge management. Communities of practice could also be established to develop the necessary standards and policies for semantic interoperability in their own domain, while complying with a common over-arching set of principles and guidelines to prevent the development of standards "islands". Such communities of practice would need to be capable of understanding and defining the information, terminology, associations, meanings, and rules for using the particular information.

5.3.6 Registration

Consequently, an agreed and managed process for the registration, detailed recording, and publishing of business items and codes or paired-values[7] that are common to more than one service is required. The definition of an item of business information must be consistent across the public service to ensure that no ambiguity exists among users of that information item. This could be achieved by –

- converting the definitions into XML schemas and associated metadata and rules using pre-defined templates and tools; and
- storing and publishing these schemas in accessible repositories/catalogues.

This would facilitate the development of systems/functionality that can consume and repurpose this business information for their own needs.

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[7] Codes and paired-values can be internationally defined elements of business information, e.g., IE=Ireland or they may be defined at agency or even service level, e.g., 1=Male, 2=Female etc.

5.3.7 Legacy systems

There are many legacy systems in use today that will not adhere to the semantic standards that are agreed, nor would it prove economical or efficient to re-engineer them. In such circumstances, the interoperability architecture must facilitate data transformation, e.g., if a legacy system uses "M" as a gender code for male then a thin layer of functionality can be developed to "translate" a standardised gender code of "1" to "M" as messages arrive and vice versa as messages are sent out.

5.4   Benefits

Benefits to this approach include -

- once, and once only development of each standard;
- once, and once-only registration in a standards repository/catalogue;
- no refitting of existing legacy systems to accommodate data because translations can be defined at a local level;
- elimination of ambiguity in business processes;
- the ability to identify commonality of data across agencies that may not be obvious at present; and
- the ability to prescribe these standards to the market when purchasing new systems.

5.5   Drawbacks

Some of the drawbacks to this approach may be -

- agencies unwillingness to commit business resources to developing standards (sometimes seen as part of the role of IT units);
- the need for constant monitoring to ensure adherence to the standards; and
- the overhead of standards maintenance to ensure currency.

6. Technical Interoperability

6.1 Principle

To support the interchange of data and use of system functionality in the provision of services, administrations should implement **a series of agreed technologies, standards and policies.**

6.2 Rationale

It is suggested that a reliable, always-on, technical interoperability architecture should be –

- **simple,** in terms of the number of components, i.e., the fewer components, the less there is to break and the easier it is to find those that do;
- **capable of linear growth,** i.e., as more agencies offer "services" in the form of information or functionality, a best-of-breed architecture would allow those agencies to join the system once and once only through a single, standardised interface;
- **interventionist,** i.e., it should allow for messages being monitored, managed, routed and intervened as they are en-route; it should provide auditing and reporting; easy location of problems; the ability to transform messages where required; the ability to route to multiple recipients, etc.;
- **loosely coupled,** i.e., all components should be clearly and cleanly separated, thereby allowing easy maintenance, reconfiguration, upgrade or replacement of individual components; it allows "best of breed" products to be used for each component without any interdependencies; it facilitates the separation of front-end technologies - that are subject to rapid and volatile changes in functionality - from back-end technologies that are more stable;
- **capable of supporting system and human interaction,** i.e., able to facilitate manual, semi and fully automated business processes and able to facilitate incremental movement of services from manual processing to full automation;
- **declarative** (i.e., providing all possible available information) **and interrogative** (i.e., providing a response to a specific question);
- **non-proprietary,** i.e., the information being processed through the architecture should not be dependent on the underlying technology as that locks the solution into the direction and format chosen by the technology vendor;
- **capable of supporting virtual services,** i.e., specially crafted services created using information/functionality from a number of disparate sources;

- **synchronous** (e.g., where a look-up of data is required before continuing in a process in a real-time environment) **and asynchronous** (e.g., a supplier provides information to the architecture once only and then goes about its business without having to wait to see that the information got to its destination/s, much like posting a letter/flyers); and

- **capable of being interconnected,** i.e., capable of linking to other scaled versions of itself.

From analyses and experience, it is suggested that a point-to-point or bilateral architecture (see Figure 4) –

- does not scale well as more and more bilateral exchanges are required and new connections are required for each additional "service";

- is costly to develop and maintain as each bilateral exchange must be "hand-crafted" to suit the applications involved; and

- does not easily accommodate the development of common or aggregated services, i.e., services that do not fall within the boundary of one single organisation.
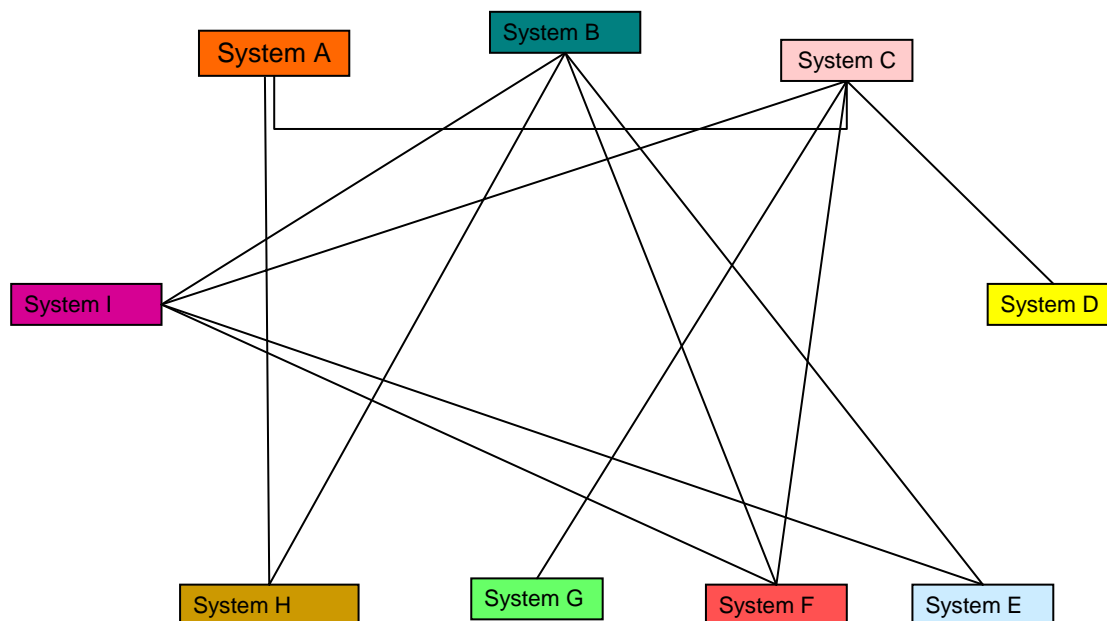
Figure 4

6.3   Possible Implementation Approach

Section 5.3.1 has already set out how XML should be used to describe the exchange of information between disparate systems, the content of information packets, and packet metadata.

The emergence of Web Services has defined a method of exposing the functionality of an application for consumption by another application/system. Although technologies and standards are still emerging around Web Services for locating, describing, securing, and transporting data, the most suitable underlying data format would appear to be XML.

An architecture using messaging technologies facilitates the reliable and secure transfer of data packets between subscribers. The concept of messaging has been around for a number of years in the ICT market and the technologies are considered at this point to be stable and mature.

Therefore, it is suggested that a technical interoperability architecture could be based on a messaging hub model (see Figure 5) that uses open, standardised XML for the exchange of information, supports XML-based Web Services for exposing application functionality, and manages and routes messages between all services that interface with it.
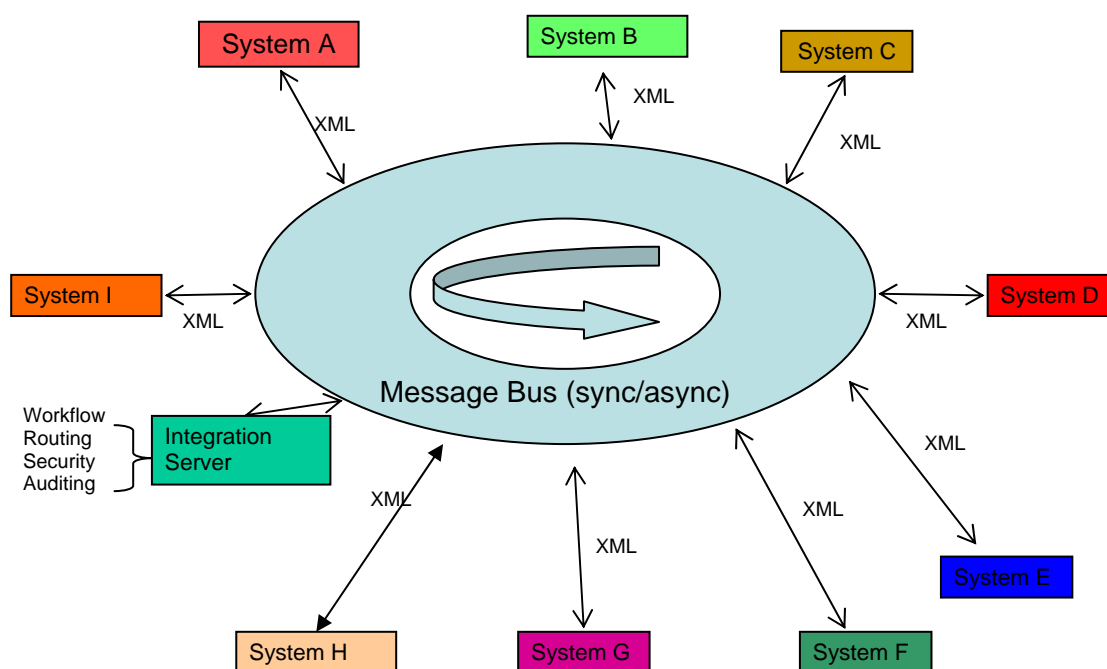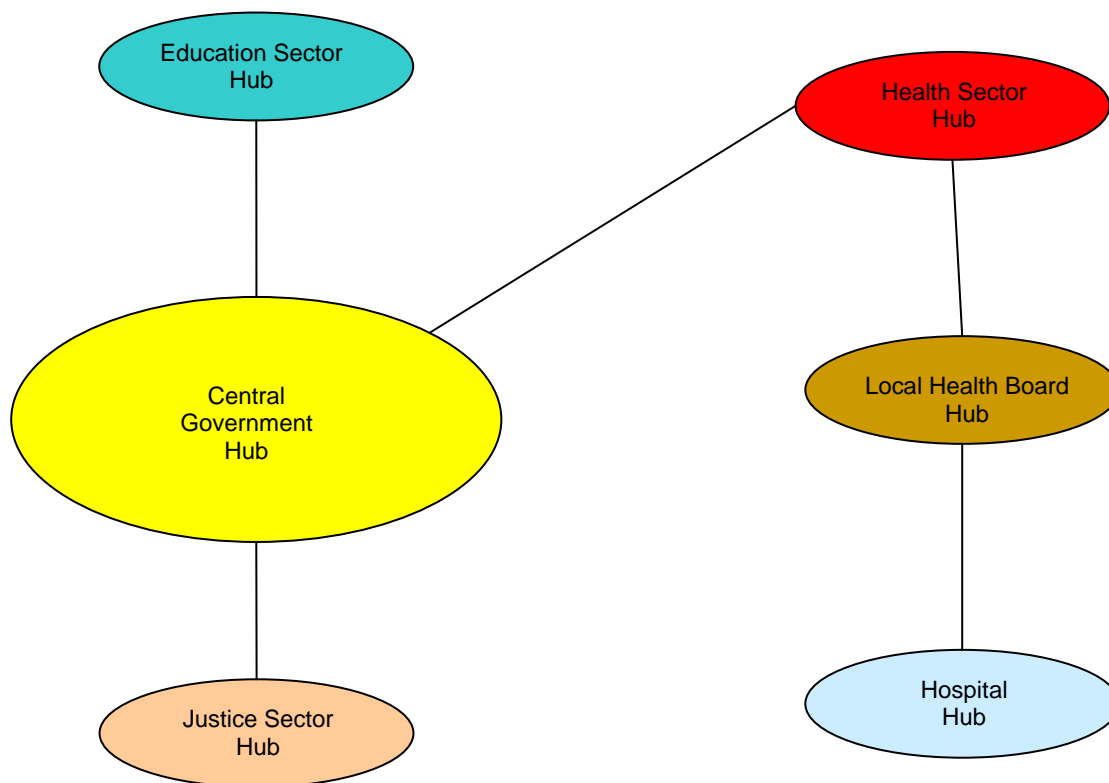

Figure 5

This architecture facilitates -

- all of the suggested requirements set out at Section 6.2;

- the ability to hook virtual services to the hub with changes to the functionality updated once and reflected in all business processes that use it; and

- the use of common or shared services such as workflow engines, rules engines, routing tables, common security regimes, authentication services, and auditing and accounting services.

Consequently, the core of the architecture is extremely light, facilitating maximum flexibility in terms of technology choices for all value-added functions and services located on the periphery of the hub.

Example of Interconnectivity

A large organisation may use an internal hub to connect all of its legacy systems. This hub would facilitate connection to a sectoral or central hub which in turn would connect the organisation to other organisations' or administrations' internal hubs (See Figure 6).

Figure 6

6.4   Benefits

The benefits of this approach include -

- a robust and scalable architecture;
- repeatable, and low-cost, development of local and sectoral hubs;
- no requirement to "rip & replace" existing legacy systems; and
- no technology lock-in to proprietary vendor solutions.

6.5   Drawbacks

Some of the drawbacks to this solution are -

- the initial outlay is high in costs and development time;
- the benefits may not accrue until enough interactions are in place; and
- it may be difficult to get vendor support for this approach as it cuts across traditional business/commercial models.

7.   Governance Regime

7.1   Principle

To implement a vision for eGovernment that achieves all of its objectives and is sustainable over time, public administrations must develop a **pan-public service governance regime.**

7.2   Rationale

Governance means taking authoritative control and direction of a process. Without a governance regime:

- each agency will continue to take an insular view of service delivery;
- although service delivery may be co-ordinated within an agency, there will still be no clear vision of what is required at a pan-public service level;
- the cost of development of technologies, standards, protocols and policies will be replicated across multiple agencies;
- each agency will be required to meet eGovernment targets solely from within their own budgetary constraints;
- new and innovative ways of working will not be easily identified; and
- provision of aggregated services to allow customers view service delivery from the "life event" approach will not be easy to achieve.

Therefore, because of the close interlinking of the technical, semantic and organisational aspects of interoperability, public administrations should develop a structured governance model. Within this model, agencies need to be identified to take responsibility for the different facets of interoperability.   This identification is dependent on the individual structures and policy responsibility assignments in each Member State.

7.3   Possible Implementation Approach

Technical and Semantic Interoperability Standards could be the responsibility of a single agency. Ideally, such an agency would be -

- separate from all sectoral domains to ensure independence;

- seen as expert in the field of interoperability to engender trust;

- capable of working as a collaborative partner with fulfilment agencies and sectors;

- pro-active in the promotion and promulgation of standards and their use;

- responsible for monitoring usage of and policing adherence to standards, guidelines, policies and protocols;

- singularly focussed on standardising and providing interoperability on a pan-public service basis; and

- an advisory body to fulfilment agencies in developing strategies and implementing solutions, to fulfilment agencies in coordinating cross agency aggregated services, and to communities of practice in setting and publishing standards.

This agency could also provide the architectural elements of common functionality (see ringed area of Figure 7), such as -

- customer contact centre/s;

- customer registration process & protocols;

- identity services;

- authentication processes & protocols;

- information services;

- forms services;

- C2G e-Mail;

- case management & status checking;

- search engines and indexing;

- multi-channel support including Web, DTV, phone, mobile;

- security regime including auditing & logging.

- workflow engines;

- rules engines;

- publish & subscribe mechanisms;

- central messaging hub;

- standards definition, registration and publishing; and

- service level agreements - for virtual services and with back-end agencies.
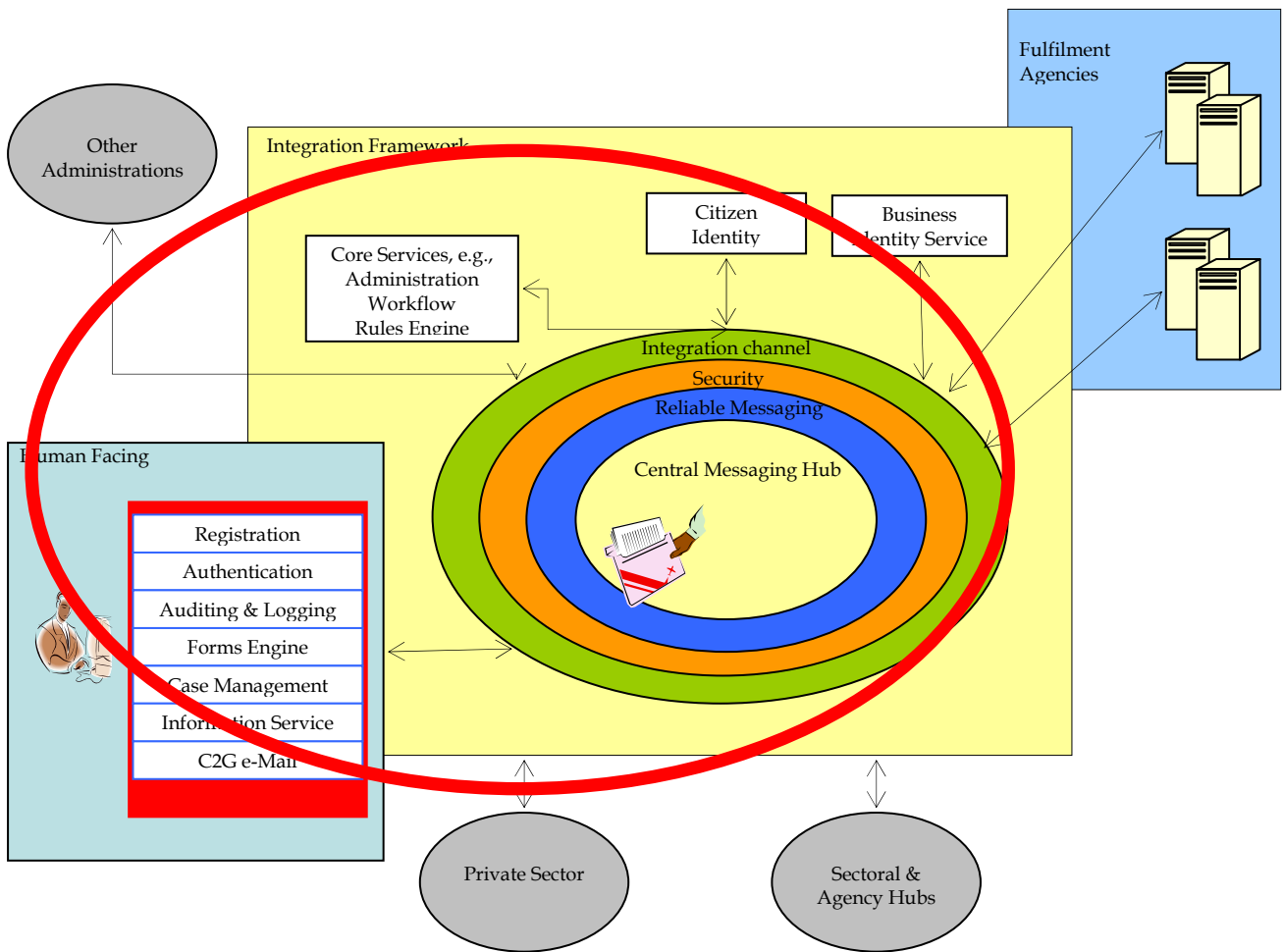
Figure 7

It should be noted that, although the agency would have responsibility for all of these areas, it may outsource the development and/or operation of any of them to other agencies (with that particular expertise) or to private sector entities. Depending on the prevailing legislative regimes in individual Member States, such a governance agency may need to be underpinned by primary legislation that defines its establishment, purpose, responsibilities, powers, accountability and redress mechanisms, as it may be assuming some of the legislative responsibilities of back-end agencies.

Responsibility for ***Organisational Interoperability Standards & Approaches*** may need to reside in other organisations. It is not possible to be prescriptive about this because of the different organisational structures in place throughout the public administrations of the Member States. Therefore, each Member State will need to individually identify which of its agencies is the most appropriate governing authority for each element of an organisational interoperability architecture. For example, expenditure reviews would, most likely, be the domain of the Government Ministry or Agency with policy responsibility for sanctioning project expenditure.

7.4   Benefits

Some of the main benefits of this approach are that -

- service delivery will have a pan-public service perspective;

- once off development of common functionality can take place;

- all agencies will have a shared vision of eGovernment to work towards; and

- standards can be maintained and monitored for their usage and adherence.

7.5   Drawbacks

The drawbacks to this approach could include -

- perceived loss of control by agencies over decisions relating to their business; and

- the need for high-level support from all agencies if it is to succeed.

8. Roadmap

Implementation of all of the principles of an Interoperability Architecture will take time and may require tailoring of the possible solutions to take account of legislative and/or organisational differences in each Member State. It would not be possible or prudent to develop and implement an Interoperability Architecture in its entirety as a single programme because –

- an Interoperability Architecture is not static - it will develop and grow over time as more services become interoperable and as administrations become more experienced in taking an interoperable view of service delivery;

- it would require a project management and resourcing programme of enormous proportions;

- it would introduce an unacceptably high degree of risk to the success of the programme and the effective operation of public services;

- the amount of analysis and design work required would effectively render the programme fruitless for many years; and

- the pace of technological advance is such that early decisions/assumptions would be overtaken before all conclusions could be reached.

Therefore, to minimise the risk inherent in the development of such an architecture, to ensure the undertaking is manageable, and to achieve early successes from which to build, it is suggested that a bottom-up approach is adopted using a small and tightly-controlled pilot. This would prove the concepts, provide the foundations of an infrastructure that could be expanded and enhanced, and help to initiate the thinking required to develop the organisational structures and responses set out in this report. The following steps are suggested –

1. Either a central agency with responsibility for eGovernment policy/operations or a public body with a pressing need and enthusiasm should voluntarily assume a governance, development and operations role for the technical and semantic aspects of the pilot. This agency/body would -

    - develop the infrastructure to define, register and publish the necessary standards;
    - develop a "light" technical messaging hub pilot; and
    - develop the business item standards in collaboration with the pilot fulfilment agencies.

2. Select a service requiring modernisation with the following traits –

    - at least two agencies involved in the workflow (preferably multiple agencies);
    - the potential to impact on multiple services and/or applications;
    - simple, in terms of the service being delivered to the citizen or business; and
    - data rich, in terms of the potential re-use of the information collected.

3. Develop a business case that quantifies the –

    *   improvements to customer service in terms of automation, speed of delivery, once only provision of data, convenience, cost (time and/or money) and channel of choice;

    *   potential re-use of the infrastructure, standards, procedures, policies and/or service applications developed during the project;

    *   potential re-use of the data collected for other agencies and/or services;

    *   benefits of using ICT in the delivery of the service in reducing errors via validation, ensuring accuracy due to once only entry, maintaining currency of data and providing historical and statistical information;

    *   potential cost reductions and/or return on investment; and

    *   potential agency-specific benefits through reduction in paper-based applications, availability of additional resources and ability to restructure additional services in a reduced timeframe.

4. Identify potential Organisational Development opportunities from -

    *   reduction in manual intervention in service delivery;

    *   removal or reduction of steps in a process;

    *   elimination of paper-based supplementary documentation;

    *   means of multi-channel service delivery and multi-channel payment methods;

    *   identification of common functionality across services;

    *   analysis and review of legislative and regulatory barriers to customer centricity; and

    *   change management approaches and issues,

    that could ultimately lead to the development of an exemplar scheme against which all other schemes could be benchmarked.

5. Operate, using the pilot messaging hub, for a period of time in parallel with the existing system for testing, accuracy, timing and usage acceptance benchmarking before switching to a live operation.

Developing this "fact-on-the-ground" would prove the technical and semantic architectural approach; would allow experience and understanding to be gained in developing re-useable standards; would highlight the organisational and governance issues that arise from such projects; and would provide a blueprint and infrastructural foundation for further developments.

Consideration should then be given to formalising the initiative by developing an Interoperability Policy, developing a strategy for the resourcing of the governance function, and seeking Government approval to proceed with the programme in accordance with the policy.

Appendix 1 – Sample Survey Results

A survey of 1,060 Irish citizens on their opinions of Government services revealed the following -

Question 1:

"What are the main features of a good quality service from a Government Department/Agency" – unprompted and with multiple answers from respondents.

Top 4 Answers:

Helpful Staff	*45%*
Ability to get what you want quickly	*36%*
Getting access to staff who understand your query	*30%*
Easy to get access to the right department	*8%*

Question 2:

"How important are each of the following in the provision of a good quality service?" – multiple answers from respondents.

	Important	Very Important	Total
Helpful Staff	*16%*	*80%*	*96%*
Easy to get access to the right department	*31%*	*64%*	*95%*
Getting access to staff who understand your query	*21%*	*73%*	*94%*
Ability to get what you want quickly	*27%*	*60%*	*87%*
Department having access to the documents needed	*33%*	*50%*	*83%*

Question 3:

"Which of these is the most important in the provision of a good quality service?" – single answer from respondents.

Top 4 Answers:

Helpful Staff	38%
Getting access to staff who understand your query	25%
Ability to get what you want quickly	12%
Department having access to the documents needed	6%

Question 4:

"How do you prefer to make contact with Government Departments or Agencies?" – single answer from respondents.

Telephone	*70%*
Visiting Office	*17%*
E-Mail	*5%*
Letter	*4%*
Depends on the query	*3%*
Don't know	*1%*