CBDIJournal

NOVEMBER 2004

Extract from *CBDI Journal*

3 Best Practice Report

The Business Case for Service Oriented Architecture

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By David Sprott

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Insight for Web Service & Software Component Practice

The Business Case for Service Oriented Architecture

An Introduction to SOA for Business Managers

Service Oriented Architecture, or SOA, is becoming widely accepted in the IT community as an important technology strategy that addresses the complexities of typical enterprise application environments. SOA is a structural approach in which business level services are published as atomic units of capability separating and formalizing the concerns of provision and use. From a purely technical perspective SOA is a superior form of application integration or middleware. However the restructuring of systems capabilities into services presents a much broader opportunity for restructuring of business responsibilities and processes around the service concept. In this report we present the business case and argue that SOA is a powerful tool for business reengineering, and that it is essential for senior business managers to become engaged in this critical activity.

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Introduction

Over the past few decades the typical enterprise IT department has created hugely complex portfolios of systems and databases to support business operations. Various surveys tell us that the typical enterprise is devoting over 80% of its applications budget to simply supporting normal business because of the complexity of making change.

This complexity has resulted from a fundamental error in the way systems investments have been made over a long period of time. Even though it is blindingly obvious that systems are subject to constant change in business requirements, the design specifications or acquisition criteria have focused on known requirements, rather than on any structured consideration of how systems will respond to unknown requirements.

This situation is comparable to providing an architect with a brief to design an opera house, knowing full well that even before the building is completed it is highly probable that the design specification will need to accommodate

production of Shakespeare's plays, popular musicals and orchestral concerts. We can all readily appreciate that each of these requirements will have radically different staging, orchestral and acoustic requirements, and indeed will attract wildly varying sizes of audience, and then have a sensible conversation about the building characteristics that will respond to change. However in the systems world we have not had a language by which we can discuss or express systems requirements for change, except at a very low level.

Given a requirement for change a systems architect will be able to respond appropriately, and there are good examples of systems that have been purpose designed to be inherently adaptable. However the overwhelming majority of systems investments are made in a manner that the resulting system will be inherently inflexible precisely, because conventional architectural approaches have not prioritized adaptability, and because it is always difficult to justify incremental expenditure for unknown requirements.

Over the past few years new approaches to systems architecture have been developed which aim to componentize systems functionality around atomic units of capability, referred to as services. This concept is not necessarily new, it has been adopted in various forms for over ten years, but recently there have been significant advances in industry standards, under the aegis of Web Services, which enable use of services irrespective of underlying implementation technology. These ideas collectively referred to as Service Oriented Architecture, or SOA, have been widely embraced in the IT technical community as a sensible and practical solution to many of the fundamental problems most enterprises face.

However systems architecture is widely perceived to be a technical issue, and whilst a fundamentally adaptable systems environment is likely to be highly attractive to business managers, there are significant costs and the need for longer term infrastructure investments. Even more important, the whole topic of systems architecture cannot be considered in isolation from business and organizational structure. In today's world organizational design is generally considered in isolation from systems. As we transition to service oriented systems the

SOA initiatives should be undertaken with deep business involvement, and that a tight focus on ROI

most effective enterprises will design their business organization and systems architecture in a single, common design process.

SOA Basics

In the consumer electronics, and particularly personal computers and devices industry it is common practice to deliver to market new versions of products on a very frequent basis, say every 3 or 6 months. For example the personal computer that you buy today is a different product version to that you might have bought three months ago. Typically there is constant reconfiguration of components delivering new or specialized functionality using existing interfaces on the motherboard. In this way making continuous change to very limited areas of functionality is a highly manageable and controllable process.

The service oriented architecture is based on precisely this principle. Capabilities are published as services which offer stable interfaces and are supported by a system of infrastructure services that, using the same service oriented architecture offer common infrastructure services such as security, routing and management. New and upgraded services can be introduced with minimum impact on existing systems, and service interfaces provide stability for service users while the underlying systems are progressively modified.

The service becomes the primary unit by which functionality is exposed, offering a real time capability that is available for execution on request. The service is typically a capability that aggregates lower level functions into business relevant operations, such as CREATE CUSTOMER or SCHEDULE DELIVERY or AUTHENTICATE USER. What's really useful about the service is that it is self describing – published utilizing industry standard protocols with all the information necessary for a third party to use it with no knowledge of the underlying technology or implementation details.

Because the service concept uses industry standard protocols, services can easily be offered and used on an intra-company basis to bridge existing systems silos as well as on an inter company basis to provide an industry standard for B2B interchanges.

Architecture for Business Adaptability

Many enterprises are embarking on SOA based strategies, and one of the first places they start is to publish services from existing systems. While a service published from an existing legacy application will not make the underlying application any better structured, publishing standard services from existing systems provides a common access point, by which standard operations can be made available to other systems without incurring the cost of integrating with the legacy system for every new operation.

Services provide what we term a point of articulation, (think articulated truck and trailer) where two independent parts collaborate to provide a combined capability, but the two components are independent entities that have their own behaviors and can be independently upgraded and or substituted.

The service therefore provides a process neutral capability that can be used in one of several business processes concurrently or over time. As shown in Figure 1 a service can be used in two or more processes concurrently and different versions of the service may be used depending on defined business rules such as date, customer type or geography.

Convergence of Business and IT

For years the best minds of business and IT have worked to achieve what they have referred to as "business/IT alignment". The lofty goal set by this activity was to deliver business systems that accurately reflected what the business needed. Much business/IT activity was devoted to modeling the business in such a manner that a superior understanding of the business could be transformed into superior system designs.
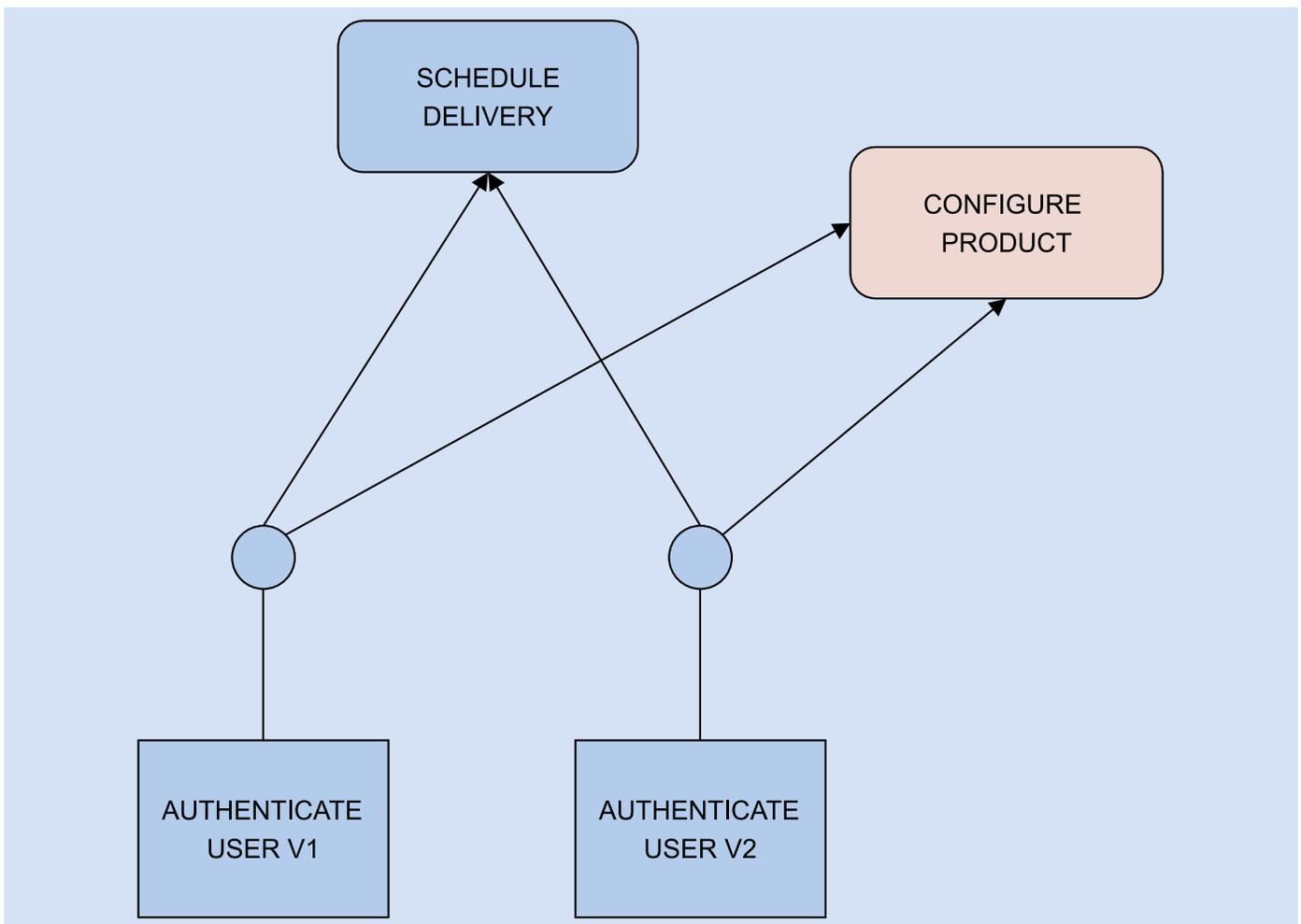

Figure 1: Services Enable Process Adaptability

The problem with business/IT alignment was that it was based on the premise that there are two separate, parallel tracks that need to be aligned. Service oriented thinking addresses the problem from first principles by considering the business and it's systems as one and the same entity.

Many businesses are already inherently service based – they offer products together with complementary services. It is very common for an enterprise to buy in services of one kind, and sell services of a different kind. For example, an airport operator buys in a range of responsibility-based maintenance services, and sells landing slots to airlines. A rail network operator may subcontract track maintenance to a group of engineering firms, and sell time on the network to train operators.

Further most enterprises are already operating on the basis that services will be acquired from the most appropriate source, which is increasingly not limited by existing enterprise boundaries or geography.

The service oriented architecture is therefore a reflection of business reality. The business comprises of many sets of services which variously provide capabilities to other parts of the enterprise, its supply chain, its channels and its customers. As discussed above, the services may be orchestrated into one or many business processes, which provide the situation and event specific business rules.

The SOA is therefore a tool which is equally a business and systems structural tool which defines the raw business services independent of business process. The challenge for enterprises is to embrace a reengineering strategy in which they define their business as a set of services. This process inevitably poses difficult questions about which services should provide standard and consistent implementations of policy across various sectors, markets and geographies, and the ownership of services, information and processes. The resulting business becomes a federation, where shared services are used according to contractual agreements, both inside and external to the business. The enterprise that is able to reengineer their technology, processes and organization around this common service perspective will optimize their systems as federations of relatively independent services, which will provide an inherently adaptable business environment.

SOA ROI

Investment decisions on IT projects has always been a difficult area. Regrettably the track record of IT projects has not always been particularly good, and the natural response of budget holders has been to narrow down the investment decision area and to minimize risk.

In many enterprises there is a fundamental dichotomy between business and IT decision making, because the business is driven by short term goals whereas major IT investments require a longer term view. It has become common practice in many organizations to exert governance over IT projects by demanding short term ROI, and this will often be completely inappropriate for SOA based projects.

SOA further complicates containment based risk management practice because a successful service is going to be used very widely, and creates more rather than less dependencies, which project managers instinctively prefer. A recent survey found that 68% of IT projects are still department based, and in the SOA environment this ratio must change significantly.

Table 1 summarizes some of the significant implications, costs and benefits.

The key business issue with SOA is that the cost/benefit equation is dependent on assessment of the value of adaptability, an innovative investment criterion that we have little of no experience of. A secondary issue is that the benefits stream, as usual, lags the investment stream.

The types of benefit shown in Table 1 are of necessity highly generalized, but in our experience we are finding that in situation specific cases the benefits are much more readily apparent, This is particularly true where the SOA initiative is predicated not on a general upgrading of the overall infrastructure, but on the merits of particular sets of services where there is a clear investment case.

SOA Governance

The challenges in developing service oriented business and systems architecture are commonly compared to urban and city planning and design. City planning disciplines have well developed practices that govern the progressive development of complementary architectural characteristics and common services in an environment

SOA implications	Cost areas	Benefit area
Shared services	Ownership issues Pan project investment and coordination Inter project dependency Incremental cost to develop generic services (x 1.5)	Consistent policy implementation Greater choice of supply Productivity gains from single implementation
Service as unit of management and reuse	Coordination Asset management Process reengineering to implement service based life cycle	Business response to change Improved process productivity Smaller horizon of change Deployed resources monitored and managed from business perspective
New business model opportunity cost		Disintermediating business models
Contractually based service provision	Contract management Formal Service Level Agreements	Improved operational effectiveness Separation of concerns and specialization of skills Greater accountability for service provision
Resource virtualization	Reduction in horizon of unit of deployment	Greater choice of supply Opportunity to use commoditized platforms and suppliers
Shared infrastructure	Enterprise Service Bus and Service Management infrastructure	Real time control of service execution Dynamic service selection Business monitoring
Rules based service execution	Tighter control over disparate implementations of business rules	Reduced human intervention in processes Autonomics, Business monitoring
Service based processes	Switch to Web Service based process technology	Processes inherit all the adaptability of Web Services plus management infrastructure
Upgrade to existing applications portfolio	Service enabling existing systems	Single interface to legacy applications simplifies application integration and reduces maintenance costs Transparency of service provision enables legacy systems replacement

Table 1: SOA Cost/ Benefit Examples

where individual buildings, and transport facilities are all undertaken as separate, distributed projects.

As a distributed architecture the SOA business and systems environment requires the development of strategies and policies that provide just enough coordination, to ensure that there is consistent policy implementation where necessary, without excessive constraint over individual (departmental, divisional, enterprise) actions.

The point of departure is to establish strategy and policies that govern the degree of adaptability that is delivered in the operational business and knowledge based systems. As discussed previously this is not a well developed area of practice or science, and enterprises will need to define their unique requirements for each area of articulation, and to create cost/benefit models to identify justifiable implementation patterns.

The SOA strategy should determine the areas where standardization is appropriate and necessary. For example common customer, product, directory services might be relevant to certain types of industry. However in others it might be appropriate to mandate only common services for regulatory compliance, business reporting, security and trust, while requiring all parts of a far flung enterprise to comply with common semantics which enable the accurate consolidation of information.

The critical issue for business and technical management is to define the strategies and policies and to establish service supply/demand and delivery practices that ensure compliance. In Figure 2 we illustrate an appropriate technique in which sets (groups) of services are clustered in domains which share common policies. The Business Service Bus provides a business perspective of the service requirements in terms of functional coverage and policy implementation which is an essential prerequisite to allow service based investment decisions before individual project charters and investments are decided. In this way responsibility

for and usage of shared services is determined prior to individual project initiation.

Business Opportunity and Strategy

We may anticipate that eventually all enterprises will offer sets of services internally and externally that represent the complete service offerings of the entire enterprise, for use by authorized users (humans or computers). To see an example of this we need look no further than Amazon, the well known retail portal, which has published a comprehensive set of services that allow third parties to make use of the Amazon services in collaborative ways. For example other booksellers list their books for sale on Amazon, gain access to the entire Amazon retail customer base and sell their products using the Amazon ecommerce services. For Amazon this is a highly strategic business direction, which is focused on establishing a critical mass of products and consumers on an Amazon platform, which increasingly dominates retail sales by virtue of size and reach.

The Amazon example has lessons for everyone. Core business services published as Web Services allows others (department, divisions and partners) to use, extend and specialize the context in which the core business service is used. This is a highly effective approach to business adaptability, providing the core business services have been designed in a sufficiently generalized manner that they do not constrain third party usage.

Standardization of services will happen over time. If Amazon is making an overt play to set the ecommerce service standard, we can expect de facto standards to emerge for business services such as authentication, risk, credit check, package delivery, booking and negotiation. We might also look at Salesforce.com as a pioneer and good example of application services where sets of services are made available for third party use for applications such as customer, resource, contact (Salesforce.com), MRP etc.
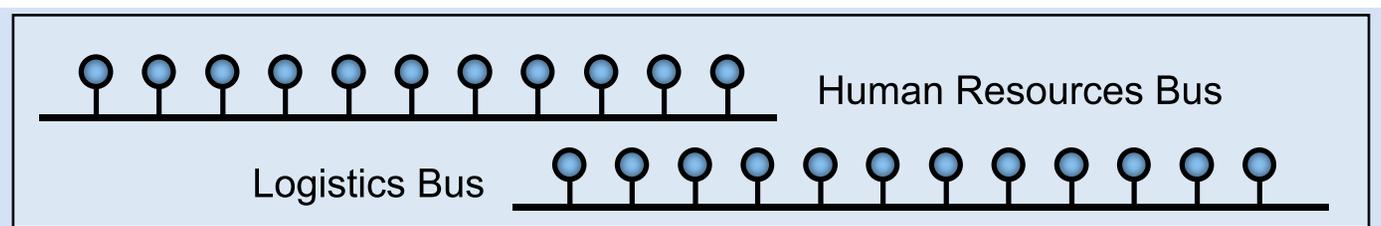
Figure 2: The Business Service Bus

As with the Amazon example these will all be delivered as virtual services over the Internet under a commercial and service level agreement.

The key questions for business managers are:

- What services they should be offering?
- What standard services should they be using?
- What standards should they be adopting?
- What standards should they be setting?

The Service Based Organization

Businesses and government departments all recognize the importance of services. Many enterprises have already reengineered themselves away from product manufacturing to embrace service delivery. Others

have recognized the criticality of the service component in a product offering, typically with high information technology content.

It is not such a stretch therefore to consider the entire organization as a set of services. As we show in Figure 3 the service provides a more stable set of capabilities that can be reconfigured in many different ways, either concurrently or over time, in multiple business processes.

The service also allows us to consider new forms of business process. The service is inherently event based, and enables processes to be configured as networks where the service components are decided dynamically depending on the context of the process instance.

In the early stages of SOA activity it is customary for service design to be delegated to IT departments.
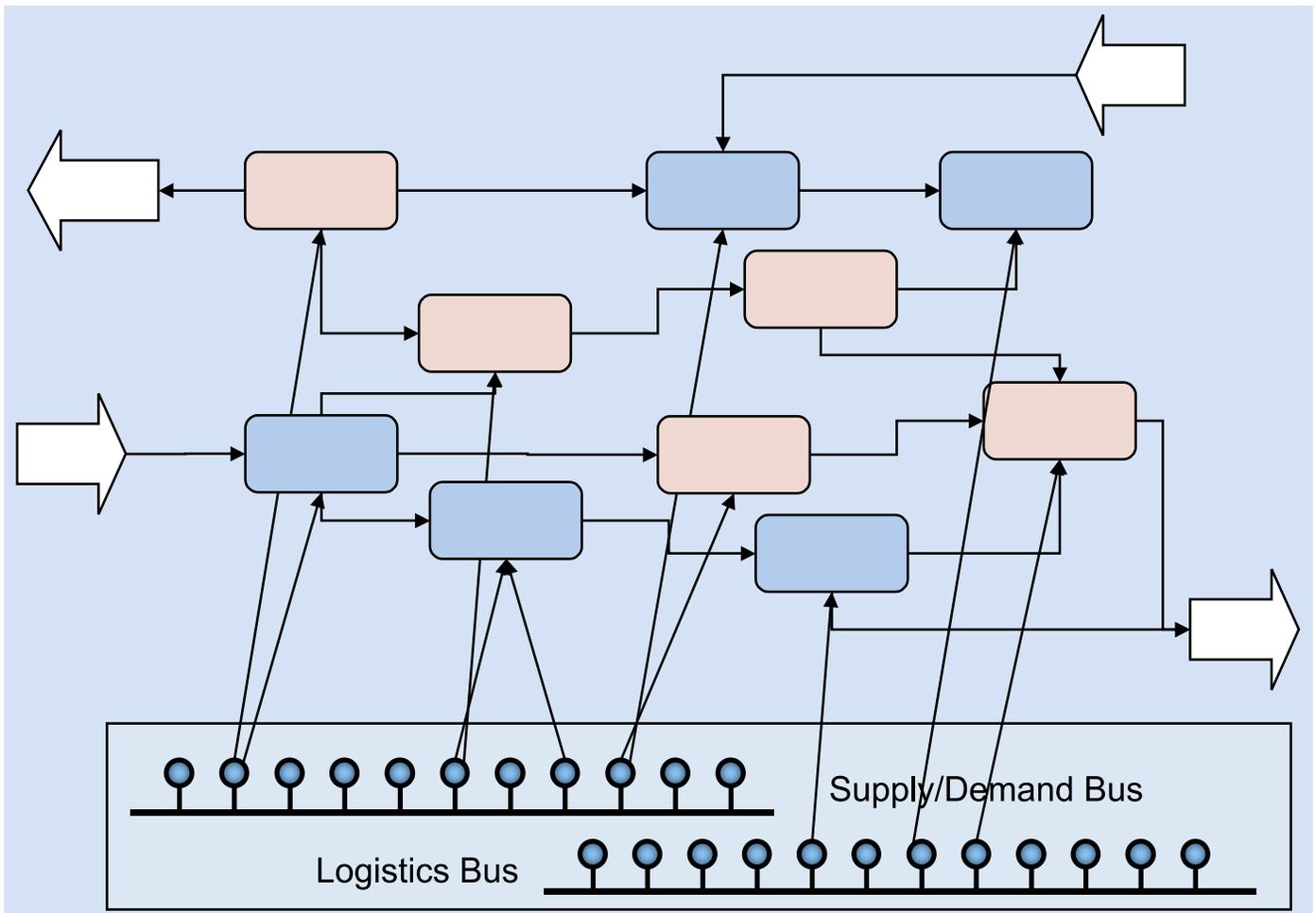
Figure 3: Services Support Multiple Processes

Of course many organizations use de facto standard enterprise applications and these are now starting to offer their capabilities as sets of services. However in our experience it is very important that service design is driven by business considerations rather than any technically oriented method.

In considering the mapping of services to the current business organization it is inevitable that inconsistencies and conflicts will be identified, where current responsibilities for both process and information are shown to be illogical. Of course there are many forces at work that inhibit rational restructuring, for example cost allocation mechanisms generally work against cross enterprise optimization.

In Figure 4 we illustrate a very common example of the HR organization where a central department has responsibility for basic personnel administration, but many of what would be regarded as HR responsibilities are typically distributed across the organization. In one case that CBDI is familiar with the consideration of common services caused the organization to rationalize definitions of resources and process ownership which enabled shared services to be implemented which were satisfactory to all parties.
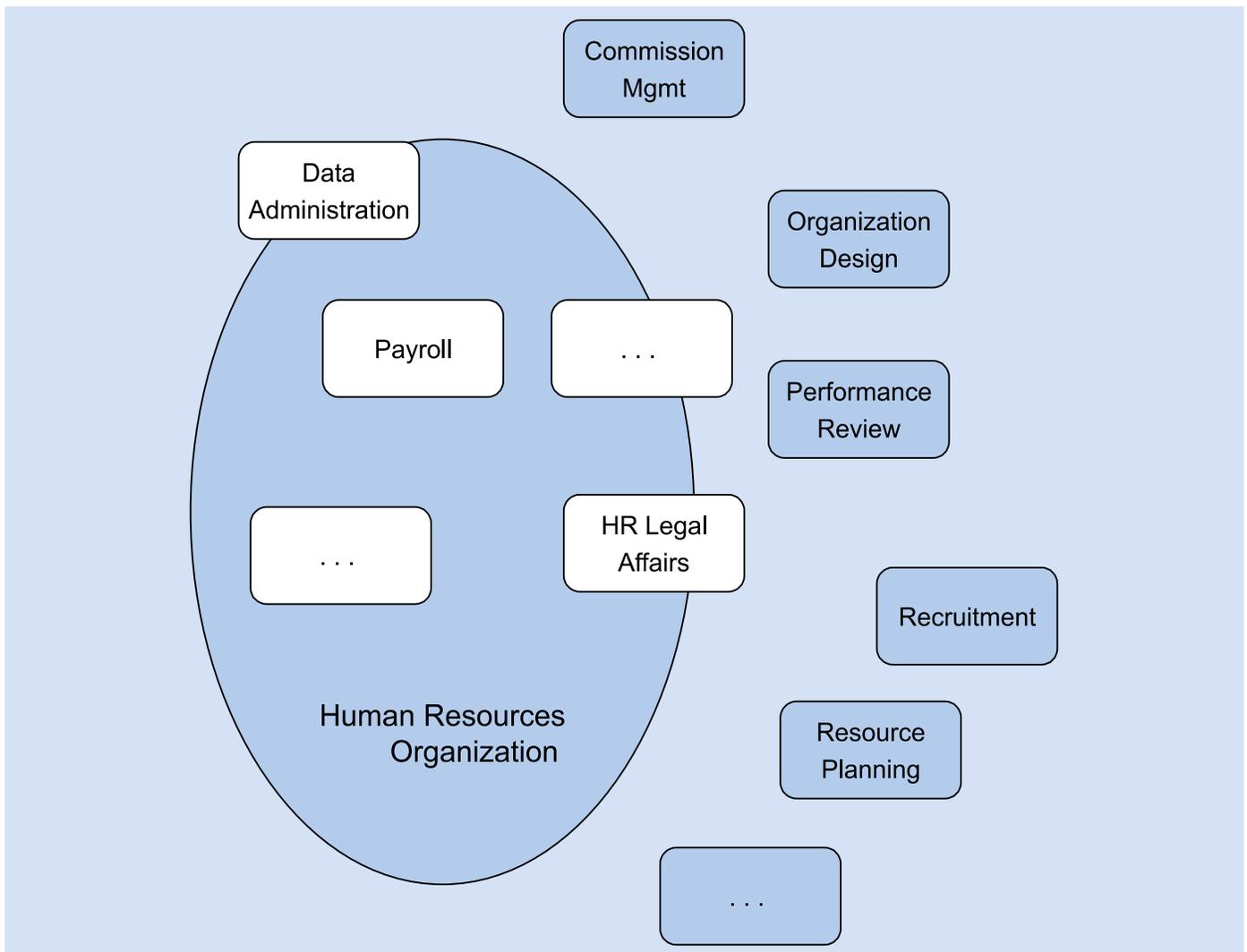
Figure 4: Services Rationalize Organization Inconsistencies

Roadmap Considerations

Most enterprises recognize that current IT strategies are insupportable in the medium to long term. The relentless growth of complexity and cost, together with inability to support changing business requirements is a pressing problem that is not going to disappear.

The issue is that restructuring requires long term programs for which there is generally no ROI. Further there is no guarantee that restructuring will be effective and lead to permanent reduction in TCO. Experience with major IT restructuring programs is not universally satisfactory!

The move to SOA provides some interesting answers to these problems. SOA can be undertaken on a progressive basis. A business can identify specific services which address business issues of policy and consistency, and implement standardization on this selective basis. Existing applications can generally support publication of standard services, with some normalization of inter system compatibility handled in a façade layer. There is a level of infrastructure investment required, in order to provide reasonable guarantees of cross organizational dependency, but this investment is relatively contained, in contrast to re-implementing major applications.

Conclusions

At this stage the service approach to restructuring business and IT looks to be a practical solution to the systems cost and delivery issues experienced by most enterprises. Unlike previous solutions, this approach is based on protecting and reusing existing assets, providing better structure around what already exists, and a basis for longer term asset renewal.

The primary issue today is that there is little tangible evidence that SOA really delivers adaptability or long term cost reduction. While the IT industry is leading the development of these concepts, there are no agreed measurement systems for adaptability which we can use. However there are good examples of enterprises that are being successful with services and there are strong indications that the basic approach is effective.

A secondary issue is that the standards and technologies are relatively immature. However it must be said that many enterprises have adopted these ideas without fully embracing the new technologies.

We recommend that SOA initiatives should be undertaken with deep business involvement, and that a tight focus on ROI is the best way to ensure an SOA initiative is properly directed and governed.

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The SOA Governance Framework

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Business-Driven SOA 2 – How business governs the SOA process

http://www.cbdiforum.com/secure/interact/2004–06/ Business_Driven_SOA2.php

Insight for Web Service & Software Component Practice

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