SOA: An On Ramp To Sustainability

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Sustainability continues its relentless march up the corporate agenda, even in the current troubled business environment. New green-related business drivers and requirements are emerging just as budgets are being cut. Service Oriented Architecture (SOA) can help to bridge this gap through greater process flexibility, configurability and visibility. SOA is on ramp to both more sustainable IT but also business sustainability. This paper examines how SOA can be used to make your business more effective and sustainable.

Hope, Fear, Opportunity and Sustainability

During the 1990s and most of the current decade we paid lip service to the notion of fast-changing business environments. But recent events have really been a tipping point in understanding what "agility" means. What happens when business assumptions change on a daily basis? What happens in an environment when a valued supplier or customer can go out of business overnight because a bank closed a line of credit? What happens when all your operating assumptions are challenged at the same time?

"The need to get a better handle on energy costs remains a key issue."

We're now in an era where fear rather than optimism is the key driver. Not fear for everyone however: many companies with good cash positions and solid cash flow are gearing up to win market share from companies in the classic Flight To Safety. The meaning behind Sustainable Business is changing- what is safe is sustainable.

During most of 2008 the high price of oil was the main driver for sustainability efforts in companies across a range of industry sectors. While the price of oil has fallen considerably in recent months this is almost certainly a temporary phenomenon. According to many energy analysts we have already reached Peak Oil, the point at which the rate of petroleum production enters terminal decline. The need to get a better handle on energy costs remains a key issue. The debate has fundamentally shifted- even Exxon Mobil's CEO recently called for a carbon tax.[1]

From Private to Public: Energy and the Obama agenda

The private sector has until recently led the charge in global sustainability efforts. Where corporate social responsibility used to be a PR led phenomenon- leading to a once a year report – it is now increasingly a strategic function in the enterprise. Sustainability is very much about CSR with teeth.

The new administration in the USA under Barack Obama is making green thinking both a policy and investment driver. The executive has placed energy independence at the center of much of its policy planning – fiscal stimulus is being targeted at US electrical networks, for example, with the idea of creating hyper-efficient Smart Grids. Homes and businesses will be tied into Demand Response networks, where electricity can be purchased when it is cheapest.

It's not only the US that is pushing ahead with sustainability-driven agendas –European Union (EU), Middle Eastern and Asian governments are also pushing ahead with aggressive plans for sustainability and energy independence. Renewable energy is now at the forefront of legislative and regulatory discussions. Local government has already been a leader in green purchasing but central government is beginning to follow the same pattern.

[1] See http://www.guardian.co.uk/business/2009/jan/10/exxon-mobil-carbon-tax

Beyond The 2%: Smart 2020 and its Implications

The first order of recent green thinking in the IT industry concentrated on the green data center –using approaches such as consolidation and virtualisation to make data centers less energy intensive. Efficiency is an important goal- not only are data centers expensive to run from an energy perspective, but in some geographies-notably major cities, electricity demand is overwhelming the network.

According to most estimates however IT only accounts for 2% of global carbon emissions, about the same as the aviation industry. We're now well into second order thinking, where IT and the market at large begin to understand how IT can tackle the other 98% of global emissions. How can IT reduce the energy bills of buildings and factories? How can IT make supply chains transparent enough that we can truly understand the provenance of goods and services to make more sustainable choices? How can it reduce our travel expenses? Industry, Buildings, Transport: that is where the big sustainability wins are going to be found.

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The report SMART 2020: Enabling the low carbon economy in the information age by The Climate Group does an outstanding job of explaining these issues in more depth. It's an essential read. According to the USA Report Addendum, 2008:

> "Americans have discarded the notion that energy efficiency and economic growth are mutually exclusive. They now understand that future prosperity requires that these two aims work together. This report demonstrates that investment in information and communications technology (ICT) should be an integral component of any U.S. economic and sustainability development plant.
>
> Through the support of feasible policy measures, ICT can enable positive environmental change with a 13-22% abatement in CO2 emissions and gross savings of $140-240 billion from reduced energy use. ICT can also promote green collar employment. By understanding the potential contribution of ICT, federal, state and local policy makers can facilitate and accelerate the adoption of meaningful solutions."

SOA: Terms of Debate

SOA will play an important role in tackling the kind of major challenges described in the Smart2020 report. We're going to need far better coordination, collaboration and correlation mechanisms across huge data sets and distributed systems. Organizations need to be able to compose and recompose business applications in entirely new ways for efficiency.

We define SOA as a mainstream approach to corporate application development, management and maintenance, in which application functions are treated as services, which can be reused and composed to create new services. The governance that SOA provides allows stakeholders outside IT to understand how their money is being spent and how any given IT asset or service is contributing to the overall business.

To complement visibility and control, SOA adds in policy driven configuration and usage. A company with an SOA can "regulate" how that SOA is used by creating and enforcing the SOA's policy. These three things together form "governance" which is what an organization needs over any business asset they're using to make money. Here, the asset is the conglomeration of applications and services the SOA wraps around, providing a sort of "utility" of IT.

Governance alone however doesn't ensure sustainability. Key to sustainability here is not

re-inventing the wheel - costing money, time, and energy - each time the business wants to modify or add new products and services to sell to customers. The promise of a functioning SOA is that businesses can quickly and cheaply change how the business uses the SOA. Indeed, this should be a key, long-term metric for organizations considering SOAs: how fast and how cheaply can the SOA be modified or added to help the overall business launch new initiatives and make more money without wasteful spending?

SOA: Tackling Big Challenges

Just as data centers virtualized computing workloads in the data center, so companies need to find ways to virtualize general business processes. SOA, as it has evolved and merged with Business Process Management, offers new opportunities in monitoring and managing business processes. With SOA you can set policies to trigger events and system behaviors based on particularly thresholds – that might be, for example, when energy was cheap in your geography because local wind farms were operating effectively at the time. Sustainability agendas introduce a new set of pivots to strategic planning; for example taking account of costs associated with pollution.

Business Process Modeling also offers the potential to simulate more sustainable process scenarios rather than physically trying them out. A good metaphor here is aerodynamic testing, which was originally an expensive process, but is now supported by software modeling.

Another area set to benefit strongly from SOA-style integration and governance is the integration of physical and virtual infrastructure – for example, management of IT and building and manufacturing assets to lower costs and carbon footprints associated with large scale facilities management. Heating and air-conditioning systems, traditionally based on proprietary interfaces, are prime candidates for integration with enterprise IT.

The canonical example of the Perfect Plant is Kodak Park, Rochester, NY – often known as “a city within a city” because it has its own fire department, waste treatment and power plants. Eastman Kodak has fully integrated its SAP systems with all building and automation control systems delivering significant management and maintenance cost reductions. Using advanced automation and correlation techniques Kodak Park has slashed its overall maintenance and facilities management bills.

“It is important to dispel the notion that sustainable always means higher cost when making a business case.”

Hewlett Packard’s R&D organisation has recently begun to talk about the need to “dematerialize” supply chains. SOA will be a key mechanism in this dematerialization. Arguably the most far reaching and coherent corporate vision so far of how SOA will drive sustainable business outcomes comes from IBM with its new Smarter Planet initiative, which has direct support from CEO Sam Palmisano. The genius of Smarter Planet is that it looks at existing technology and business trends- such as the mass instrumentation of everything with tiny sensors (such as RFID tags) – and predicates them on better environmental outcomes. With Smart Planet even arthropods can be network sensors- in one water quality project IBM is quite literally using blue mussels to measure water quality. What kind of back end infrastructure is going to back end these billions of sensors? SOA, integrating high scale database and file stores, collecting and managing billions of events. IBM was already the market leader in SOA. Now Smart Planet has given the company a further burst of energy.

Green is Lean: The Upside

It is important to dispel the notion that sustainable always means higher cost when making a business case. There is perhaps no better current demonstration of efficiency for business sustainability than the auto industry. US car manufacturers had until recently spent hundreds of millions of dollars lobbying against more aggressive efficiency standards, but have now realized they need to take a new approach to compete with companies that have invested in efficiency. The companies building the most efficient

cars are also those with the most efficient supply chains.

A green supply chain is by definition a lean supply chain. Green supply chains are ones in which you only provision the resources you actually need to manufacture a particular good or service. Here manufacturing can learn from IT and "adoption-centric computing". No manufacturer or service provider wants to find themselves burdened with excess capacity. Even worse is unsold stock – and the resulting "channel stuffing". How well does your organisation understand its cost of goods sold? What areas are open to being cut? Investments in better business process design using SOA make obvious sense here.

As the recent commodity and energy price spikes and subsequent crashes show us, it's almost impossible to manage supply side costs (long term fuel hedging strategies notwithstanding). But it is possible to more effectively manage demand, and the response to it – in the parlance of Energies and Utilities, Demand Response, a core concept within emerging electricity Smart Grids.

Successful Smart Grid implementations will rely heavily on SOA. While utilities traditionally collected in the order of 1 terabyte of customer/billing data every 10 years, with the advent of Smart Grids taking meter sample points up to every 15 minutes, utilities will now be collecting terabytes of data on a monthly/weekly basis. Smart Grids, with their ability to introduce radical efficiencies, virtualize power plants and facilitate greater penetration of renewable power sources are inherently Green. Citing the Smart 2020 report again:

"Users will not migrate J2EE workloads to JBoss or Apache Geronimo overnight."

"Smart grid technologies were the largest opportunity found in the study and could globally reduce 2.03 GtCO2e, worth €79 billion ($124.6 billion)."

SOA can be used to tie together manufacturing, order entry, and supply chain applications and systems across organizational boundaries to lessen supply chain cost risks. You might argue this is "just EDI" or "just integration", but SOA has significantly lowered costs of packaged application integration.

SOA: Sustainability as the new "-ility"

Early hype around SOA is now abating, and there are plenty of negative voices in the mix. But for every claim of expensive failure, there are thousands of organizations benefiting from the service orientation work of packaged application suppliers such as Lawson Systems, Oracle, and SAP. To label SOA a failure is to forget just how expensive, monolithic and tough application integration used to be.

Technologies such as Service Registries and Repositories, and perhaps more importantly new competences and shared service centers around SOA governance and contract management, have made it possible for organizations to act more flexibly.
In the past organizations investing to modify their ERP applications were effectively pouring concrete over them.

Today the customization can occur in the SOA layer, leaving the core application unmodified. This makes system upgrades far easier, and less expensive. SOA can offer real benefits, but it requires investment. As we begin to understand the Sustainability is just the latest "-ility" that IT needs to manage, SOA becomes ever more relevant. Data center energy costs are a new pivot around which to manage strategy. Just as with scalability and availability, sustainability suffers from the law of diminishing returns. Five 9s availability in the data center is not cheap- and organisations needs to understand which workloads are most relevant at which cost.

A key theme in sustainability is reuse – this is true in buying cars as much as computers. Rather than buying something new all the time- try retrofitting existing systems and so

on. SOA provides a means to modernize applications and systems for reuse. SOA-driven standardization of interfaces also provides a means to swap out less efficient services and applications. By reducing application and service lock-in in this way SOA provides a key mechanism for "swappability", allowing for replacement of components, processes and suppliers. SOA centers of excellence can also become centers of gravity for sustainability competence, particularly in the era of mashups and "disposable" reporting.

Environmental Accounting and Green Tape

"The future of financials is non-financials"
–Sir David Tweedie, International Accounting Standards Board

Carbon accounting is growing in importance, through legislation such as the EU's emissions trading system, but also through business driven reporting such as the Global Reporting Initiative's triple bottom line, which takes account of factors that traditional accounting would consider as "externalities" to be ignored.

But of course carbon is not the only substance we need to track. A great example of green tape (environmental regulations) is the EU's REACH program, which applies to all firms manufacturing, or potentially even assembling goods within the EU – it deals with the Registration, Evaluation, Authorisation and Restriction of Chemical substances – coverings literally thousands of chemicals. The EU has adopted a service-oriented approach to REACH reporting, through a central hub at the European Chemicals Agency (ECHA). Company updates are automatically sent and consolidated by the agency. The required reporting is sufficiently complex it's not amenable to processing by hand. Compliance also play into certification schemes – such as those covering the use of timber products from sustainable forests. Automated reporting and aggregating is the kind of problem SOA excels at.

IBM has a methodology for carbon reporting maturity called Green Sigma but many other firms are entering the market. Clearly it makes sense to centralize green accounting functions and services though, rather than creating new silos. Carbon accounting needs to become integral to corporate information management and reporting, given its central role in terms of both the bottom line (revenues) and broader reporting (compliance and CSR).

Benefits of sustainability reporting include compliance with standards set by regulatory authorities, attracting investment, improving reputation and potentially avoiding fines. ISO 140001 is a voluntary corporate environmental standard, which could be supported in-house using SOA techniques or through Governance Risk and Compliance (GRC) applications.

Environmental Reporting and The Supply Chain

Traceability is a major trend in retail. Food scares and health issues with some toy products imported from China, for example, have brought traceability to the forefront of consumer and market expectations. Of course many shoppers don't care where the products they buy are sourced, but many high value consumers do. The timber industry is another industry where certification is increasingly important. The inhabitat blog, for example, recently reported that IKEA's new forestry plan for 2009-2012 will bring certified volumes up to 35%, up from a very small current base.

As supply chains become ever more complex and globally integrated, new approaches are going to be required for provenance management and traceability for certification and reporting. Tracking and reporting really is an end to end process - UK retailers now regularly include pictures of the farmer on the farm that grew the produce on the packaging. Integrating provenance with packaging print services is another opportunity to use SOA to engage with customers in new ways, while reducing cost and ensuring

compliance. Adobe is already working with consumer goods and medical companies in packaging compliance. Integrating information across different applications and data services, from a range of external sources, to be used in enterprise information management – this is another SOA opportunity, especially given the need for interface standardization for reporting purposes.

The Paper Chase

Today in 2009 the paperless office is as far away as ever, let alone the paperless enterprise. IT seems to continually drive the need for new printing. But paper incurs all kinds of additional costs to the organisation - notably in terms of disposal and compliance. Paper-based forms processes lend themselves to fraud and errors in a way that integrated digital processes do not. Smarter organizations are building shared service centers for document scanning and handling, while forms technology has moved on in leaps and bounds. Reducing paper in the organisation offers clear and realizable benefits and almost as a side effect sustainability benefits. Adobe and HP are both aggressively working these problems with customers.

According to RedMonk research partner EQ2, a specialist environmental economics consultancy, an increasing number of Fortune 500 companies are looking to assess risk and cost associated with paper chains in their business processes. This question is moving up the strategic agenda, but more research will be required before we can completely accurately model these exposures. A strategy of complete digitization may of course impose new energy requirements in the data center but the additional benefits (such as reducing the risk of fraud) are likely outweigh the overall energy costs.

Again – SOA can help us obtain some visibility here.

Case Studies

Big SOA

Greencert, was designed from the ground as an SOA to help organizations monitor carbon dioxide and other greenhouse gas (GHG) emissions. Built by C-Lock Technology, a wholly owned subsidiary of Evergreen Energy, the infrastructure is based on IBM middleware – including WebSphere Portal Enable, WebSphere Process Server, WebSphere Dashboard FrameWork, DB2 Universal Database, DB2 Content Manager, DB2 Records Manager, Lotus Forms, Lotus Sametime and Lotus Quickr and IBM System x servers.

The advantage of building GreenCert using SOA and Software As a Service (SaaS) techniques is that customers can deploy the system in short order. Installing and integrating middleware is normally a costly and time-consuming exercise. GreenCert takes data from a variety of emissions-monitoring sources and synthesizes it into Certified Carbon Emissions Reduction Credits (CCERC) that can be sold on the open carbon market, IBM estimates for between $3-8 per metric ton.

GreenCert recently won an important new partner in Asia Pacific. Foxconn, one of the world's largest contract manufacturers for global electronics outsourcing, is investing heavily, including training 700 developers, with a goal of increasing the affordability of environmental-friendly electronics products. Given that many US and UK firms conveniently ignore carbon costs of their extended supply chains, its good to see Foxconn investing here.

Little SOA

AMEE is one of London's hottest startups: it is also happens to be a great example of a

service built from the ground up to be a Sustainable SOA. The company provides a back end for carbon calculators, and aggregates all data inputs. It provides data cleansing, cleaning and aggregation services building up an aggregated picture of all the inputs to the system. All AMEE code is licensed under the GPL open source, while the data is freely available under a Creative Commons license. Rather than competing with other more front end focused services (carbon calculators are after all ten a penny on B2C sites these days) the idea is just to make the data better and better, through sharing.

Rather than adopt traditional enterprise SOA standards from the complex WS-Interoperability stack AMEE's SOA used web-based protocols and standards. The AMEE API is based on Representational State Transfer (REST) and supports Javascript Object Notation (JSON) for low latency updates between web clients and servers. AMEE is perfect for correlation - for example, the Dopplr social network for frequent travelers uses AMEE data to convert the miles tracked into carbon footprint. AMEE provides standardized access to emissions factors and methodologies as a service, which makes them as natural partner for many companies/organizations and counts the UK and Irish governments, Google, Radiohead, Morgan Stanley and Tesco as users. AMEE is designed using the core Web 2.0 pattern Small Things, Loosely Joined. In that sense it's a Small SOA. It was designed to be deployed and managed as a service but does not make any use of complicated WS-Interoperability standards.

Case Study: a Smarter Grid

Delaware Electric is a cooperative electricity company which needed to find more effective ways of connecting to its customers to better manage energy supply and demand. It is somewhat unusual in that it is a classic small to medium sized business (SMB) reference: founded in 1936, it has 140 employees, 65k members, and 75k meters, but it is using SOA underpinned by WebSphere Process Server (WPS) for Demand Response.

Electricity is the very definition of a shared service. There is nothing more commodity than electricity - therefore the advantage has to be in information about the electricity...Delaware Electric needed to be in a situation where they could advise customers how to reduce their bills. How else do you compete against bigger rivals, which may benefit from economies of scale for spot pricing? If customers are running batch jobs, running heavy machinery at peak time, the company can help them reduce their total cost of energy. WPS, in this case, enables the flexibility that turns a billing engine into an information service provider within a SOA.

Case Study: Paper Cuts

Emdeon, a US-based provider of revenue and payment cycle management solutions for the healthcare industry, recently decided to offer reduced paper as a service to its varied healthcare industry stakeholders.

The company worked with SAP to replace existing paper-based reports with online versions, and can now offer claims processing as a largely paperless process. It is still early days – customer demand for low paper is still somewhat limited, but that is set to change. Rather than wait for the change, Emdeon is also leading the US Healthcare Index, an organisation dedicated to tracking and encouraging digitization in US healthcare. Taking a pragmatic view of the green in green, the Index estimates that paper reduction- even direct deposit could save $11bn a year.

It is currently running a dual infrastructure with parallel legacy paper processes and fully digitized, automated equivalents. SOA allows the flexibility of the dual process approach.

Prior to 2008, Emdeon printed and distributed as many as 800,000 paper reports a day.

At that time Emdeon identified BI and online reporting as a sustainable technology that could help reduce paper reports and move online reporting to a self-service model. Today, Emdeon uses SAP BusinessObjects as a part of its Emdeon Vision for Claim Management application for paperless customer tracking and trending, and to provide customers with online access to claims related information. XML handling is provided by Crystal Reports, with IBM WebSphere as a runtime for transaction processing and management. WebSphere portal is used to enrol and manage users and provide the authentication and security model.

Conclusions and Key Takeaways

While SOA is now a mature technology approach, it's still early days for Green or Sustainable SOA. One of the problems with sustainability of course is it can be a question of how certain constituencies want the world to be, rather than reflecting how it actually is. It is leading edge companies that have embraced the approach, but these companies are seeing business benefits and the rest of the market is likely to follow accordingly. Sustainable SOA offers real benefits but it requires investment. As we begin to understand the Sustainability is just the latest "-ility" that IT needs to manage, SOA becomes ever more relevant to the tasks in hand. Sustainability, like SOA itself, is very much a cross-cutting concern – cutting horizontally across vertical businesses and vice-versa. Organizations will need to invest in training and competency in both SOA and sustainability to get results.

Packaged applications are as important as ever in SOA, but retooled service-enabled applications can be used effectively in a range of integration scenarios- behind the firewall, cross wall, cross organizational and so on.

SOA isn't a silver bullet for sustainability any more than it is for general business benefits, but the core tenets and methods can provide the kind of flexible foundation a business can use to become more effective while driving costs out. If SOA isn't about business benefits it's a waste of time but when it comes to sustainability we have no time to waste.

About RedMonk

RedMonk is a research and advisory services firm that assists enterprises, vendors, systems integrators and corporate finance analysts in the decision making process around today's enterprise software stacks. We cover the industry by looking at integrated software stacks, focusing on business and operational context rather than speeds and feeds and feature tick-lists.

RedMonk launched its sustainability advisory business, Greenmonk, in 2008. Clients include Dell, HP and IBM.

Founded by James Governor and Stephen O'Grady, and headquartered in Denver, Colorado, RedMonk is on the web at www.redmonk.com

