SOA Adoption in the Danish Public Sector
Part II – Main Report

Denne rapport er udarbejdet af analysefirmaet CBDI Forum for Videnskabsministeriet. Rapporten omhandler adoption af den service orienterede arkitektur (SOA) i den offentlige sektor i Danmark og skal ses som et bidrag til udviklingen af en egentlig SOA adoptionsmodel. Formålet med rapporten er ikke at definere en service orienteret arkitektur, men snarere at give et bud på en model eller et rammeværk som offentlige institutioner kan bruge til at styre deres adoption af SOA.

Det er vigtigt at bemærke, at rapporten beskriver et *udkast* til en SOA adoptionsmodel, hvilket betyder at indholdet ikke er fastlåst, men må forventes at undergå ændringer i forbindelse med validering og afprøvning.

Videnskabsministeriet
Februar 2006

CBDIReport

SOA Adoption in the Danish Public Sector Part II – Main Report

A framework for SOA adoption in the Danish Public Sector

ABSTRACT: ISK, on behalf of the Danish Public Sector as a whole, is concerned to mobilize an orderly, cost-efficient and effective adoption of service-oriented architecture (SOA) across the Danish Public Sector. The purpose of this report is to provide a generalized adoption model for Danish public institutions and a common frame of reference that will be useful for public sector institutions and related organizations to enable planning of adoption at the individual organization as well as identifying opportunities and requirements for collaboration.

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February 2006

Independent insight for Service Oriented Practice

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Section 1 - Introduction

Introduction to the Report

Introduction to the Adoption Model

The purpose of this report is to describe a Service Oriented Architecture (SOA) adoption model for Danish public sector institutions. The purpose is not to define a service oriented architecture, rather to provide a model or framework for public authorities and related organizations to guide their adoption of SOA including:

- stages and phases of activity
- approaches that may be adopted
- benefits/value at each stage
- capabilities and competencies required at each stage
- readiness assessment
- governance requirements

The framework aims therefore to provide a common frame of reference that will be useful for public sector institutions and related organizations to enable planning of adoption at the individual organization as well as identifying opportunities and requirements for collaboration and alignment on many levels ranging from standards activity to shared services.

The report has been developed with involvement from a number of Danish organizations and individuals and the authors acknowledge those contributions towards making the model relevant to the Danish public sector. However it is inherent in the nature of a framework that the models are a starting point rather than an end point, and are intended to be actively customized and further developed in many ways.

For this purpose the report includes a detailed SOA Capability Model which provides a basis for detailed and ongoing planning and coordination. The model has been provided both in tabular form in the report as well as in an Excel spreadsheet.

Readership

This Part II of the report is the detailed framework and assumes some general familiarity with basic SOA concepts. For a more general introduction see Part I – Summary Report

Background

SOA Opportunities

Service Oriented Architecture (SOA) is an enabling strategy. SOA is the sets of policies, practices and frameworks that enable application functionality to be provided and consumed as sets of services published at a granularity relevant to the service consumer that can be invoked, published and discovered, which are abstracted away from the implementation using a single, standards based form of interface. This architectural approach, which can be applied progressively to existing application and infrastructure environments, addresses important concerns for the Danish public sector enabling:

- a set of technologies and technical standards that enable invocation and management of runtime capabilities (services), and facilitate interoperability between systems and processes (and consequently between the organizations that use them)

- a policy-driven architectural design approach that guides the use of these technologies and standards to deliver and maintain an appropriate level of business, application and technical loose coupling, together with an appropriate level of standardization and flexibility
- a significant reduction in complexity through improved abstraction and encapsulation

When these elements are adopted together, SOA can be used to support the following strategies.

Opportunity	Importance from Danish Perspective
Standardization – facilitating standardization of many aspects of government including security, semantics, utility services and business process components such as case handling	High
Shared Services – removing duplication and inconsistency within and between sectoral "silos" of public services – delivering both cost reduction and process improvement	Medium
Service-Based Procurement – outsourcing appropriate operations in an efficient and flexible way to a healthy ecosystem of competing service providers.	High
Process Improvement - enabling a fundamental upgrade in process design	High
Joined-up Delivery – orchestrating complex services across multiple organizations (including public and private)	High
Government Transformation – introducing greater flexibility into the way the public sector is organized as well as the capability to utilize that flexibility for rapid response to continuous change	High
Citizen-Centric Services – providing consolidated departmental perspective to support citizen's based processes	Very High

Table 1 – SOA Opportunities

The Public Sector Ecosystem

The public sector is an ecosystem comprising largely autonomous departments as well as relationships with many non-governmental bodies including suppliers as well as other collaborating organizations. The service oriented architecture potentially enables enhanced collaboration between all of these parties on many levels. A key part of the SOA Adoption Roadmap is to discover what collaborations deliver increased value – which may range from collaboration on standards, specifications and processes to seamlessly integrated end-to-end business processes that span multiple organizations.

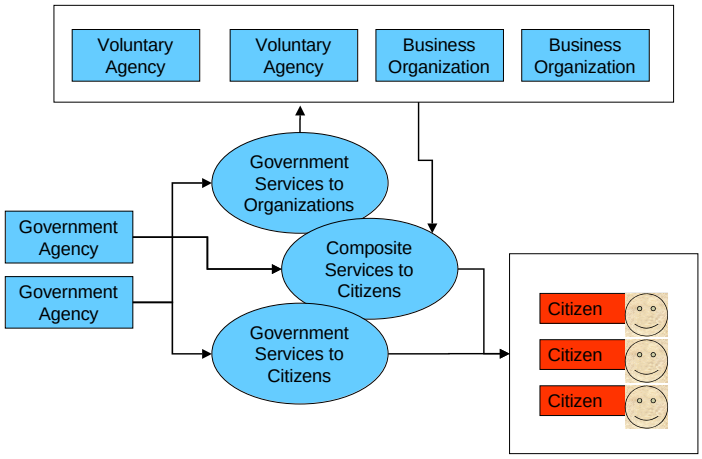

Figure 1 – SOA in the Public Sector

Joined-Up Government

Joined-up government is a major objective for the Danish public sector. Difficult issues such as social exclusion, drug addiction and crime cannot be resolved by any single department of government, but need a concerted effort combining several government departments, often central and local government plus public agencies and private and voluntary sectors.

Conventional approaches have emphasized inter-department integration, usually limited by available technologies that constrain joined-up government to the benefits available from improving interoperability and coordination within a single sector, or between sectors. Shared services can be orchestrated from the supply side – however, it is likely that the main benefits of this form of joined-up government will be delivered in the form of supply-side economies of scale, with no directly observable impact on the citizen.

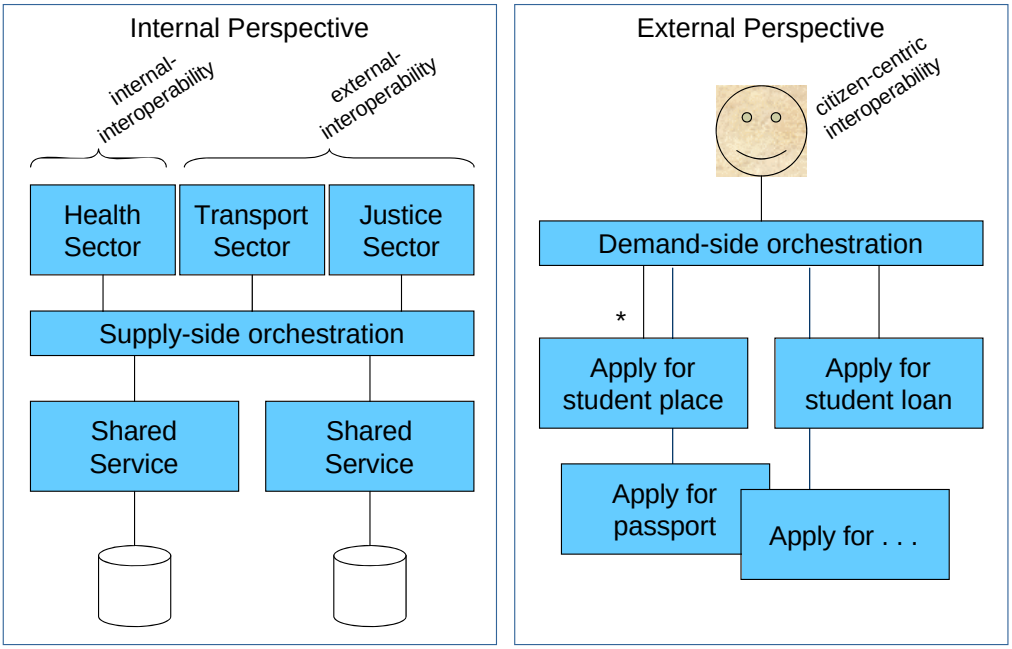

Figure 2 – Two Views of Joined-Up Government

Figure 2 illustrates this internal perspective but contrasts with the advantages of an external perspective that is driven by the overall business or citizen centric process in which joined-up government from the citizen's perspective provides the citizen with a joined-up experience of government and its services. Service oriented architecture brings the potential to orchestrate the consumption of government services from the demand side, and may be supported in doing so either

by government itself, or by appropriate independent agents. (For example, healthcare professionals may perform demand-side orchestration of healthcare services on behalf of a given patient.)

Shared Services

If we take the student/citizen viewpoint in Figure 2 above, we can see that there are various opportunities for shared services at different levels. There are some shared services within a single sector (in this example, we are looking at the education sector). And there are some opportunities for shared services across multiple sectors. For example, prisoner education requires collaboration between the justice department and the education department. And single-parent support may require access to childcare facilities (e.g. nursery) as well as university facilities. To provide a prisoner-student with a consistent and integrated service, it may be useful to have a single resource supporting the generic aspects of all kinds of applications (university, accommodation, parole, crèche) across many sectors.

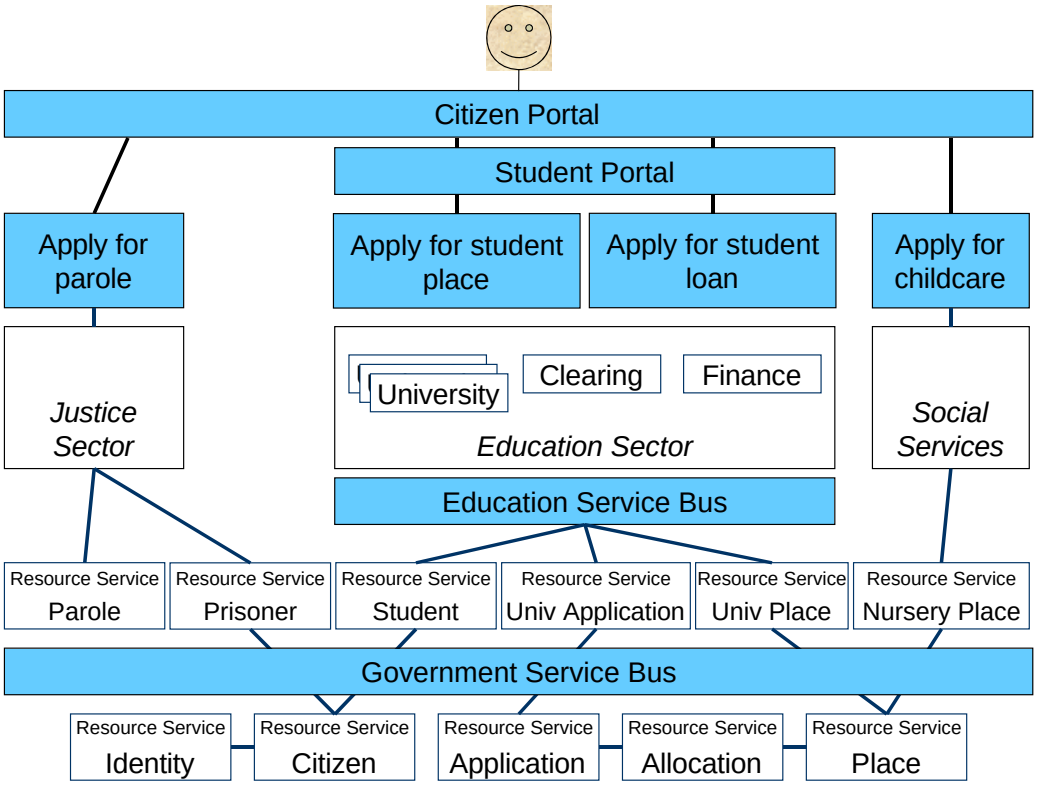

Figure 3 – shared services

In addition to business-centric shared services there are opportunities for a wide range of shared services at all levels covering technical infrastructure (for example identity and authentication, logging, transformation), and horizontal business services (for example generic customer services, process automation and case handling, Digital asset services, business analytics and back office services.

Danish Government Situation

Goals and Objectives

The Danish Public Sector is organized (as most governments are) into a large number of largely autonomous departments and agencies, with many and complex interactions between them. These organizations interact in turn with a wide range of external parties, including:

- citizens, residents and visitors

- companies and voluntary bodies
- other governments and international bodies.

There is a strong awareness of the need to change this de facto situation in order to create greater value for citizens, directly via on line services and indirectly via a more efficient public service. The transition to SOA is seen as a foundational component in the maturing of Danish eGovernment and digital services capabilities, moving from simple HTML pages and portals to integrated and seamless online services across organizations with full automation. At the very highest level we understand that Danish Government policy will be along the following lines:

- The public sector acts as an enterprise. There is coordination of policy that guides and manages appropriate levels of integration at all levels across all sectors.
- Systems must be loosely coupled. Departmental systems must be less department specific and act in collaboration with other department systems in order to optimize the pan-government view required to support both citizen-centric and joined-up government processes.
- Authorities shall only ask citizens or companies to supply information once. All other information must be pulled from other authorities – implying a profound change in processes across all departments and agencies.
- Each agency must expose their data and services using XML – creating a technology-independent abstraction layer that permits government transformation and process improvement.

There is a strong political imperative to implement citizen-centric processes. However it is widely recognized that this cannot be at the expense of government-to-government processes that are essential enablers of citizen centricity. Figure 4 illustrates a typical development sequence of events from which we may infer a generalized prioritization of needs. It shows that attention to quality and productivity issues is required in order to enable process improvement and transformation, which are in turn essential to support mature joined-up government and citizen centricity. So while it will always be possible to deliver narrowly focused solutions with the minimum of restructuring and infrastructure, it will be essential to manage greater maturity across a wide range of capabilities in order to deliver the complete set of reliable, consistent and flexible processes.

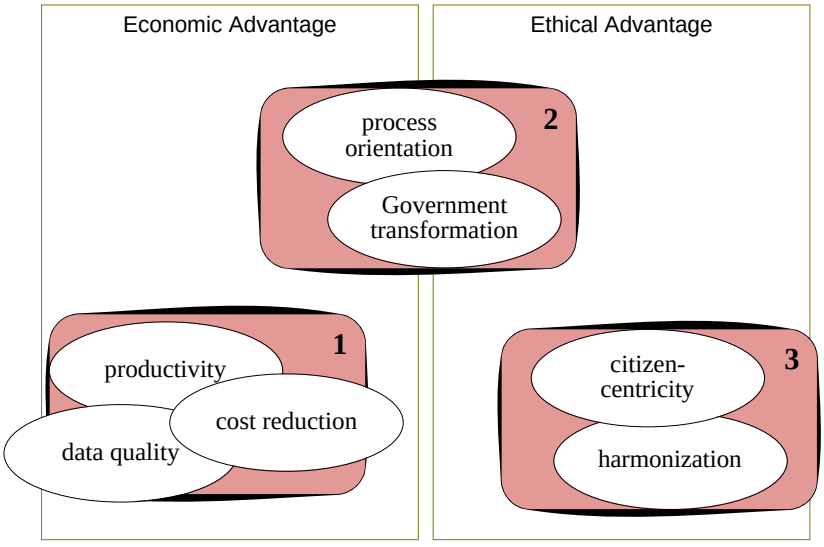

Figure 4 – Summary of Opportunities

Challenges

WHAT	WHO	HOW / WHEN
Architecture and Policy	Governance by Consensus	Planning Complexity
Open Procurement	Distributed Leadership	Coordination
Operational Complexity	Trust and Commitment	Change Management
Citizen / User	Ownership	Knowledge Management
Shared Business Services	Subsidiarity	Managing the Learning Curve
		Process Management

Architecture and Policy

SOA is the adoption of specific architecture and design policies that enable loose coupling and abstraction in order to support more flexible, standardized business processes. In any organization, regardless of whether private or public sector, there is significant challenge to set and implement policy that delivers on that promise. The problem is that there are inevitable tensions between architects and solution projects, between autonomous departments, and between central architects and lines of business.

Whilst adoption of common standards, specifications, semantics and services may be completely logical for the autonomous unit (project, department etc) it generally represents loss of control which also means increased risk, cost and timescale.

The Service Oriented Architectural task is often compared with the City Planning task, where a central group of planners establish policy over shared services (roads, transport, waste disposal, building) that set regulations for local development to take place with the minimum of central constraint, but using shared services wherever possible. To implement the city planning model requires a more formal split of accountabilities: enterprise architecture functions should have real power over who does what in situations that impact on the enterprise perspective. In the same way as city planners, the SOA enterprise architects should have real responsibility and accountability for development of policy and compliance practices for shared services. There are three primary challenges for the Danish public sector:

1. To empower architecture functions at all levels in the public sector in order to set appropriate policies in a manner that will be used pervasively without the level of legal obligation that is available to the city planners.
2. To implement a framework that enables the appropriate level of coordination and standardization at all levels of the public sector that facilitates the objectives of joined up, citizen centric government processes.
3. To implement mechanisms that ensure architects across the public sector can establish workable policies that meet both project-specific and broader objectives.

Open Procurement

In theory the move to SOA should, with greater loose coupling at all levels, increase choice and flexibility to procure products and services from multiple suppliers. Further it should allow coordination of procurement of shared services across departments and agencies in order to establish collaborative services in support of, for example, integrated citizen services. However to

ensure that this level of choice and flexibility is maintained, it will be necessary to create competition between service suppliers. Architectural decisions must avoid creating new forms of supplier lock-in.

The move to SOA will also require that the conventional single agency, project-based procurement approach changes to a multi-agency procurement of shared service.

Procurement agreements will need to incorporate important elements of architectural policy. While a service may be delivered as a fully encapsulated capability, the consumer of the service is extremely interested in the architecture underlying the delivered service. If for example a service is delivered by wrapping a monolithic application component, or that has extensive integration dependencies that dramatically widen the horizon of change, the time to upgrade the component will be radically different to one that has been implemented using a purpose designed component.

Operational Complexity

One of the opportunities of SOA is that it permits systems (and systems of systems) to be managed at a much finer level of granularity. While this potentially brings significant benefits in terms of greater efficiency and flexibility, it also increases the operational complexity of service management.

The SOA vendors are starting to introduce monitoring and control tools that help to manage this operational complexity. However, the tools alone are not enough. Service management requires a new set of operational skills – paying attention to an emerging set of operational issues – which the monitoring and control tools should support.

Citizen / User

While there is a considerable political agenda around citizen-centric services, there are some important concerns about an exclusive focus on the citizen.

1. Public services are provided to Danish companies and other stakeholders, as well as to Danish citizens. Public services are also provided to foreign nationals. While they are undoubtedly of primary importance within the Danish political system, Danish citizens therefore do not represent the entire user population.
2. In the provision of public services, there is an important role for the individual who interacts directly with the public, and who may be the primary direct user of any computerized service. This category may include not only government employees, but a wide range of professionals such as doctors and teachers.
3. We must also recognize that Government to Government (G2G or internally joined-up government) is often an essential prerequisite to citizen-centric services.

Shared Business Services

Early SOA projects in the Danish public sector have exhibited problems commonly found in many other environments. Without a strong business-driven architecture, projects generally follow a conventional approach to project scoping. This results in services that are unsuitable for sharing and inconsistent even within a department. Opportunities for wider use or longer term flexibility are not addressed because this is effectively outside the remit of the project.

The challenge for the Danish public sector is to establish mechanisms that enable projects to both contribute to and benefit from shared service activity. Initially this requires knowledge of the work of others, that might be gained from sector-level registry information and/or enterprise architects, but very soon requires process change in order to allow the project to enter into a trust agreement with a third party.

Governance by Consensus

SOA can deliver significant benefits in terms of business process agility and cost reduction. However this is critically dependent upon the architectural principles being implemented without major compromise. This requires a form of governance to be carried out to ensure that project delivery decisions conform to the principles. The way organizations apply governance can vary widely, ranging from mandating of policy to self regulation.

In every environment there are tensions between enterprise and departmental architects as well as between all levels of architect and solution project teams. Each group emphasized its own set of concerns and may not have the full awareness or expertise of the others.

In the Danish context there is a need to find mechanisms that combine consensus with architectural integrity, and it is likely the optimal solution to achieving consistency of policy implementation will be achieved by involving (at least) representatives of each constituency in policy setting and also in governance compliance reviews.

Distributed Leadership

A particular challenge in the Danish context derives from a cultural dislike for top-down command-and-control change management, and a strong preference for consensus. This means that a **distributed leadership** strategy is indicated, whereby the function of leadership is performed collaboratively rather than directed from the centre. However, one of the pitfalls of a distributed leadership approach is that the lack of top-down command-and-control management allows forceful middle managers to exert inappropriate authority. This will require the consensus-building teams recognize the formal responsibility, and that the wider organization acknowledges and complies with that accountability.

One way to achieve this level of collaborative leadership is to formalize the collaboration necessary between organizations and in Figure 5 we illustrate a useful technique for[1] managing collaborations that was developed by UN/CEFACT.

[1] Business Collaboration Framework from UN/CEFACT - The overall intent of the BCF is to provide a collaborative enterprise architecture; to take the Zachman principles and apply them to inter-enterprise collaboration, by defining a system of methods, models and patterns which form a standardized framework for guiding collaboration. Note the current status of this work is uncertain.

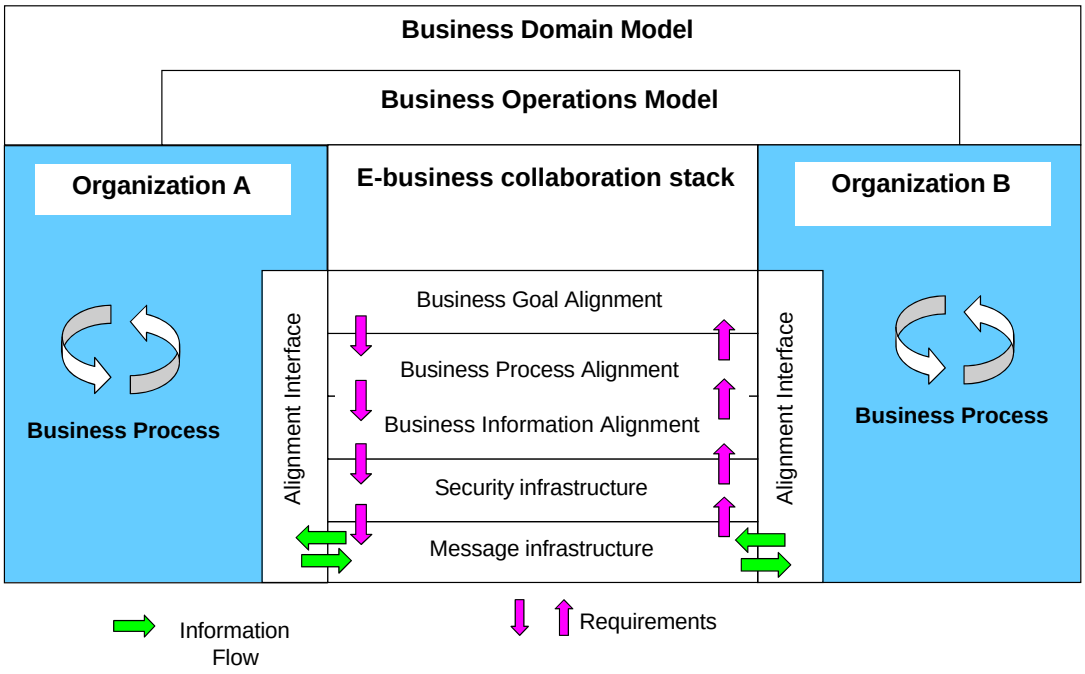

Figure 5 – Business Collaboration Framework (source: UN/CEFACT)

Collaborative working generally requires mutual obligations around particular tasks and deliverables. Inter-departmental trust allows collaboration to proceed on the assumption that such obligations are given and received in good faith. With an appropriate level of trust, such obligations can be managed on a less formal and more flexible basis, and this produces considerable administrative savings.

Furthermore, collaboration between autonomous or semi-autonomous agencies works best when there is a collective willingness to invest equally in the project – where investment may include not only the allocation of funding and other tangible resources, but also intangible resources such as political commitment and acceptance of risk. Inter-departmental trust supports the presumption that agencies are willing to play fair – taking a reasonable share of the cost and risk, in order to receive a visible share of the benefits.

Trust and Commitment

Similar to every public and private organization worldwide, there is observable in the Danish public sector a distinct lack of trust between departments and agencies. This has resulted in widespread duplication and inconsistency. A good example of this is in the customer management area where there are many different implementations of very similar functionality with reports of widely varying data quality.

Apart from the significant administrative and operational overhead this situation is a real inhibitor to collaborative projects and to the creation of the seamless end user experience.

The SOA approach of course provides a more formal service based interface that to an extent makes it easier to have looser coupled, cross-organization dependencies, and SOA best practice suggests that rich service specifications include commercial as well as technical specifications of obligations. However it will be an essential pre-requisite for SOA that organizational protocols are established in order to allow inter-department dependencies upon services.

Ownership

An SOA agenda of shared services brings ownership issues into the foreground. While some previous IT initiatives have introduced other forms of resource sharing – notably data sharing – the effective deployment of SOA calls for a much more comprehensive programme of sharing at many levels of abstraction.

Subsidiarity

Finding appropriate level of consistency and sharing of policy and services and infrastructure. The concept of subsidiarity[2] refers to the scoping level at which a given set of actions and outcomes are coordinated. Which aspects can be (or must be) determined locally, and which aspects can be determined centrally? Which aspects are managed at department level, or at sector level, or at national level? This calls for architectural thinking about management.

In the early phases of SOA adoption, the primary challenge may be to constrain departmental autonomy over some key issues. However, in the later phases of SOA adoption, SOA-based thinking can be used progressively to decouple public sector activity. Government transformation may sometimes reduce the need for tight synchronization between different processes, while technology and common standards help reduce the interoperability risks. Such changes may have the effect of empowering a degree of greater local autonomy and differentiation (diversity) against a common platform of shared services. This outcome becomes progressively available as the SOA adoption becomes more mature.

In Attachment 3 –SOA Capability Model, sets of capabilities are identified and defined. Against each capability there is an framework for defining the organizational level at which each capability should be established. In this framework report the suggested assigned levels are not intended to be accurate, but merely representative – to be refined to meet the needs to of the Danish Public sector.

Planning Complexity

In general terms, planning complexity arises because SOA adoption calls for a large and complex set of actions. If these actions are all tightly coupled, then progress becomes almost impossible, because everything has to be synchronized with everything else. (The German word for this is Gleichschaltung. Presumably there is a similar Danish word?)

However, there are significant dependencies between these activities, and all sorts of risks emerge if these dependencies are not adequately managed. The SOA Roadmap is designed to allow these considerations to be properly balanced – permitting effective progress with just-enough coordination.

In the Danish context, further planning complexity will arise because the obvious SOA strategy to increase the level of sharing (of many aspects of standards, practices and services) across agencies is likely to increase the level of consensus that needs to be reached, and risks creating a) longer lead times and b) the possibility of sub optimal solutions. This is further compounded by divergent levels of SOA maturity in different agencies that will make sharing more difficult.

So what's needed is a SOA Adoption Roadmap approach that allows each agency to understand where they are in terms of maturity level and to be aware of collaboration opportunities and risks.

[2] **Subsidiarity** is the idea that matters should be handled by the smallest (or, the lowest) competent authority. The Oxford English Dictionary defines subsidiarity as the idea that a central authority should have a subsidiary function, performing only those tasks which cannot be performed effectively at a more immediate or local level. The concept is applicable in the fields of government, political science, cybernetics, and the management of large organizations. Subsidiarity is, ideally or in principle, one of the features of federalism. From Wikipedia

Issue	Dependency / Risk	Pragmatic Approach
"Good Enough Standards"	In a complex world, models and standards and other products are unlikely to be perfect first time, but will require some iteration and improvement. Much of the business environment for SOA works on the principle of the "perpetual beta". A strategy of perfection – refusing to use something until it is absolutely final and frozen – can interfere strongly with progress and change. If you use version 0.9 of some domain model or standard – whether produced within the Danish SOA program or imported from elsewhere – then you have to accept a risk of rework when version 1.0 appears. But unless someone somewhere uses version 0.9, we may never get to version 1.0. But if everyone uses draft standards, of varying levels of quality and completeness, then we may not be getting the proper benefits of standards.	This leads to a strategy of carefully controlled working with draft versions of models and standards, which we shall find in both the architecture stream and the infrastructure stream.[3]
Authoritative services	Authoritative services (in other words, services that offer the authoritative source of some official information) depend on perfect implementation.	Similar to the previous point, with carefully controlled roll-out of good-enough implementations.
Market readiness	Can't get the economic benefits of traded services if a market doesn't yet exist. But if the market doesn't exist, how can the emergence of such a market be accelerated without some engagement?	The Danish government may have an important leading role in the creation of any market in Danish-specific services. Even if the scope is international, then the Danish government may wish to participate internationally in market creation.

Table 2 – Examples of Planning Complexity

Change Management

A key challenge is to introduce new ways of working that implement common practices and standards where it is appropriate that will facilitate economies of scale, sharing and productivity while retaining the autonomous nature of the autonomous departmental organization.

Most large organizations (and governments in particular) effect change by guiding and influencing the actions of others. People and organizations need to be enabled, encouraged and empowered to alter their behavior in ways that are orderly, coherent, and consistent with the overall aims of the change program. This is achieved by a number of mechanisms including the dissemination of policy and the allocation of resources.

The detailed roadmap for the adoption and implementation of SOA (See Attachment 3 –SOA Capability Model) within the Danish Public Sector identifies many of the areas of change that will be

[3] This comment is relevant only for areas with missing or immature standards. This is not meant to convey a requirement to experiment with well-established standards like the DS484 security standard.

required over time. The challenge will be to link these change areas together such that they are synchronized and form a natural evolutionary path which progressively delivers greater capability.

Within each stream, there are different levels of activity. Different aspects of the SOA adoption may be performed at agency level, or at sector level, or at local level. This requires coordination as well – so that the appropriate links are made between what is happening at the local level with what is happening nationally. For example, in the architectural stream, there will need to be defined links between the local architectural models and the common models.

Similar considerations apply when attempting to change the behavior of autonomous organizations. For example, if the Danish Government wished to create a healthy ecosystem of commercial providers within a given space, this would typically require enabling (perhaps this might include the exposure of internal government services for external consumption, as well as the specification of standards), encouraging (making it likely that commercial companies will receive a fair commercial return) and empowering (for example, lifting commercial or regulatory constraints). As before, the effectiveness of these instruments is enhanced when they are very roughly synchronized.

Knowledge Management

The idea that the Danish public sector needs to operate in some ways as an enterprise has an important impact on knowledge management. If the Danish government is to succeed in its ambition to rapidly deliver shared services and joined up government many aspects of the learning process need to be coordinated in order to establish a common frame of reference. If this doesn't occur, then perhaps every department and agency will be establishing its own approach to service architecture and design. Radically different practices may be put in place that will inhibit everyday processes such as service requirements specification, change management or service level agreements.

SOA is possibly somewhat different to previous changes in the IT environment where it is important to ensure that there is widespread agreement on the basic reference model (what concepts), the processes (what needs to be done) and foundational elements that enable sharing and inter-departmental collaboration.

Managing the Learning Curve

Each capability carries a learning curve, with early, mainstream and late adopters. Across the Danish public sector, there will be some agencies that are early adopters for a given capability, while other agencies may be able to defer this capability until other parts of the Danish public sector have already established some capability and experience. This pattern of technology adoption is entirely normal. The early adopters take a higher risk, in return for earlier access to the benefits. The risk for the mainstream adopters is significantly reduced – but this is largely dependent upon good transfer of knowledge and know-how from the early adopters to the mainstream.

A typical pitfall of technology adoption is that there are some relatively small organization units that are natural early adopters of all kinds of new technology. These organizations will typically run pilot projects, and experiment with SOA. However, there is often a gulf between these early adopter organizations and the mainstream. The issue with SOA is that early adopting activity will frequently not conform with architectural standards at business and technology level, and that the opportunities for downstream collaboration may be severely limited. On the one hand the government as a whole needs experience of SOA and therefore will want to encourage early adopting activity, but any costs of retrofitting architectural integrity will come at a price that probably no-one will want to afford.

The challenge for the Danish public sector will be a) to advance its architectural work on a narrow path such that it can provide at least minimum necessary advice on enterprise wide (department/sector) policy, and b) to persuade the early adopting project teams and their

stakeholders to collaborate with enterprise architecture activity concurrent with project level specification work.

Process Management

In common with many enterprises the Danish public sector does not have a mature capability with process management. Processes are designed at departmental level, there is limited process documentation and there is limited understanding of the requirements or opportunities for joined up and or citizen centric processes.

SOA activity should be driven by a good understanding of the business. A pre-requisite therefore for service design that will enable widespread sharing will be thorough analysis of the process requirements. We stress also that this is NOT simply documentation of today's processes, but a deeper analysis of the requirements for the future.

Section 2 - SOA Adoption Planning

Federated Approach

Adoption of SOA across the Danish public sector cannot be orchestrated in detail from a single central planning point. Instead, we present a roadmap framework capable of supporting the following connected activities:

Each public sector organization or agency may plan, manage and control its own SOA adoption.

Private and voluntary sector organizations with high public sector interoperability requirements may plan, manage and control their own SOA adoption with reference to the public sector adoption framework

SOA adoption can be coordinated between multiple organizations and agencies

Provision of a 360-degree big-picture view of SOA adoption across the whole Danish public sector

For the purposes of this report, we shall refer to all relevant government departments, organizations, organization units and suchlike, whether public, private or voluntary, as agencies. We shall use the term “organization” to refer to the management structure of any such bodies, or to the structure of collaborations between several such bodies.

Managing Maturity

An essential focus of SOA adoption is the acquisition of capability. Each agency has a series of capabilities that are relevant to the adoption and effective use of SOA. The level of capability affects the outcomes that can be achieved and/or the risks attached to the achievement of a given set of outcomes. Capabilities are assessed at different levels of maturity[4]. Higher levels of maturity indicate that more ambitious outcomes can be attempted at lower risk.

No technology change is completely without risk. The point of the maturity model is to support reasoning about the complex trade-offs between risk and reward, An agency may be directly responsible for enacting some aspect of SOA adoption, or may be responsible for enabling, encouraging or empowering some other agency or agencies.

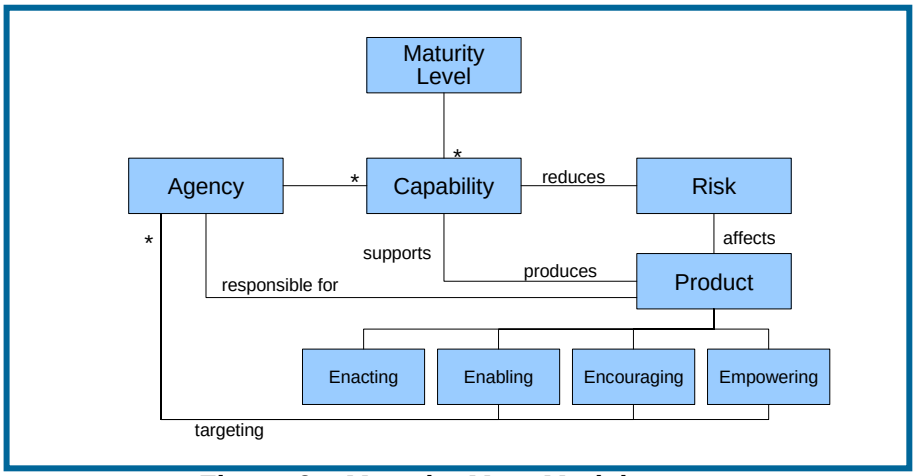

Figure 6 – Maturity Meta Model

[4] Capability maturity is an established technique for process improvement developed by the SEI. See Capability Maturity Model® Integration (CMMI).
http://www.sei.cmu.edu/cmmi/adoption/pdf/cmmi-overview05.pdf

Phasing Strategies

The maturity levels in an adoption roadmap can be considered analogous to a computer game, in which achieving certain intermediate outcomes “unlocks” further options. In the case of SOA adoption, each maturity level releases higher levels of funding and other resources for more ambitious projects, and generates political support for more wide-reaching organizational change.

Phase/Level	Project Focus	Service Deployment Emphasis
1 Early Learning	Technology	Mostly internal Low-risk external Using existing security mechanisms Not mission critical Focused on better application integration
2 Integration	Shared Services	Business process oriented Project level implementation Mostly internal usage
3 Reengineering	Joined-Up Government	Enterprise level, with common services used right across Danish public sector Services implemented as an integral part of business products Supported by guarantees and standards based measurement and monitoring systems Enabled by a wider selection of available services both inside and external to organizations
4 Cultural Integration	Government Transformation	Services are ubiquitous Federated services collaborate and create complex products with individual services provided from potentially many providers Services are designed to support the citizen in their ecosystem, not in a company specific system or service Many business services may have become pervasive standards

Table 3 – CBDI Maturity Levels and Roadmap Phases

Key Dependency Analysis

Tracing the dependencies between capabilities allows us to perform a number of key coordination planning tasks:

- Identify preferred sequence of adoption activity
- Visualize the prerequisites for a given SOA goal
- Identify and manage risks of sequence variations (i.e. implementing a capability before all the prerequisites are in place)
- Assess the importance of a dependency, and an acceptable tolerance level. (This is sometimes dependent upon the style of governance – a more interactive and collaborative style of governance may be able to tolerate a less formal approach to capability dependency.)

Figure 3 and Figure 4 show extracts from the capability dependency models relating to two of the identified SOA goals. These reference the capabilities defined in Attachment 3 –SOA Capability Model.

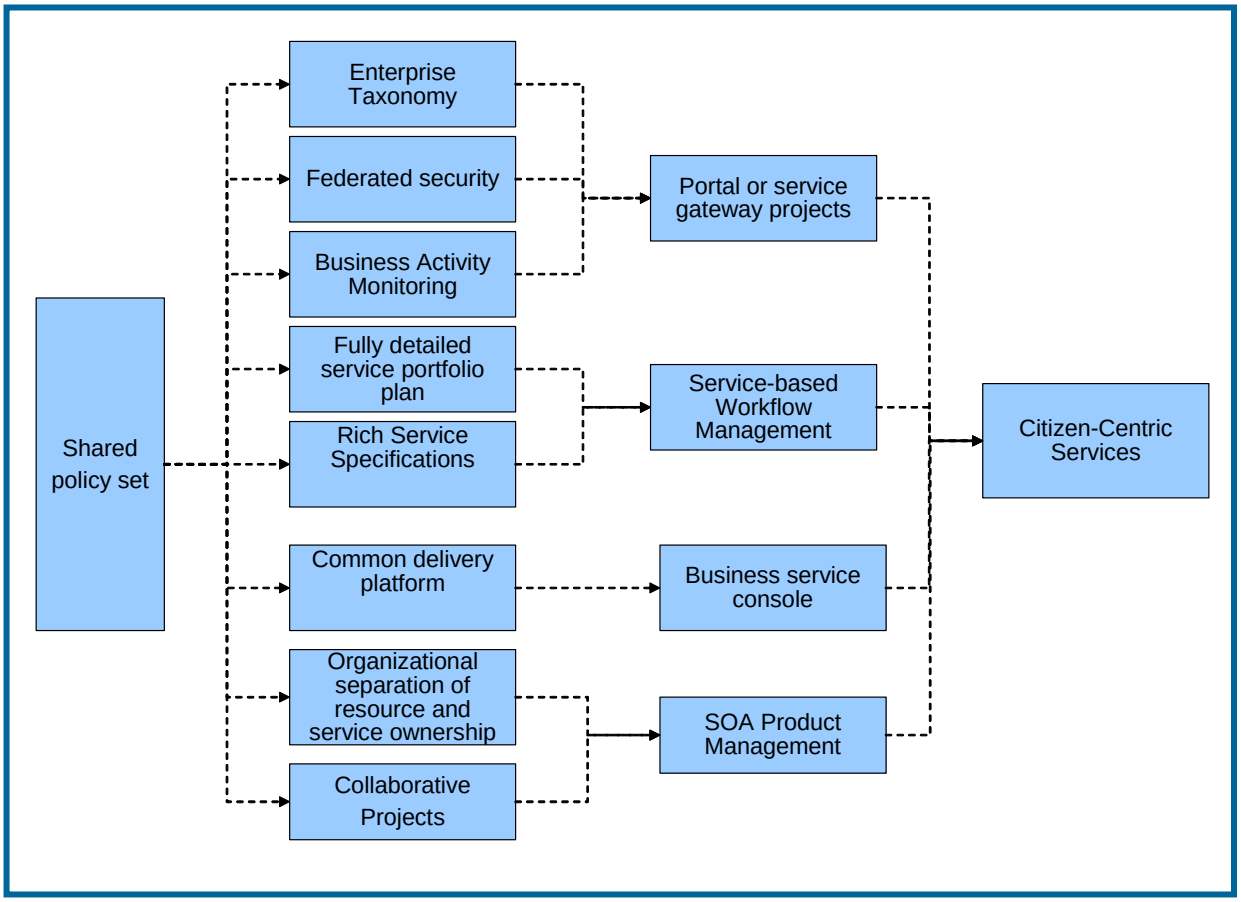

Figure 7 – Capability Dependency Diagram: Shared Services
(Illustration, not intended to be exhaustive)

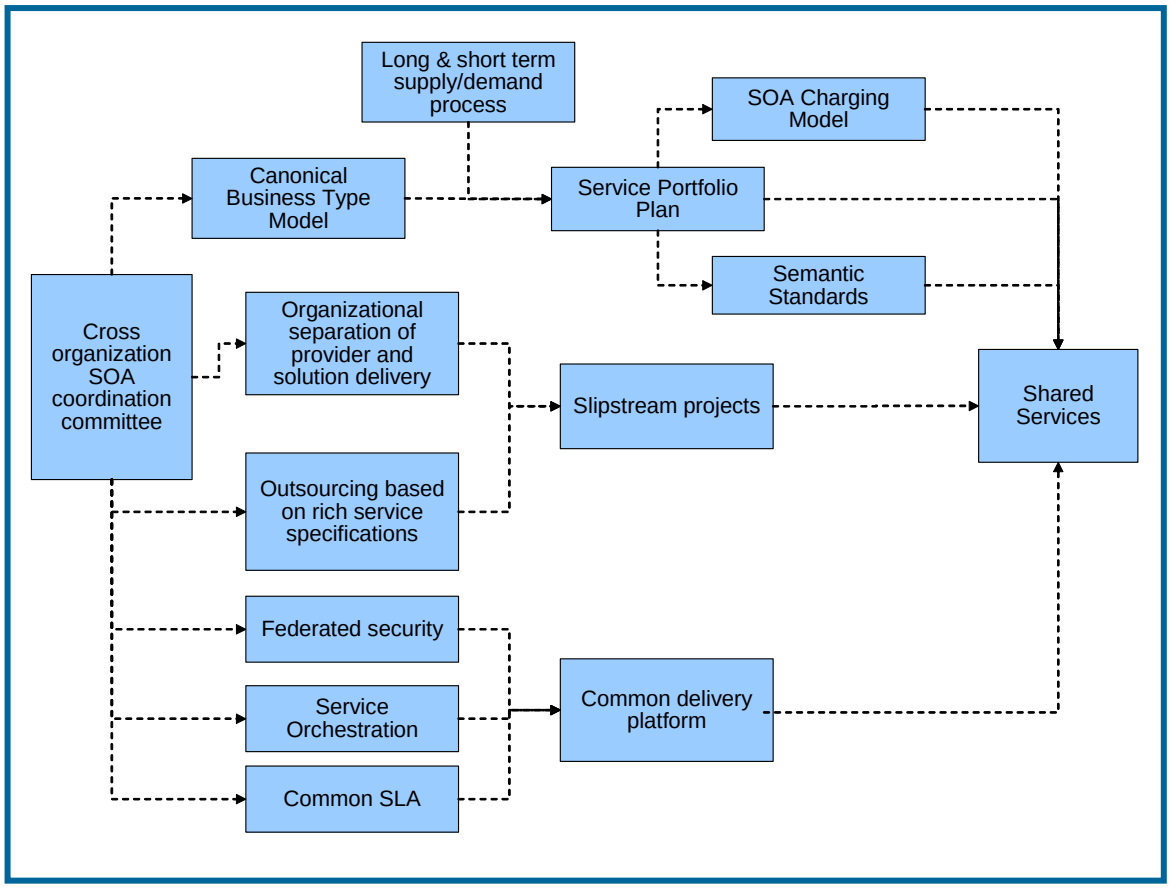

Figure 8 – Capability Dependency Diagram: Citizen-Centric Services (Illustration, not intended to be exhaustive)

There are two ways of reading, interpreting and using these capability dependency diagrams. If the arrows are read as logical prerequisites, then diagrams like these show how much has to be done (on the left hand side) before you can attain your goals (on the right-hand side.). But if the arrows are read not as absolute statements of logic but as relative statements of risk, then these diagrams show how much can be achieved how quickly (on the right-hand side), with an acceptable level of risk, based on good enough preparation and groundwork. Furthermore, the diagrams provide a basis for subdividing the goals, based on a differential notion of risk, to the extent that the dependencies themselves vary according to context, as shown in Figure 9.

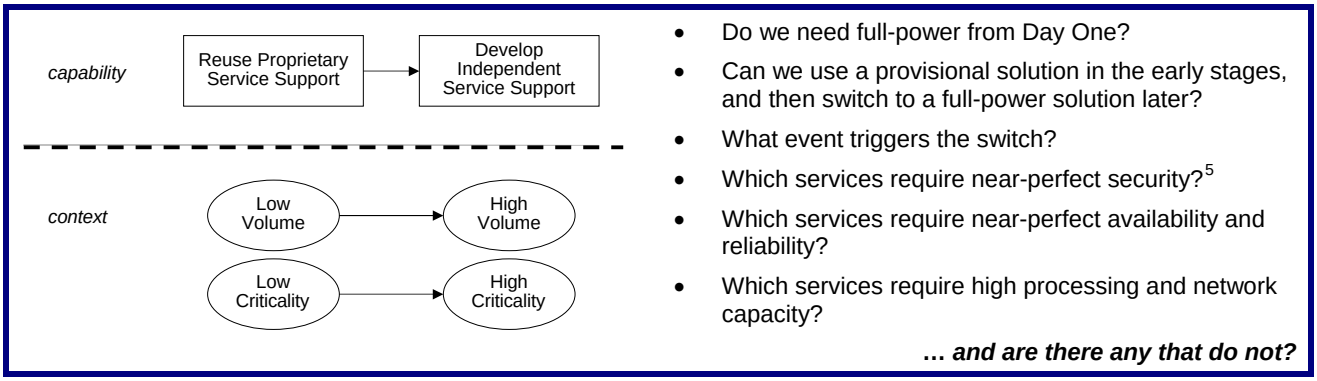

Figure 9 – Dependency varies with context

[5] Note this and the following contextual question would in practice be aligned with the DS484 standard

Thus it is often possible to segment the adoption programme, and find some places to start that can be based on “good enough” infrastructure.

Managing the Federation

To achieve interoperability across a large and complex federation of public sector organizations, we need some formality in defining the federation, together with multiple levels of enterprise architecture (departmental and public sector), showing different potential levels of sharing. Large sectors (such as Health and Transport) themselves typically involve multiple organizations.

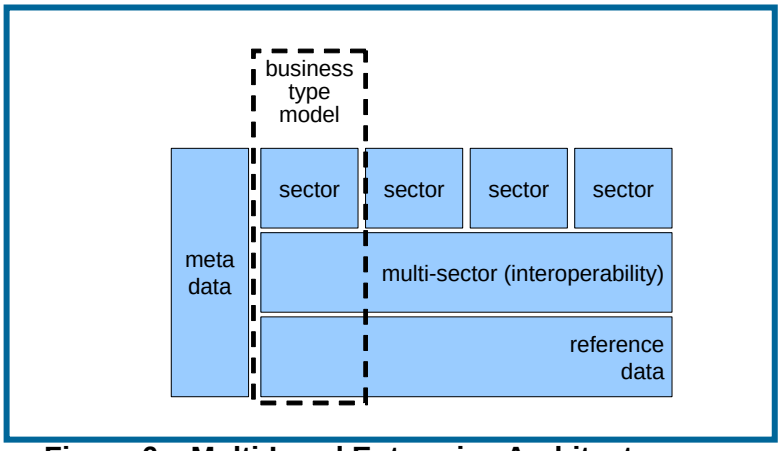

Figure 6 – Multi-Level Enterprise Architecture

The principle of subsidiarity is highly relevant to SOA adoption, given that SOA principles support the decomposition of government function into autonomous services. Subsidiarity requires decentralization of governance, subject to the following four criteria:

Criterion	Explanation	SOA implications	Architectural implications
Sufficiency	Only take something upwards if a smaller unit cannot deliver the requirement. Help is required from a larger body.	Interoperability and shared services cannot be achieved by unilateral bottom-up action, but can only be achieved by coordinated top-down action.	Metadata and some reference data are centralized on this principle
Benefit criterion	The larger unit can achieve greater benefits than the smaller units.	Shared services across multiple sectors may achieve greater economies of scale than within a single sector.	Interoperability standards are coordinated at least up to the sector level, and possibly to the trans-sector level, on this principle.
Power-to-the-edge criterion	Keep decision-making close to the citizen.	Where some degree of variety and customization is essential to delivering high quality services to the citizen, then the activity should be mobilized at the local level.	Business type models can be customized to the particular local requirements.
Autonomy criterion	The larger unit should be continually focused on increasing local articulation.	Under SOA, central initiatives such as interoperability standards are justified in terms of the potential for greater agility and adaptability in the provision of services at all levels.	The models are articulated to allow for high levels of flexibility in accommodating ongoing change.

Table 4 – Criteria for Decentralization of Governance

Stream Strategies

The stream structure consists of eight topic areas providing an organization-independent decomposition for more detailed identification of process, infrastructure and technology capability. For each stream/capability area we will identify strategic choices and key dependencies both intra and inter stream.

Given that each stream has a different set of concerns and tensions, conflicts may be expected to emerge in the interactions between the streams. This is a perfectly normal phenomenon; the provision of a governance structure for each stream, together with a governance structure for the roadmap as a whole, will allow such tensions and conflicts to be properly contained and resolved.

As an example of a possible area of conflict, it is possible that the Architecture stream will be eager to impose a broad range of policies as early as possible, while the Organization stream and the Projects stream may be reluctant to overload projects with too many new policies at the same time.

While the Roadmap framework provides a sound basis for reasoning about the general timing of such matters, there will still be detailed issues that will require ongoing local consideration and fine-tuning, involving negotiation between those responsible for the different streams.

In this section each stream is discussed and candidate strategies identified. Note a more complete list of Capabilities is included in Attachment 3 –SOA Capability Model.

Stream	Focus	Description
Management	WHY	Driving and coordination of the whole adoption program.
Architecture	HOW	Alignment between the demands of the organization (WHY) and the constraints imposed (via Policy and Process) over the Projects (HOW).
Infrastructure (operational)	WHERE	Creating the technology platforms and standards (WHERE)
Infrastructure (service lifecycle)		
Process	WHEN	Alignment between the Infrastructure (what the technology is capable of) and the Projects (how the organization is using the technology)
Organization	WHO	Developing the individual and collective capability, through assignment of role and responsibilities.
Projects	WHAT	WHAT is being done that uses the SOA technology within the SOA organization

Table 5 – Stream Definitions

Management Stream

The management stream is a focus for steering the introduction of SOA. This is particularly important in a public sector environment where there is a requirement to have both accountability and governance over expenditure of public funds. In the early stages it is often appropriate to assign a fixed budget for experimental activity, which is otherwise uncontrolled. This is appropriate

for areas of innovation, but the role of management should be to ensure that SOA activity is not compromised by existing management practices and vice versa.

It is all too common to see SOA projects being delivered using conventional funding and project management arrangements, which generally result in failure to deliver on the SOA objectives, and possibly the entire project. So from the outset it is vital that the business case is understood and communicated in a manner that the SOA objectives are thoroughly integrated into the project plan, and not compromised because they are seen to be optional.

A key part of this management activity is to ensure visibility through communication of ROI and the business case, management reporting and public relations.

It will then be important to develop metrics and management reporting systems that provide the feedback corroboration of the business case. There may be a strong case for coordination across agencies in the development of business case and metrics to present a consistent and comparable business case.

Candidate strategies:

- Should be done on a major agency level – e.g. Ministry of Finance. Not practical for each agency to do separately – must cooperate inter-agency.
- Experimental funding scheme coordinated at sector level to stimulate learning, practice development and development of shareable deliverables in specified areas, with coordination to avoid unnecessary duplication.
- Inter agency coordination committee for metrics development, monitoring and communications.
- Publication of general guideline on good management practices relating to steering, funding, monitoring and control.
- Publication of general guideline on good management practices relating to project and program investment and charging.
- Experimental schemes (proof of concept) – already done but with limited economic resources – management should consider founding experimental schemes – advantages: low budget, discovery of weaknesses, avoid mistakes which can be more expensive in large-scale projects, gain experience.
- Example: education and institutions: master data repositories – proof of concept demonstrates interoperability between repositories and how these can provide services to the ecosystem.
- Active participation and support from management requirement - for example semantic standards - enabling sharing - political-level push to reinforce initiatives. Semantic consistency is a strong supporting facility for citizen services and joined-up government--ties into a big objective - therefore shouldn't be difficult to find a political champion
- The recent introduction of the E-invoice provides a useful point. This initiative wasn't popular in the private sector - therefore required political commitment to implement. E-Invoice requires pushing from Ministry of Finance. The general lesson from this is that we need to know how we tie all these organizational and technical strategies into the political level

Architecture Stream

SOA is a set of architectural principles and the creation of an understanding of those principles as they apply to an organization is an essential pre-requisite to almost any other SOA related activity. An SOA reference model is needed to establish a practical nomenclature to allow all SOA related activity to proceed with common understanding and communications. In the public sector

environment it would be sensible to establish this across the ecosystem of suppliers and other involved parties.

The fundamental objective of SOA adoption is about an appropriate level of standardization in order to facilitate agility. The potential for cross agency use of architectural deliverables at multiple levels is an important topic for exploration at an early stage. While the agencies may historically have collaborated on many matters, the projects will generally have been delivered in isolation. In the SOA environment this is less clear, and a shared approach to architectural development in the spirit of discovery will be an important strategy to adopt. It will be natural and immediately productive for agencies and suppliers to collaborate on technical standards. However other areas include semantic standards, canonical models, architectural policy, portfolio plans, contract templates and mode. (see the architectural section of Attachment 4 – Capability Model for details).

An SOA reference model is needed to establish a practical nomenclature to allow all SOA related activity to proceed with common understanding and communications. In the public sector environment it would be sensible to establish this across the ecosystem of suppliers and other involved parties. The development of the service oriented architecture will focus on:

1. Development of policy frameworks that may be used pervasively throughout the public sector or an agency, either as standards or as a basis for departmental customization.
2. Identification and adoption of subsets of the policy frameworks as standards that may be adopted by particular constituencies in particular contexts.
3. Development of service portfolio plans at sector and agency level.
4. Identification and planning of shared services for adoption as standards for particular constituencies.

Candidate strategies:

- Working party to develop sector level SOA Reference Model.
- Inter agency architectural working party or committee to guide and coordinate development of SOA architecture and to recommend areas for collaboration, joint investment and or standardization. Candidate groups may include:

    Technical standards

    Semantic standards

    Data or business type harmonization

    Architectural policy development

    Contract and specification templates

    Governance practices

- Early identification of key shared services at sector, agency and sub-agency level to drive prioritization of service architecture work.
- Good practice - already have many domain committees that manage XML schemas. (Don’t want to proliferate committees - reuse existing committees.)
- Architectural “tax” for projects - 10% surcharge for architectural work. This entails some work on the accounting and accountability of architecture – for example what is the ROI on the architectural investment?
- Need really good metrics and forecasting - forecast the shape of projects to come.
- Develop business models by sector.

Operational Infrastructure Stream

In the early stages of SOA it is often sensible to constrain investment by developing basic minimum infrastructure capabilities. In many cases an organization will already have vendor products and platforms installed that offer some services support capability and it is expedient and effective to reuse this capability. Whilst there may be shortcomings these are rarely a problem in the early stages where volumes and criticality are low. At some point, as volumes and criticality increase, it will be necessary to make the transition from reusing third party capability to developing autonomous / independent capability.

The opportunity for shared infrastructure in a public sector environment is potentially very high. In the early stages of SOA it might seem easier to implement for example ESB capabilities at a departmental level. However implementing inter agency shared capabilities from the outset might be a sensible strategy – to standardize the infrastructure capabilities across agencies to deliver reduced cost, before agencies need to implement shared services which introduce a further level of SLA related complexity.

If a shared service infrastructure cannot be adopted it will be important to establish standards for ESB integration including management policies to enable inter-agency processes.

Whether agencies share a common infrastructure or not, there will be opportunity to share and make single investments in at least the infrastructure specifications of specific services such as security. Making a single investment in mission critical areas such as security will

Candidate strategies

- Base early learning activity on existing products and platforms
- Implement basic ESB capability to support multiple agencies

  Establish common, federated security services and necessary infrastructure
- Establish other common, federated infrastructure services including logging, transformation, events, etc
- Implement basic services management capabilities such as monitoring and alerts
- Phase advanced service management such as policy-based, SLA-based management, correlation of service and system management on a need basis
- Standardize ESB policy usage in the early stages to allow transformation to federated ESB environment and common delivery platform as shared services become widely used
- Establish common SLA standard to allow end to end management of inter-agency processes
- At the agency, standards should be adopted - should be established somewhere else
- Establish an inventory of services (instances, providers) at an early stage of the adoption to know where they are implemented (in what applications). Understanding that probably you will have the same service implemented in a number of different applications. Which means keeping track of who has implemented (a version of) this service.

Service Lifecycle Infrastructure Stream

In this area the vendors have done a good job of developing tools that create profile compliant services shielding the developer from the underlying technology complexities. However as the organization becomes more mature in SOA the emphasis shifts from service development to high levels of reuse and service assembly of both custom and commodity services.

At the Roadmap Integration Level there is a strong focus required on managing the service lifecycle from inception as a reusable asset to publishing an invocable service. Asset management is particularly important because of the need to manage asset dependency. There is also a significant exercise to populate and or validate the accuracy of the existing systems contents of an asset repository to support service change impact analysis.

Some organizations may delay implementation of the registry capability, however this is not recommended because the registry, together with the asset repository, plays an important part in governance compliance.

In a federated environment the registry plays a primary role in providing service discovery and usage management on a wide area basis, either as a central or replicated architecture. What will be useful is for basic classification standards to be established that will facilitate discovery.

Candidate strategies

- Early implementation of Service registry capability that provides additional governance processes to manage compliance
- Federated registry implementation to support inter agency shared services
- Establish standard for Service Lifecycle to enable common level of governance activities across agencies
- Establish standard for Rich Service specifications to facilitate sharing
- Establish Common asset specification (based on RAS) to allow higher levels of inter-agency sharing
- Develop frameworks and patterns to enable customization and change of services with minimum impact.
- Need to define standards - we always seem to be on version 0.9. Need versioning standards. Coordinating selection and use of standards – standards profiles.
- Important to have standard for measurement – e.g. measurement of service quality – like to have some tool and tool-competencies – and these should be in the platform – need workflow management tool within platform
- Need to get proof of concept of SOA applications – vendors may exaggerate their capability

Organization Stream

The focus of the organization stream is on how roles and responsibilities may need to change in line with the adoption of SOA. Roles and responsibilities may change because the shared nature of services requires separation of organizational concerns that correlate with separation of capabilities. This realignment may occur within agencies and inter agency.

An important device to manage this process is some form of cross organization SOA coordination committee. The charter of this committee is primarily non technical, to manage the SOA adoption process in a culturally appropriate manner, ensuring the right parties are involved in establishing shared policies, infrastructure and so forth at all levels (sector, agency and sub-agency). In many organizations there is a similar body already in existence, and it may be possible to extend the remit suitably, or alternatively a new body may be required.

While many aspects of information solution delivery move to a more federated state, some functions will centralize. Experience from several major corporations suggests that centralizing existing integration functions is an important strategy that will enable rationalization of poorly structured, existing point to point integration contracts.

A key change in organization is the separation of shared service provider and solution delivery projects. This separation may also be a key boundary for procurement, forming the point for contract, allowing different suppliers to deliver the shared services and the solution assembly, thereby enforcing separation of concerns using rich service specification contracts in a formal, technical manner, that enforce the contractual separation.

Another key change is rationalization of ownership and the concomitant need for trust relationships between unconventional parties. This is a process that needs formal agreements to be put in place so that for example multiple agencies can collaborate in delivering a consolidated citizen view.

The effectiveness of the SOA is critically dependent upon implementation and maintenance of the underlying architectural principles. Governance is required to ensure that over time the architectural principles are not compromised. Governance compliance reviews need to become an integral part of relevant individuals' responsibilities. In a Danish context it would seem to be appropriate to form review councils that include the architect responsible for the policy area together with independent architect practitioners to undertake reviews that have the objective of maturing current policy as part of the process of exerting governance at preset project review points.

Candidate strategies

- Establish cross organization SOA coordination committee at intra agency, inter agency and sector levels.
- Create cross organizational learning devices to ensure that lessons learnt and best practices are effectively communicated and shared at all levels.
- Centralize responsibility for integration architecture at sector and agency levels as a key mechanism to rationalize existing integration inconsistency.
- Separate shared service provision into separate organization(s) and or procurement contracts that specialize in delivering generalized shared services.
- Base procurement contracts on rich service specifications – linking the contractual formality with technical rigor.
- Establish organizational trust relationships that are implemented in SLAs.
- Establish governance review councils that have the skills and expertise and independence to progressively mature policy in a consensus manner.
- Charter business analyst roles to establish longer term demand for business process improvement from business process owners.
- Approval committee - probably at agency level - perhaps not practical to have continuous contact at three levels
- Knowledge management mechanisms - search and publish. The technology is important, but more important are the organizational aspects. Knowledge materials need to be properly reviewed, and individuals need to be encouraged to participate.
- Promote best practice - don't criticize the slow-runners.
- Business-related - could be used by more than one business

Process Stream

The focus of the process stream is to establish repeatable delivery processes. In the Roadmap Early Learning stage the process activity is primarily about discovery and learning, but in a highly federated government environment it is essential to have basic knowledge management processes in place together with the appropriate social networking to facilitate organizational learning.

The focus of the Integration and Reengineering stages are to establish systematic approaches (methodologies) that will allow the SOA principles to be implemented and for governance compliance reviews to be conducted.

Candidate strategies

- Define one process centrally that could be adopted and customized by agencies
- Establish knowledge management processes that enable communication and learning with minimum duplication
- Adopt formal service portfolio planning (SPP) methodology
- Use SPP process to coordinate shared services requirements and availability between agencies
- Use long term demand to stabilize and generalize shared services. Establish long term and short term demand discovery processes as part of requirements planning. (Discovery is already part of normal business practice.) Should not become an hierarchical approach - you must be able to adopt services from peers - requires sophisticated knowledge management to support learning from peers.
- Establish governance review processes that support policy evolution by consensus
- Establish requirements gathering process to determine where and how process change will occur in future, and to define requirements for flexibility.
- Evolve project release process to reduce functional scope.
- Implement component dependency between projects (slipstream project management)
- Define processes based on service lifecycle

Projects Stream

The focus of the projects stream is to alter where necessary the structure of projects to capitalize on service characteristics.

Candidate strategies

- Realign existing projects to become domain projects
- Use portal projects to deliver well formed shareable services that can be utilized more widely by solution delivery and process assembly projects
- Move to commodity based enterprise applications that offer a service architecture. Adopt the enterprise application service architecture and modify by customization to meet requirements
- Rationalize legacy systems by creating service facades that allow restructuring or replacement of the legacy applications (with commodity service based applications) with minimum impact on the business process project(s)
- Create cross agency shareable services by forming key shared service projects that deliver 360 degree services
- Separate shared service and process assembly projects, organize to minimize dependency and allow asynchronous deployment
- Maximize reuse in solution delivery and process assembly projects. Reduce timebox.
- Run projects using slipstream pattern that uses component dependency (not project dependency)
- Monitor who is using services - so they can be informed of changes - update strategy (anonymous or known) - also measure effectiveness of service from breadth of use.

- Centralize project coordination at agency level - coordinate the responsibilities of projects throughout project

Overall Roadmap Strategies

Having considered the strategies for each stream, we now consider strategies for the SOA adoption as a whole, considered holistically.

Trust and Security

Trust and security are naturally important areas of concern and strategy considerations apply to all the streams. The trust and security strategy should therefore aim to establish a positive reinforcement cycle – building trust in order to earn trust across all developmental activity.

The Danish Government has already a well-developed programme of information security, which will provide many of the capabilities required by the SOA programme, in accordance with an ISO based standard. This program is expected to achieve the following[6]:

- strengthen the coordination of different information security activities within Government and between public institutions
- strengthen awareness activities thus building a culture of security among citizens, businesses and within the public sector
- develop and implement different measures improving information security within society
- strengthen the monitoring of the state of information security nationally and internationally
- strengthen the development of competencies and knowledge on information security through research and education
- strengthen international cooperation on information security.

Candidate strategies

- Define SO architectural risk assessment process
- Establish common, federated security specifications
- Establish common, federated security services and necessary infrastructure
- Implement agile security management capabilities such as monitoring alerts and rapid response.
- Establish trust environment across multiple agencies and organizations – potentially private and voluntary as well as public sector.

Establish strategies for different SOA threat types including agency-level response to each threat type

Further Strategies

We need to establish a proper balance of activity across all the streams, and a balance of resources between phases (short-term balanced with longer-term).

Table 6 summarizes candidate strategies for each stream. Table 7 illustrates sample strategies fore coordinating activity at varying levels of the public sector.

[6] Source: Interview with Yih-Jeou Wang, Head of IT Security Division, Danish National IT and Telecom Agency, eGov monitor, May 2005. http://www.egovmonitor.com/node/851

Initiative	Stakeholders	Strategies
Strategic Enterprise Initiative	Department/ Agency	Driving and Organization prepared and able to commit to enterprise wide program. Early development of Service Portfolio Plan provides basis for coordination of policy Allows more rapid move into formal adoption Strongly data centric – establishing core business services that manage consistent data and business logic across the organization. Platform for rationalization of data management and business processes.
IT Transformation	Department/ Agency	Componentization of the existing portfolio as a means to improve response to business requirements Interface with business largely unchanged in early stages, focus on business needs for standardization and flexibility at business process level. Alignment of business model addressed only when componentization and service publishing process largely complete Strongly data centric – establishing core business services that manage consistent data and business logic across the organization. Platform for rationalization of data management
Project based development	Department	LOB focused SOA is embraced by individual projects – can deliver better structure and reuse within a large project. Need to undertake broader domain analysis if the services are to be useful more broadly. However unless the project is large and has it's own self contained organization, there is likely to be a lack of cross organizational commitment, which will mean shared services will not be widely accepted because the required support structures are not in place to allow others to depend on them. May be strongly process driven, in which case rationalization of data will need to be addressed at messaging and schema level
Product development	Supplier, 3rd Party	Self contained services, providing complete support organization in which the raison d'etre is to create services and support mechanisms that make it really easy for others to use them. Strong business involvement May be strongly domain centric, in which data and processes are tightly coupled and under control of the product development team Shared infrastructure
Managed Ecosystem	Danish Public Sector	Government departments, Supply chains with dominant partner, Shared policy, potentially shared support infrastructure – government departments Strong focus on funding, shared benefits, schema and policy alignment in early stages
Loose Ecosystem	Collaboration of suppliers	Collaborating companies Supply chains Information networks Strong focus on interface and schema alignment in early stage, plus selected policies that relate support and QoS
Key Services	BPO	Very similar to product development – however may not necessarily have same level of business involvement, which will require strong IT sponsorship For example core business services such as 360º view of customer or product; utility services such as rules service,

Table 6 – Candidate Stream Strategies

Coordination Level	Interoperability: Business Processes	Interoperability: Shared Data and Services	Interoperability: Skills	Interoperability: Platform Standards	Interoperability: External Procurement
International	Limited	Limited	SOA as opportunity for Danish IT professionals to maintain competitive position internationally	The Danish public sector will seek to adopt international standards where appropriate	Global Vendors such as IBM and SAP will provide systems and services to many national and local governments.
National	Significant opportunities to deliver citizen value through services that cross multiple sector processes		Generic SOA skills of increasing value within the Danish job market		Major Danish vendors such as KMD
Sector	Consistency for processes within sector	Sector-wide services Sector-wide data sharing	Ability to apply SOA to specific problem domains, such as Health and Justice.	Domain-specific standards	Niche vendors
Agency	Asset-Specific Processes	Asset-Specific Services			Niche vendors
Sub-Agency	Asset-Specific Processes	Asset-Specific Services			Niche vendors

Table 7 – Candidate Subsidiarity Strategy

Customizing the Framework

It is envisaged that each agency or department within the Danish public sector will face a different situation – trying to address different (if similar) goals, with different emphasis and concerns. The Roadmap Framework outlined in this report is intended to provide sufficient flexibility to allow each agency to produce its own SOA adoption plan, within a coordinated framework for the Danish public sector as a whole.

Each agency will therefore need to go through the following planning steps;

1. Review the goals and priorities for this agency.
2. Assess the current capabilities within this agency.
3. Assess the available capabilities elsewhere in the Danish public sector (which may possibly be accessed through knowledge sharing and/or through coopted resources and services).
4. Develop a customized plan for the acquisition of the necessary capabilities, either internally or externally.
5. Negotiate appropriate resources and other support to implement the plan.

Related Initiatives

The adoption of SOA is clearly not the only initiative facing the Danish Public Sector. Other related initiatives include:

The development and extension of eGovernment within Denmark

Enterprise Architecture

Open-Source ICT

Accordingly, the SOA Roadmap may be composed with other Roadmaps, in order to support the coordination of related activities. Interoperability of multiple interrelated roadmaps depends on a common underlying reference model of capabilities and risks. The recommended technique here is to express each Roadmap as a capability dependency model, and then decompose these models in parallel until the common elements can be identified and cross-related.

Next Steps

Recommended immediate next steps include:

- Review and refine SOA coordination strategy – coordination committees, stakeholders
- Develop SOA Communications, blogs, knowledge management portal, discussion forums, run communication days
- Develop education strategy and plans
- Develop detailed assessment of current capability and assets
- Develop critical dependency diagrams at all levels
- Decide on Roadmap coordination strategy
- Develop Subsidiary Matrix
- Develop outline Service Portfolio Plan for important shared services
- Consider proof of concept projects to demonstrate solution delivery with architectural consistency and associated processes

Attachment 1– About CBDI Forum

Introduction to CBDI

CBDI is widely acknowledged as an authoritative source of commentary and practice guidance on software componentization including Web Services and SOA. We are a research organization and think tank delivering continuous analysis, generating innovative concepts and defining practices that are widely used by many leading enterprises.

Our mission is to facilitate the transition to the service oriented environment providing unique and independent insight and guidance for business enterprises and governments.

The CBDI topic footprint covers business design through technology and application architectures, practices and processes across the entire life cycle. All research material published by CBDI is exclusive and rarely syndicated elsewhere. The majority of material is published by our own analysts, or commissioned from others under strict editorial control.

Products and Services

CBDI carries out continuous research, analyzing, developing and documenting concepts and practices. The research is made available to our customers in several ways:

- **Subscription services** - provision of continuous commentary and information through the CBDI Journal. The monthly Journal includes reports covering best practices, products, market trends and vendor updates. Part-works that build a detailed set of guidance around major subjects are a regular feature. The Journal is available in paper copy, PDF and HTML, dependent upon subscription level.
- **Consulting Services** – for vendors and enterprises including methodology development and customization, business/technology strategic guidance, adoption roadmap guidance and technical and business evaluation for investment purposes.
- **Education Workshops and seminars** - briefings and intensive workshops covering adoption, architectures, processes and practices, often in conjunction with consulting services.

Our Membership

We have over 15,000 registered members who are the technical leaders in their organizations. Our membership base is genuinely worldwide, with 40% membership in North America, 50% in Europe and considerable presence in Asia Pacific.

Members are typically technical leaders with roles including application and technical architect, business analyst, product manager and CTO.

www.cbdiforum.com

Attachment 2– Selection of Further Material

Danish Government

White Paper on Enterprise Architecture. ISK 2003.

Danish eGovernment Strategy 2004-2006. February 2004.

Other Governments and Official Bodies

EU	IDABC. European eGovernment Services. http://europa.eu.int/idabc/
OECD	OECD Peer Review of E-Government in Denmark. September 2005.
Ireland	Reach. http://www.reach.ie/index.htm
UK	Transformational Government: Enabled by Technology. http://www.cio.gov.uk/transformational_government/index.asp
USA	Commission on Systemic Interoperability http://endingthedocumentgame.gov/PDFs/entireReport.pdf FY07 Budget Formulation: FEA Consolidated Reference Model Document (May 2005) Global Infrastructure Standards Working Group NASCIO (especially Committee on Interoperability and Integration) https://www.nascio.org/publications/index.cfm National Task Force on Interoperability (NTFI) http://www.ojp.usdoj.gov/nij/topics/commtech/ntfi/welcome.html

Independent Sources

Victor Bognanor (ed), Joined-Up Government. Oxford University Press, 2005.

Joe McDonagh, Modernizing Service Delivery: A Blueprint for Development and Change (Trinity College Dublin, November 2004)

CBDI Material

SOA in the Public Sector. CBDI Journal, December 2005

http://www.cbdiforum.com/secure/interact/2005-12/The_SOA_Maturity_Model.php

Attachment 3 –SOA Capability Model

Stream	Level	Capability	Description	Enabling	Sector	Agency	Sub Agency	Notes
Management	1	Business case for SOA	Prepare and manage the business case for investment in SOA in order to gain the approval of business and IT stakeholders	Stakeholder approval	X	X	X	
Management	1	Experimental SOA funding	Investment in SOA projects to demonstrate capability, test feasibility, assess organizational and technical readiness, validate assumptions, measure ROI	Proof of concept projects, readiness activity	X	X		
Management	1	Management reporting	Reporting SOA Roadmap activity to management stakeholders.	Visibility of plans and progress throughout all levels of organization	X	X	X	
Management	1	Public relations	Publication of SOA Roadmap activity to broader audience including other streams, interested internal and external participants in SOA	Visibility of plans and progress outwards, public relations, marketing.	X	X		
Management	2	IT Stakeholder RAEW (Responsibility, Authority, Expertise, Work)	Define and agree which IT stakeholders have the Responsibility (Accountability for the satisfactory performance of the task), Authority (Power and resources needed to perform the task), Expertise (Knowledge and skill to perform the task) or Work (Perform the task).	Appropriate project steering, commitment to roadmap		X	X	
Management	2	Metrics for service flexibility	Define metrics by which flexibility will be measured. For example, reduction of time taken to support new requirement by reuse of existing Services. Define process for collecting metrics.	Monitoring and measurement	X	X		

Stream	Level	Capability	Description	Enabling	Sector	Agency	Sub Agency	Notes
Management	2	Shared services investment funding	Allocation of separate funding to invest in the creation of Shared Services. For example, granting additional funding to projects to broaden the scope of their Services to enable wider sharing, or funding new projects focused on delivery of shared services	Achievement of critical mass	X	X		
Management	2	SOA Charging model	Define commercial model by which use of shared Services will be charged to Service Consumers. Including pricing and charging mechanism.	Shared activity	X	X		
Management	2	SOA ROI Model	Define model by which to show the Return on Investment (ROI) in SOA based activities. For example justifying investment in shared Services.	Prioritization	X	X		
Management	3	Business process & IT stakeholder RAEW	Coordinate / align Responsibility, Authority, Expertise and Work across both Business and IT stakeholders	Business and IT involvement in delivering adaptable business, shared responsibility		X		
Management	3	Establish & embed benchmarks in management reporting	Define benchmarks for comparison.	Comparative analysis		X		
Management	3	Metrics for business flexibility	Define metrics by which business flexibility will be measured. For example, reduction in time to market for new business product, ability to support additional channels to market. Define process for collecting metrics.	Monitoring and measurement	X	X		
Management	4	Business stakeholder RAEW	Coordinate / align Responsibility, Authority, Expertise and Work of Business stakeholders across multiple agencies	Business accountability for flexibility		X		

Stream	Level	Capability	Description	Enabling	Sector	Agency	Sub Agency	Notes
Management	4	Metrics for Business Services in business reporting	Define metrics by which usage of business services will be measured. For example usage of standard process components. Define process for collecting metrics.	Architectural capability to respond to change used in developing and executing business strategy	X	X		
Architecture	1	Architecture recovery & reconstruction	First cut architectural models of existing / legacy portfolio.	Development of canonical models, evolutionary migration plan		X	X	
Architecture	1	Basic minimum semantic standards	Definition of semantic standards that support the exchange of information and documents between participants. This might include standards for common business objects and their attributes, and for shared processes	Early deliveries to be reused, Semantic interoperability	X	X		
Architecture	1	Basic minimum technical standards	Definition of technical standards that support development and deployment of SOA, and to enable interoperability between participants. This might cover for example standards for the runtime platform, communications, integration, run-time interoperability, development platform and design time interoperability and sharing of specifications. This might include standardization on XML, Web Service protocols, use of particular messaging technology, and so on.	Basic consistency of approach, avoiding period of uncontrolled activity, Technical interoperability	X	X		
Architecture	1	Disseminate SOA Reference Model	Also disseminate to public sector ecosystem of suppliers and other interested parties	Common nomenclature, taxonomy reused throughout public sector and related organizations including suppliers	X	X	X	

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Architecture	1	Establish/acquire SOA Reference Model	A reference model provides a framework for understanding concepts and relationships within some environment. An SOA reference model should provide a common frame of reference and outline the principles that define SOA, and concepts such as Service, Service Provider, Contracts, and so on.	Consistent understanding and application of basic principles.	X	X		
Architecture	2	Canonical Business Type Model	A Business Type Model defines all the things the enterprise needs to keep track of in its computer systems. The model represents business concepts, though concepts that will not be tracked in computer systems are omitted. The model defines, in well-structured way, all the data the business needs to store, but it is not database design	Basis for common understanding, basis for data quality improvement and identification of stable core business services	X	X	X	
Architecture	2	Defined requirements for business standardization and differentiation	The architecture defines the requirements for standardization and differentiation at business process, business type, domain and service levels	Appropriate sourcing decisions, direction of investment $ Enables agile procurement contracts based on specified levels of flexibility.	X	X		
Architecture	2	Enterprise Taxonomy	Though Semantic standards are desirable for interoperability, there will often be requirements where the same information needs to have alternative tags for different scenarios. For example an organization may participate in different ecosystems each with their own semantics. An enterprise taxonomy or ontology is therefore a useful mechanism against which to map different semantics.	Internal Semantic interoperability	X	X		

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Architecture	2	Governance compliance reviews	The capability to manage the compliance of service and solution delivery against agreed policy.	Management of policy exceptions, evolution of policy		X	X	
Architecture	2	Layered architecture, design patterns, dependency, standardization, customization	The initial architecture policy set should define policies for how layers are used in the architecture (to separate concerns) and policies that govern forming dependencies and relationships across layers and within layers. The policies should also define how standardization and customization of services is managed. For example, policies defining which standard services can be customized, and what mechanisms are used to support customization	Initial policy set	X	X	X	
Architecture	2	Partial Service Portfolio Plan	The Service Portfolio Plan (SPP) provides a list of the Services required by the enterprise and a plan for their delivery. The SPP is normally divided by business domain. A partial plan might address a limited set of domains at the core of the business or a limited number of core services within each domain. The partial plan should identify those core Services that are most obvious candidates for sharing.	Sharing of Core Services , Project coordination	Key services at sector level	Key domains at agency level		

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Architecture	2	Rich Service Specification templates	Service specifications are required to understand what a Services does and how to use it. A rich specification is required to enable this with out having to examine a particular implementation (that may mislead the Service consumer with implementation specific detail). A template is required so that Service Providers all define their Service Specifications in a common format	Consistent specifications, Provider/consumer separation, Best sourcing, Basis for service lifecycle asset management	X	X	X	
Architecture	2	Service contract templates	Contracts define obligations on both Service Provider and Consumer. Contracts include the pre- and post-conditions of using the Service, commercial contracts, and Service Level agreements. These contract types should be provided as templates so that Service Providers can set out standard contracts and clauses for their Services.	Fully encapsulated services	X	X	X	
Architecture	3	Fully detailed service portfolio plan	The SPP is completed and primary Services identified for all domains. Services are mapped to appropriate layers	Sufficient granularity and articulation in the available services to support flexible composition	X	X	X	
Architecture	3	Industry sector taxonomy	Semantic standards are established for industry sectors or specific ecosystems to enable interoperability	Semantic interoperability across partners/ecosystem	X			
Architecture	3	Mature policy set evolved from level 2 experience and shared appropriately	Policy will evolve through the early stages of SOA maturity. At a certain point the level of maturity will reach the point that exceptions will be treated more rigorously	Consistent approach to policy implementation	X	X		
Architecture	4	Resource Virtualization architecture	The Service architecture is matured to support virtualization of both business and IT resources.	Focus on core, Best sourcing, Demand driven scalability		X	X	

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Operational Infrastructure	1	Basic minimum management infrastructure	Service status is monitored reactivily	Knowledge of what services exist and who's using them		X		
Operational Infrastructure	1	Basic minimum operational infrastructure	The operational infrastructure enables the technical delivery of Services. Interfaces to operational resources are enabled as Services, using appropriate technology such as Web Service protocols. However manageability is minimal.	Unsupported services with little or no guarantees		X		
Operational Infrastructure	1	Basic WS-p compliance	Service messages are examined at run-time within the Service pipeline for compliance with policies determining usage of WS-protocols, and appropriate formatting	Tool enabled compliance checking of compliance with profiles	X	X	X	
Operational Infrastructure	1	Basic permissions	Use of a Service is granted at runtime using basic permissions capabilities - for example using LDAP	Control use of services	X	X	X	
Operational Infrastructure	1	Transport Level Security	Security is implemented at the transport level using current technologies such as SSL/HTTPS, message oriented middleware or private networks	Point to point security	X	X	X	
Operational Infrastructure	2	Basic ESB	An Enterprise Service Bus (ESB) is implemented to provide basic routing and transformation of messages	Message-level mediation	X	X		
Operational Infrastructure	2	Basic ESB	The ESB can transform messages between different platform, middleware or communications specific Service technologies (for example HTTP to JMS)	Platform neutral service interoperability	X	X		
Operational Infrastructure	2	Basic ESB	The ESB is used to transform messages and provide Service wrappers around existing systems	Service enablement and integration of existing non-service based applications	X	X		

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Operational Infrastructure	2	Basic Service Management	Services and message streams are actively monitored with real time alerts to problems.	Health Monitoring and alerts	X	X		
Operational Infrastructure	2	Basic Service Management	Service activity and messages are fully logged to create audit trails and enable off line auditing	Auditability by Logging	X	X		
Operational Infrastructure	2	Common SLA	Common Service Level Agreements are agreed between participants as a basis for active management	Inter-agency processes	X	X		
Operational Infrastructure	2	Service Orchestration	Multiple Services can be orchestrated in a process. Typically using the WSBPEL standard WS Business Process Execution Language	Process Automation	X	X		
Operational Infrastructure	2	Service Orchestration	Multiple Services can be orchestrated to provide composite Services. Typically multiple Services at a lower architectural layer are composed into a single composite Service at a higher layer	Service assembly/aggregation/composition	X	X		
Operational Infrastructure	2	Tool-dependent policy management	Operational, run-time Policies are defined in different tools within the operational infrastructure using tool specific mechanisms	Policy-based Service execution	X	X		
Operational Infrastructure	2	Contract-based permissions	Use of a Service is granted at runtime using contract-based permission mechanism such as commercial contracts, prioritized Service levels (e.g. gold/silver/bronze)	Access use of services based on usage and commercial contracts	X	X	X	

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Operational Infrastructure	2	Contract-based permissions	Contracts enable permissions at a fine grained level based on message content, and Service consumer profile	Message/content level permissions	X	X	X	
Operational Infrastructure	2	Message Level Security	Security is implemented at a message level, providing authentication and encryption of individual messages (and parts of) that is not dependent on transport level mechanisms. For example using WS-Security protocols, XML signature, XML encryption and SAML	Fine-grained encryption and signing of message content	X	X	X	
Operational Infrastructure	3	Advanced ESB	Use of a policy-based ESB to drive mediation and transformation based on compliance with business and IT policies. Permitting mediation based on dynamic business rules to drive routing and transformation at message content and Service consumer level	Policy-based mediation	X	X		
Operational Infrastructure	3	Advanced ESB	ESB is interfaced to Service and System management	Dynamic mediation based on status and notifications	X	X		
Operational Infrastructure	3	Advanced ESB	The ESB is componentized	Distributed, platform neutral interoperability	X	X		
Operational Infrastructure	3	Advanced Service Management	Run-time policies are implemented in Service pipeline. Service activity is actively monitored to check compliance	Run-time governance and policy compliance checking	X	X		
Operational Infrastructure	3	Business Activity Monitoring	Mapping of Service activity to business activity	Business dashboard. Correlation of business and service events	X	X		
Operational Infrastructure	3	Combined Service and System Management	Service Management is part of overall systems management. Services and underlying resources are fully mapped to each other	Correlation of service and resource events	X	X		

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Operational Infrastructure	3	Combined Service and System Management	Services are monitored and managed to defined SLA. Scalability and reliability mechanisms are dynamically invoked to maintain Service levels	Manage to SLA	X	X		
Operational Infrastructure	3	Common delivery platform	A common operational platform is established across the enterprise	Standardization of enterprise ESBs and operational infrastructure services	X	X		
Operational Infrastructure	3	Infrastructure Resource Planning	A common schema database is used to manage configuration and run time usage of resources	Managed resource base	X	X		
Operational Infrastructure	3	Service-based Workflow Management	Workflow engine can consume and provide Services, use make use of Service Orchestration	Integration of workflow and service orchestration	X	X		
Operational Infrastructure	3	Service-based Workflow Management	Workflow activities are can be invoked and orchestrated as Services	All activities represented as Services	X	X		
Operational Infrastructure	3	Tool-independent policy management	policies are standards based	Consistent Policy execution across Services	X	X		
Operational Infrastructure	3	Use of Infrastructure Intermediaries	Common Infrastructure capability that is shared by participants is provided by intermediary	Managed ecosystems	X	X		
Operational Infrastructure	3	Use of Infrastructure Service Providers	Infrastructure capability is access via external services rather than implemented in-house	Specialized capability	X	X		
Operational Infrastructure	3	Federated security	Message level Security complies with federated aspects of WS-Security and Liberty Alliance protocols.	Multi-hop for external collaboration support. Secure processing by intermediaries	X	X	X	
Operational Infrastructure	3	Resource-Based Security	Focus on applying security to individual resources, rather than at the perimeter.	Deperimeterization	X	X	X	

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Operational Infrastructure	4	Business service console	Convergence of Business Service and deployed Service. Service Console is provided to business users for determine Service resource requirements based on business resource requirements	Business requirements manage resource allocation	X	X		
Operational Infrastructure	4	Infrastructure is SOA	The infrastructure for SOA is itself presented as an SOA. Infrastructure capability is provided and managed using Services.	Virtualization of infrastructure resources	X	X		
Service Lifecycle Infrastructure	1	Service aware IDE	The Integrated Development Environment (IDE) is capable of designing and building Services and their implementations. The IDE can support relevant technologies such as XML, use of Web Service Protocols, JMS, etc	Service creation, delivery and usage		X		
Service Lifecycle Infrastructure	2	Asset management Stage 1	Services are managed as software development and deployment assets. An asset management system or product is used manage relationships and dependencies to artifacts of the Services (such as specification documents) and to other asset types (such as software implementations)	Service to Artifact dependency management		X		
Service Lifecycle Infrastructure	2	Asset management Stage 1	The asset management system or product is used to manage the lifecycle of the service asset by ensuring basic compliance with policies for state change and recording activity for accountability	Governance compliance recording		X		

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Service Lifecycle Infrastructure	2	Compliance with service based development standards	Support for development lifecycle standards within the IDE and other tools. For example IMG specifications such as UML2 modeling notation, Reusable Asset Specification (RAS), or Model Driven Architecture (MDA).	Consistent asset profile		X	X	
Service Lifecycle Infrastructure	2	Process based service assembly	Application solutions to provide Business Process Automation support are assembled from (pre-existing) Services that provide the capability required rather than the capability built into the process itself which may duplicate effort, and introduce inconsistencies and inflexibility	High productivity solution delivery projects		X	X	
Service Lifecycle Infrastructure	2	Process modeling	Processes that provide or consume Services are modeled using appropriate techniques and notations such as BPM or WSBPEL or UML Sequence Diagrams. The modeling process both serves to identify the Services that are required to support a process, and how they process executes.	Process-driven Service identification		X		
Service Lifecycle Infrastructure	2	Registry Stage 1	Provision of a basic Service registry supports publication and discovery of Services. A level 2 maturity, the registry should provide management functions to ensure proper governance over the publication and discovery processes to maintain quality and integrity of entries, and manage appropriate usage	Indirect service usage (proxy), governance and usage, Internal publication and discovery		X		

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Service Lifecycle Infrastructure	2	Service customization frameworks and patterns	To facilitate the customization of Services in the Service consumption and provisioning processes, Services are delivered as part of a framework (or pattern) that details the customization mechanisms. For example it map provide the specification of plug-points into which Services and Components might be placed within the framework to extend or replace capabilities or configuration profiles that enable customization of the functionality or behavior of a Service	Architectural and design response to future change		X	X	
Service Lifecycle Infrastructure	2	Service modeling	Services with their context and behavior are represented in models in compliance with appropriate SOA constructs and policies, using relevant techniques and notations such as UML2, and where relevant using contract-based approaches to provide a rigorous and unambiguous specification. The modeling process both serves to assist in the identification of the Services that are required to support the organization, and to provide a detailed specification of those Services	Improved communication of requirement/specification		X		
Service Lifecycle Infrastructure	2	Tool-dependent Policy Management	Policies are maintained in different tools within the lifecycle infrastructure using tool specific mechanisms. Policies are defined at a level of abstraction above, and externally to, the implementation code.	Abstraction of policies from implementation.		X		

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Service Lifecycle Infrastructure	3	Asset management Stage 2	A full inventory of the organizations software development assets has been completed. Dependencies and relationships between assets have been recorded. Properties and information about assets has been captured as metadata	Populated existing assets, comprehensive service lifecycle governance and change impact analysis		X		
Service Lifecycle Infrastructure	3	Metadata-based approach	All properties and information about a Service including its usage, dependencies and relationships is maintained as tagged metadata, rather than just narrative descriptions.	Consistency across service lifecycle		X		
Service Lifecycle Infrastructure	3	Metadata-based approach	Tools and systems used in the Service lifecycle understand Service metadata. Metadata is based on open standards	Automation of service lifecycle		X		
Service Lifecycle Infrastructure	3	Registry Stage 2	At stage 2, the Service Registry is integrated with, or interfaced to the asset management system to manage versioning as part of the Service lifecycle. The Service Registry supports Service Lifecycle State, and Version as classifications and properties of the Service, enabling publication and discovery by Version	Versioning	X	X		
Service Lifecycle Infrastructure	3	Registry Stage 2	Service Consumers are recorded, and the registry is able to notify them of new versions and their impact.	Consumer notifications	X	X		
Service Lifecycle Infrastructure	3	Registry Stage 2	Access to the Service Registry is provided to external users such as business partners or members of an ecosystem. The Service Registry also acts as a filter on external Services that are provided to the organization, or which it is permitted to consume	External publication and discovery	X	X		

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Service Lifecycle Infrastructure	3	Tool-Independent Policy Management	Policies are expressed using open standards. Different tools and systems are all able to support the policy standards	Consistency across lifecycle, services and usage. Policy-based lifecycle		X		
Organization	1	Centralization of integration	Integration activities are consolidated and centrally coordinated and managed to reduce proliferation of point-to-point communications, and proliferation of products and disparate technologies.	Rationalization of existing EAI contracts; governance over integration activity, transformation to services		X		
Organization	1	Coordinated cross organizational learning	SOA learning is coordinated across the enterprise to ensure that different providing and consuming projects and organizational units have common skills and understanding where required, and to optimize the roll out of training activity across the organization	Effectiveness of educational activity	X	X	X	
Organization	1	Cross organization SOA coordination committee	An SOA co-ordination committee represents different business units, and IT functional units. The committee focuses on areas of sharing and standards where consensus or enterprise wide consistency is required	Consensus development of policy, standards, practices and shareable services	X	X		Different levels in local and regional
Organization	1	EA organization with SOA remit	The Enterprise Architecture organization establishes policies and standards for enterprise wide adoption of SOA	Enterprise level standards and policy development	X	X		
Organization	1	Governance review RAEW	Responsibility and Accountability for governance compliance review are defined	Effective compliance checking		X		
Organization	2	Appointment of SOA-specific roles.	SOA specific roles are covered by agency architect.	Assignment of responsibility and ownership	X	X		

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Organization	2	Business analyst/architect function have responsibility for short and long term demand for business process change	Requirements for shared Services are established on the basis of forecast business needs. For example providing Services as points of flexibility and reuse, by understanding emerging needs for process optimization and flexibility, new products and channels, changes in business structure includes merger & acquisition, and changes in business strategy	Services in advance		X		
Organization	2	Different reward mechanisms for solution and shared service developers	Differentiation of reward schemes for different types of development Some developers are focused on creating assets for reuse, while others are focused on exploiting reusable assets.	Improved productivity and reuse		X		
Organization	2	Experiment with organizational alternatives to traditional project organization.	Introduce differentiation of management structures for different types of development.	Improved accountability	X	X		
Organization	2	Organizational separation of provider and solution delivery	The organization is separated into projects focused on the provision of core Services and projects responsible for assembling solutions from them.	Specialization of skills for core business services, governance of encapsulation, Role consolidation, solution developers code to the service specification		X		
Organization	2	Organizational separation of resource and service ownership	The organizational responsibilities are mapped against a stratified architecture in which the service sits at a different level to the resources upon which the service is based.	Service Provisioning		X	X	

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Organization	2	Ownership of service separated from solution ownership	Responsibility and ownership of core Services is separated from ownership of solutions. Service owners are motivated and funded to deliver durable, reusable Services that are shared across solutions. Solution owners are responsible for the rapid assembly of solutions from pre-existing Services (where possible/applicable) and not to duplicate core common functionality	Shared services		X	X	
Organization	3	Agile Procurement	Procurement needs to change to exert some architectural control and obligation over 3rd parties – because the outsourcing contract needs to specify the requirements for flexibility.	Service-Oriented Procurement		X	X	
Organization	3	Transform IT organization into primary service-oriented roles and responsibilities.	Formalize differentiation of management structures for different types of development.	Align the structure of the development organization to service-oriented thinking		X	X	
Process	1	Basic knowledge management & social networking	Introduce a basic publish/subscribe mechanism for items of knowledge and experience. Introduce a basic FAQ (frequently asked questions) mechanism. Introduce a basic social networking mechanism for people and groups to contact others with similar intreests and problems.	Shared learning and communication	X	X		
Process	1	Basic training	Developing an initial group of trained people with basic skills.	Skills		X		
Process	1	Business process driven approach to Service Identification	Initial (quick and dirty) approach to service identification, based on bottom-up models of existing business processes.	Limited reuse benefits		X		

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Process	1	Existing architecture rationalization & transformation process	Capability exists to harvest architecture from existing systems and or modeling environments	Phased adoption	X	X	X	
Process	2	Defined business requirements for flexibility	Process that defines specific and testable requirements for business adaptability, with full 2-way traceability (accountability) between business adaptability and system adaptability.	Architectural response to change		X		
Process	2	Defined Service Lifecycle	Development and management processes aligned with the defined service lifecycle.	Governance over state change. Compliance testing relative to state	X	X		
Process	2	Governance compliance process Stage 1	Including tool independent certification of profile compliance	Reviews		X		
Process	2	Long & short term supply/demand process	Differentiation of short-term requirements (agile process) and longer-term requirements. Note that a classic agile process is not suitable for forward provision.	Services in advance		X		
Process	2	Mentoring & coaching	Developing a group of people with advanced skills, who can provide coaching and mentoring to other staff.	Customization of skills		X		
Process	2	Outsourcing based on rich service specifications	Using the rich service specifications to govern procurement.	Greater separation between provider and consumer	X	X		
Process	2	Service Portfolio Planning methodology	Implementing a repeatable SPP process.	Repeatable process	X	X		
Process	2	Slipstream projects	Inter-project dependency at service and component level	Reduced time to market		X	X	
Process	2	SOA Project profiles	Define and approve project profiles for SOA projects.	Repeatability		X		

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Process	2	Train-the-trainers	Developing a group of trained people with the ability to train others in basic skills.	Expansion of skills		X		
Process	3	Advanced training	Providing follow-up training to people with previous SOA training and SOA project experience.	Deepening skills - and a growing community of SOA expertise.		X		
Process	3	BPO integrated using SOA	Taking outsourcing to a higher level to embrace business process outsourcing (BPO), using an SOA approach to service acquisition and management.			X		
Process	3	Formalized knowledge management and best practice	Establishing a process for knowledge management.	More efficient and effective dissemination of best practice and organizational learning	X	X		
Process	3	Governance compliance process Stage 2	Significant level of compliance checks automated in IDE, Asset or Registry environments	Automated checking of usage		X		
Process	3	Managed process variation	Establishing a mechanism for managing variation - including experimental non-standard process for non-standard projects where appropriate.	Ability to handle a broad range of non-standard projects and other activities.		X		
Process	3	Product Line Management	Implementing a defined process for managing services for external customers (citizens)	Continuously evolving products	X	X	X	
Process	4	Process Innovation	Implementing a defined process for process improvement, with continual feedback and organizational learning.	Continual process improvement and organizational learning		X		
Projects	1	Proof of concept	Initial projects to establish business case for SOA	Business case		X		
Projects	2	Domain service projects	Realignment of conventional project scope to deliver shared services	Shared services		X	X	
Projects	2	Enterprise Application service integration	Projects using SOA to integrate enterprise process	Reuse of acquired commodity services		X	X	

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Projects	2	Key shared services	Development and publication of key shareable services. Initial deployment and reuse. Gradual decommissioning of non-standard or local alternatives, where appropriate.	360 degree services	X	X		
Projects	2	Portal or service gateway projects	Projects to acquire and install service gateway or portal.	General purpose abstraction layer		X	X	
Projects	2	Separation of application and process assembly projects	Differentiation of projects	Greater opportunity for independent evolution of process and applications		X	X	
Projects	2	Service Enablement Projects	Harvesting existing systems to be used as Underlying Services.	loose technology coupling		X	X	
Projects	2	Technical gateway or bus projects	Projects to acquire and install technical gateway or bus.	Technical integration		X		
Projects	3	Collaborative projects	Ability to work collaboratively with other organizations.	Delivering inter-organizationally interoperable solutions.		X	X	Inter agency
Projects	3	Commodity services support context areas of business	Projects focused on context	Cost optimization		X		
Projects	3	Customized services support core business areas	Projects focused on core	Better focus of IT spend to support mission critical and innovation activity		X	X	
Projects	4	Slipstream project organization	Multiple concurrent projects with smaller scope, Component and service level project dependency,	Faster time to market		X	X	