ANATOMY OF BUSINESS IMPACT MANAGEMENT USING SMAC

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Introduction

The convergence of Social Computing, Mobility, Analytics and Cloud Computing (SMAC) is leading a new service revolution in managing business processes. The strategic services primarily revolve around Business Impact Management (BIM) encompassing all spheres of operations.

The erstwhile relationship between business and consumers has taken on a new dimension where the influence of SMAC-based decisions is directly related to an agile business model unlike conventional market dynamics and process automations. This volatility in B2C (Business-to-Consumer) is setting a new norm that would control the way people and business relate to technology and product innovations. This is also opening newer avenues in business process management and alternate opportunities of IT delivery management.

It is often dubbed as a stack with the different components operating as an integrated solution to deliver maximum business results and transformation value adds. Here, ‘Social computing’ and ‘Mobility’ entities are seen as effective drivers of productivity, accessibility and engagement, while ‘Analytics’ and ‘Cloud computing’ are enabling real time decision making at optimal costs.

This article outlines the various elements of SMAC architecture that enables organizations to realize an agile business model and the methodology towards assessment, adoption, and implementation of a robust Event-driven Enterprise Architecture. Also covered is the role of SMAC in achieving the goal of realizing strategic benefits of sustainable IT services in terms of the creation of value to customer, enterprises, and businesses as a whole. There is no doubt that SMAC seems to have found instant followers across every vertical from large enterprises down to small and medium business. This article also touches on the technological and operational aspects of adopting SMAC; integrating the framework with business processes and delivery, salient efficiency drivers, and comparative study of SMAC solution-based services. The idea of striking a balance between the various entities of the SMAC stack would be helpful for Solution Architects, IT Consultants, and Technology Specialists involved or interested in SMAC-based systems concept, design, implementation, and management.

SMAC Impact at a Glance

Gartner says the Nexus of Forces will drive more than 26 per cent of total enterprise software market revenue by 2017. The impact of Cloud, information, mobile, and social initiatives on enterprise software markets will far outpace overall market growth[1].

A quick question that now enters the minds of most CxOs and technology evangelists is: "Does SMAC actually add more business value or simply complicate the current state of affairs"?

Practically, SMAC is definitely accelerating the pace of business and would function as a key enabler of transformations cutting across technology and process lines in reshaping the future. This is a compelling reason for organizations to incorporate these technology stacks in various ways to create a meaningful business impact like improving total customer experience (TCE), robust innovations, and competitive marketing and product life cycle management.

SMAC is impacting business trends as the general public is extensively consuming various services like emails, blogs, social media, online analytics, work collaborators, gaming, mobile apps, and so on. As continuous intelligence is imbibed in every business process and services collaboration, agile business enterprises have started adopting a SMAC framework aligned to their Enterprise architecture.

Enterprises are moving from historical and near-time reporting to real-time analytics that enable real-time decisions with the ability to predict future trends processing large volumes of market dynamics gaining traction with customers. Hence, SMAC adoption is turning out to be the next most viable option to reduce costs and improve agility.

Although this would make a profound positive business impact for some organizations, not all organizations would be able to mine the true value of their SMAC investments. This is mainly because of the dependency factors such as type of business services/products, operating model, size, process functions, application stacks, tools integration, client geographies, user demographics, and so on. Hence investing in these technologies without a thorough assessment and customized approach would not only miss realizing the value of those investments, but result in increased complexity and underutilized resources.

For instance, in retail stores SMAC is raising a higher level of engagement among business and consumers, with models evolving from customized service in outlets, personalized ecommerce portals, to multidimensional virtual shopping. While this enables stores to realize smart shopping trends, loyalty bonus, and effective logistics management, people are being empowered to work toward desired spending behaviors based on their funds, flex pay, free offers, and product options. Now, this can be realized only by initially analyzing the SMAC influencers and dimensions while formulating strategies, defining an enterprise-level architecture that incorporates these technologies, identifying an ideal roadmap and Return on Investment (ROI) plan before implementation. Refer to Appendix E for detailed use case on Retail shopping.

According to Kao's Law, the more users that connect to a network, by way of their individual perspective, the more powerful that connected network. Today, the technology industry is abuzz with reports about SMAC and BIM. While the convergence of these capabilities has its pluses, the common notion of SMAC alone revolutionizing BIM is ambiguous; because each technology has a different level of complexity, maturity, market adaptability, and service impact based from one industry to another. The fundamental business model to align with this shift should have the capability of radical customization where continuous change would be the new norm of the day. SMAC is so promising because it depicts the notion that convergence of these individually proven and competent technologies can work in synchronization to solve the complex problems of these fully integrated technology systems. It is collectively being touted as the new platform that can transform enterprises by enhancing employee productivity and profits. So, the adoption of SMAC is seen as the means and strategy to remove economic, operational, and expertise barriers impeding simplification of business processes.

The idea of realizing Analytics and Mobility in the highly modularized yet integrated Social Networking services on Cloud-based systems helps improve real-time access to actionable knowledge on BIM choices through various channels. The gen-next organizations would augment in driving services, developing and adopting a more agile business model aligned to SMAC. In the same manner that steam power, steel, and electricity provided the platform for the industrial revolution, the SMAC stack is setting the foundation for the knowledge-based digital revolution.

Social Computing Redefined

Social Computing helps organizations adopt real-time collaboration and feedback. In terms of collaboration, the move toward a Social Business is evident from the increasing use of social media tools like Facebook, LinkedIn, Twitter, Yammer, and so on within an organization.

- Facebook Monthly active users (MAUs) were 1.19 billion as of September, 2013[2]
- As of October 2013, LinkedIn had 259 million members across 200 countries[3]
- Twitter Monthly active users (MAUs) were 231.7 million members with 500 million average number of tweets sent per day as of October, 2013[3]
- Social Media is already disrupting traditional models of marketing and selling

Facebook, Foursquare, Google+, LinkedIn, Twitter, and YouTube have become the new channels of communication for businesses and individuals worldwide. Enterprises increasingly leverage social media for customer engagement and brand building. This has been realized with the double effects of the proliferation of smartphones and gadgets coupled with the rise in mobile Internet usage.

Social media platforms enable collaboration through posts, chats, tweets, like/dislike commenting, blogs, social bookmarking, geo-location tagging, following threads, and lots of more. As these modes evolve and vary, so do their end user application and priority from one individual and/or business to another. Moreover, changing business dynamics influence the decision of enterprises to choose and migrate to a social media platform.

As more individuals become active on the Internet using social media, cloud-based services would be the common thread for unified communications in realizing social computing and information analytics across platforms. This would be enriched with just-in-time computing that enables vital decision-making on-the-fly. Hence, the outcomes-based delivery is moving past conventional application systems with limited collaboration toward intense and dynamic process-driven services that focus on multiple business functions, user predilections, and geographical markets.

Mobility on the Rise

Access to management data and business apps on the fly can be realized through mobile computing. Hence, in coming years, the focus will be on providing enterprise-class features and support for mobile data and applications. The key drivers for this transformation are technologies such as enterprise mobile management systems (EMMSs), mobile-based BI, integrated utility apps stores, users' collaboration, and legacy migration.

Mobile technology disruption can be understood from the following statistics:

- Over 1.2 billion people access the web from their mobile devices. (Source: Trinity Digital Marketing)
- Global mobile traffic now accounts for 15% of all Internet traffic. (Source: Internet Trends 2013)
- 60% of mobile shoppers use their smartphones while in a store, and another 50% while on their way to a store. (Source: Deloitte Digital)
- Almost half a billion tablets will ship in 2013 and 2014 alone according to Gartner[4].

There are 6.8 billion mobile subscriptions worldwide, estimates The International Telecommunication Union. (February 2013) That is equivalent to 96 percent of the world population (7.1 billion according to the ITU) and is a huge increase from 6.0 billion mobile subscribers in 2011 and 5.4 billion in 2010. (Source: mobiThinking) Mobile devices have really changed the way people access digital content. Smart devices and gadgets have brought rich, digital content to the fingertips of consumers. Shoppers are increasingly using their mobile devices for everything from content surfing to comparing to buying products. Shopping on the mobile Web, i.e. m-commerce, will reach US$119 billion in 2015, predicts ABI Research. (February 2010) That's about 8 percent of the total e-commerce market. Gartner predicts that in 2016 there will be 448 million m-payment users, in a market worth $617 billion. Asia/Pacific will have the most m-payment users, but Africa will account for the highest revenues[5]. All this is forcing enterprises to get on the Cloud Mobility bandwagon with an innovative set of smart and mobile ready business and e-commerce applications.

Cloud Mobility refers to the form of compute interaction within, between, and outside the cloud by which the computing processing power is accessible across boundaries during normal usage. The mobility is fundamentally based on three facets of mobile communication, associated hardware, and software. The first facet addresses

communication issues in ad-hoc and infrastructure networks as well as communication properties, protocols, data formats, and concrete technologies. The second facet is on the hardware devices or components while the third facet deals with the characteristics and requirements of core applications. The key components of a Cloud Mobility framework that helps drive real-time cloud service delivery and collaboration to enable Smart decision-making includes:

1. **Mobile Computing**: This focuses on utilizing computing resources and all necessary processing power even when being mobile. Hence, it realizes the ability to use computing capability without a pre-defined location and/or connection to a network and/or access to a specific business application.
2. **Processing Portability**: This lays the standards and guidelines determining data processing portability through physical and virtual entities across functions and boundaries. This is vital to discover business knowledge and perform operations.
3. **Cloud Collaboration**: This ensures seamless data sharing and electronic data interchange between, within, and outside various cloud models of Private, Public, Hybrid, and Community through Mobile Apps.
4. **Ubiquitous Analytics**: Decentralize conventional information analytics to identify, analyze, evaluate, represent, distribute, and predict business process anytime, anywhere. This should be embedded with a compact and cross platform-independent security feature for roaming cloud systems focusing on protecting business-sensitive and private data.
5. **Predictive Simulation**: This function envisages the results by applying Business Intelligence (BI) based decision making and presents it real time to the mobile user. The process workflow would be simulated to validate different options based on real time or near time data feeds. This is contrary to the conventional BI decision practice focusing on a consistent set of metrics involving past and present performance and guide future business planning.

(Cloud Mobility Source: EMC Knowledge Sharing 2012 Article; Atomizing Cloud Service Delivery with Analytics & Mobility)

Big Data Analytics

Companies have always kept large amounts of data and processed information. While it's true that the amount of data in the world keeps growing, the real change has been in the ways that we access that data and use it to create value. Today, you have technologies like Hadoop, for example, that make it functionally practical to access a tremendous amount of data and then extract value from it. The availability of lower-cost hardware makes it easier and more feasible to retrieve and process information, quickly and at lower costs than ever before[6].

Large volumes of transactional data have been around for decades for most big firms, but the flood gates have now opened with more volume, and the velocity and variety—the three V's commonly used to describe Big Data—has arrived in unprecedented ways[7].

Characteristic	Description	Attribute	Driver
Volume	The sheer amount of data generated or data intensity that must be ingested, analyzed, and managed to make decisions based on complete data analysis	The world is generating 1.8 Zettabytes of information – with continuing exponential growth – projecting to 35 Zettabytes in 2020	Increase in data sources, higher resolution sensors
Velocity	How fast data is being produced and changed and the speed with which data must be received, understood, and processed	Accessibility: Information when, where, and how the user wants it Applicable: Relevant, valuable information for an enterprise Time value: Real-time analysis yields improved data driven decisions	Increase in data sources Improved connectivity Enhanced computing power of data generating devices
Variety	The rise of information coming from new sources both inside and outside the walls of the enterprise creates integration, management, governance, and architectural pressures on IT	Structured – 15% of data today is structured, i.e. row, columns Unstructured – 85% is unstructured or human-generated information Semi-structured – The combination of structured and unstructured data is becoming the norm	Mobile, social media, videos, chat, genomics, sensors

Table 1: The three V's of Big Data[7]

Solutions vary by industry and so do their modes of service delivery and KPIs (Key Performance Indicators) of business outcomes. Thus, the need to implement analytics aligned to how the clients' operating vertical ascertains the business sense towards this merit adoption.

To realize such a solution, service delivery should be from a primary cloud platform layer wired to enterprise service applications with on-the-fly change and migration capabilities. The incorporation of mobility and analytics would enable on-demand business tasks of capacity and computing power provisioning/optimization, cloud service levels and operations management including security, availability, performance, and usage cost analysis required to function in accordance to the real time business dynamics. Refer to the 'SMAC Service Delivery Architecture' section for understanding SMAC modules in action.

A typical example is in the case of Medical and Healthcare. Here, standard solutions might ensure that their business services, system implementations, IT infrastructure, security, and application management is up and running. However when it comes to dedicatedly serving the medical fraternity across healthcare, pharmaceuticals, genetics research, life science practice, and other allied services in achieving their detached yet strongly differentiating business goals of excellence, growth, and enrichment, we require advanced analytics integrated in the business operating model. Innovative solutions are required for product research and development; managing varied services; reducing costs; and improving efficiency, productivity, performance and quality.

Enterprises have begun using analytics for everything from driving growth, to reducing costs, revamping sales, improving operational excellence, recruiting workforce, to completely transforming their business strategy. Online retailers such as Amazon have already realized increased revenues implementing Big Data Analytics. Between 2008 and 2020, the amount of data managed by corporations will grow at least 44-fold.[8] As a result; Gartner has highlighted business intelligence and analytics as the top priority for corporate IT.[9] More recently, government departments and NGOs across the world have started using analytics, from optimizing public welfare programs, smart city planning, reducing traffic congestion, expanding cost-effective healthcare and education for remote areas, to fighting and preventing crime.

Cloud Analytics accelerates realization of benefits to end-users. It refers to the skills, technologies, applications, and practices for continuous iterative exploration and investigation of past and present performance to gain insight and drive real-time service delivery. It focuses on developing new insights and understanding of business performance based on historical, current, and predictive views of business operations. Common functions include reporting, real-time analytical processing, information analytics, data mining, process mining, complex event processing, business performance management, benchmarking, and predictive analytics. The key components of the Cloud Analytics framework that controls the analytical decision making includes:

1. **Flexible Reporting**: This is the platform for strategic reporting to serve the strategic management of a business. This is different from operational reporting and involves data visualization, executive information system, and OLAP.
2. **Real Time Analytics**: This builds quantitative processes for a business to arrive at optimal decisions and to perform business knowledge discovery based on real time data inputs received from various channels. This operation frequently involves: data mining, process mining, statistical analysis, predictive analytics, predictive modeling, business process modeling, and complex event processing.
3. **Collaboration**: A collaborative platform program enables different parts (both within and outside the business) to work together through data sharing and electronic data interchange. The archives here would often consist of metrics from past performance and business planning tips based on historical data and statistical methods.
4. **Dynamic Modeling**: Modeling function simulates the process of developing optimal or realistic decision recommendations based on insights derived through the application of Information Analytics, multi-dimensional Business models, and analysis against existing and/or predictive data.
5. **Benchmarking**: Benchmarking measures and creates a hierarchy of performance metrics and standards that informs business leaders about progress toward enterprise goals and objectives. This also includes a scalable repository to manage the company data driven through strategies; i.e. practices to identify, create, represent, distribute, and enable adoption of insights based on industry leading standards.

(Cloud Analytics Source: EMC Knowledge Sharing 2012 Article-Atomizing Cloud Service Delivery with Analytics & Mobility)

Cloud Services

Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources such as networks, servers, storage, applications, and services that can be rapidly provisioned and released with minimal management effort or service provider interaction. (Source: NIST)

Cloud Services has redefined delivery, enabling organizations to consolidate their data centers, virtualize apps and infrastructure, maximize utilization, and improve operational efficiency and service levels in a cost effective manner. Market trends indicate the upsurge in cloud adoption.

- $180 billion is the estimated global cloud services market by the end of 2015.[10]
- 84% of CIOs are cutting application costs by moving to the cloud.[11]
- According to Gartner Research, SaaS-based delivery will experience healthy growth through 2015 when worldwide revenue is projected to reach $22.1 billion.[12]
- IDC Research found that Infrastructure as a Service (IaaS) will grow to $5.4 billion between now and 2017 while Platform as a Service (PaaS) will grow to $1.1 billion.[13]

The atomization of Cloud Services creating cloudlets forms the building blocks for assembling the cloud delivery model factoring in key process, operations, and domain differentiators for clients. The atomization incorporating analytics and mobility promotes decoupling of cloud infrastructure from the business applications so that each business module can be dynamically customized, scaled, utilized, and managed.

Although the cloud delivery model is considered to be self-configuring, self-architecting, self-managing and self-healing, data retention and data loss is a serious concern for companies thinking about (or those who have already) moving to the cloud. To avoid data loss in the cloud, companies should ensure they have the right cloud backup and/or cloud-to-cloud backup technologies in place proactively driven by business process events and automation measures.

Embracing the SMAC Stack

Embracing the SMAC stack often involves rewiring the digital IT DNA of an enterprise in order to facilitate better adoption and improved efficiency to make businesses run faster and differently. Enterprises that adopt a Web 3.0-4.0 mindset can attain optimal maturity wherein the multidimensional data from various channels is synthesized into valuable information creating significant commercial, customer, and competitive values. These companies capitalize on digital ecosystems that are expanding due to the confluence of social computing, mobility, analytics, and cloud computing. Today, market uncertainty accompanied by dynamic user preferences is starting to become the new norm of business volatility. Here, SMAC helps to overcome challenges to take advantage of the positive disruptions the new trend portends while operating at the rapid pace of innovation and change. This in turn creates newer avenues in product/services development strategy, vendor/partner/customer collaboration, real time analytics, and apps migrations on the fly, thereby setting a unique competitive advantage of business process automation. (Figure 1)

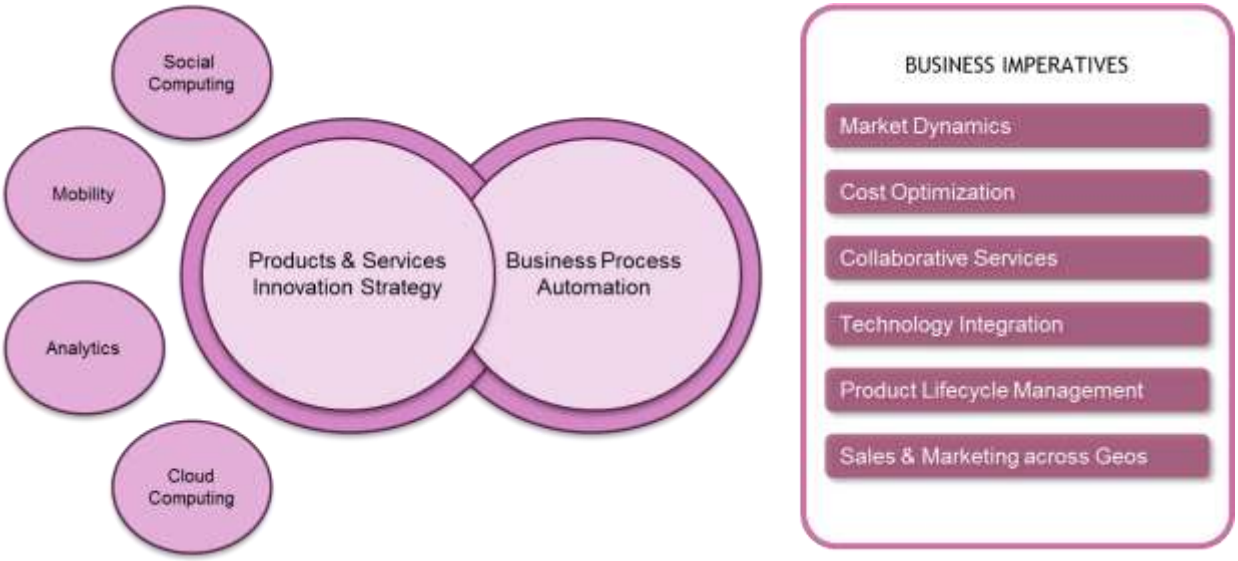

Figure 1: SMAC Adoption Rationale

Refer to Appendix B for understanding the pace of SMAC market shift.

Each component of the SMAC stack complements with other during execution:

- Social media enables collaboration among colleagues, customers, business partners, and/or service providers/vendors
- Mobility enables and enhances accessibility across locations and with multiple data sources
- Analytics helps synthesize multidimensional data to create actionable information for BIM in real-time
- Cloud computing helps meet workload fluctuations on demand, managing the information, infrastructure, and applications and automating operations

Some of the enterprise focus areas while adopting SMAC are depicted in Figure 1. The key business imperatives include:

1. **Market Dynamics**: The different business domains across Horizontals and Verticals of the organization would be integrated with a common set of process and practice guidelines aligned to the operating markets.
2. **Technology Integration**: The enterprise-wide maturity to adopt automation and virtualization across the platform and infrastructure of the IT landscape for optimizing SMAC deployment is assessed. This also improves the design planning of an open and extensible architecture with better business reliability, precision, process convertibility, and output turnaround time.
3. **Collaborative Services**: Various applications deployed across departments, i.e. front office (FO), middle office (MO), and back office (BO) become coalesced based on operations management, business functions, and production activities. However, the feasibility of having the coalesced units as Mobile Apps and hosting on the cloud should also be a key criterion in addition to data privacy, cloud residency (Public/Private/Hybrid/Community), and information security.
4. **Cost Sustainability**: The sustainability factor is primarily based on incorporating Green IT-based best practices into mainstream infrastructure, platforms, and data centers. The additional benefits include rationalizing people, process, tools, and technology present in all stages of the product lifecycle.

5. **Sales Modelling**: The sales activities (retired/current/future) as per portfolio are revamped in lines of functional overlaps, technological, and Geo boundaries. This enhances service delivery capability and broadens the service catalogue scope.

SMAC Service Modelling

Whatever cloud model is adopted—private, hybrid or public—as the core of the SMAC service model, the following is basic evaluation criteria during assessment for the adoption and implementation of the SMAC architecture.

1. **Why are you adopting SMAC?**: Organizations should be clear about the rationale behind adopting an enterprise wide SMAC strategy. Is it reduced costs? More flexibility? Increased collaboration and accessibility? Complete clarity should be gained on all objectives behind the components of the stack.
2. **Assess your Cloud needs**: Identify the costs of delivering services from on premise compared to a cloud service provider. This should include computing costs, storage, network, application, security, and infrastructure or data center maintenance. Not all services make business sense to move to the cloud all the time.
3. **What to be deployed as Mobile Apps**: Mobility solutions or enterprise mobile apps or app stores enable users to be connected on the move. Although, this enhances user accessibility and experience, the downtime could have serious consequences for critical systems which are vital to the success of the business. The common factors are RTO (Recovery Time Objective); How long the business processes can operate without a particular app being available and RPO (Recovery Point Objective); What amount of data the business division can afford to lose?
4. **Socializing the Business:** Enterprises need to be fully aware of information security, privacy regulations, and legal compliance when collaborating through social networks. This medium enables almost real time feedback to be shared privately or publicly and on the basis of which buyer choices would be influenced and enterprise decisions could be taken.
5. **Understanding Analytics Processing**: Enterprises should ask providers about the analytics capabilities of a tool or service. They should also be aware of where the data resides during processing, as well as what security and privacy options are available. The capability of connecting human insight with machine intelligence,

advanced analytics, and dynamic sensing would drive new levels of productivity and efficiency for businesses cutting across industries.

Depicting Synergy: Social-Mobility-Analytics-Cloud

Today, with social, mobile, analytics, and cloud technologies convergence, IT is not merely a supporter or enabler of the business but a game changer that can become a strategic value differentiator to organizations. To deliver value mapped to business goals or business transformations, SMAC deployment should be linked to key strategic imperatives and be business driven.

The synergy of Social Computing, Mobility, and Analytics is realized by Atomization of Cloud Services. It ensures the seamless flow of refined information, functional logic, and process integration of business entities between, within, and outside the cloud through various modes of communication. Monitoring, management, and control activities can be realized with high-end interactive Business Intelligence and Analytics.

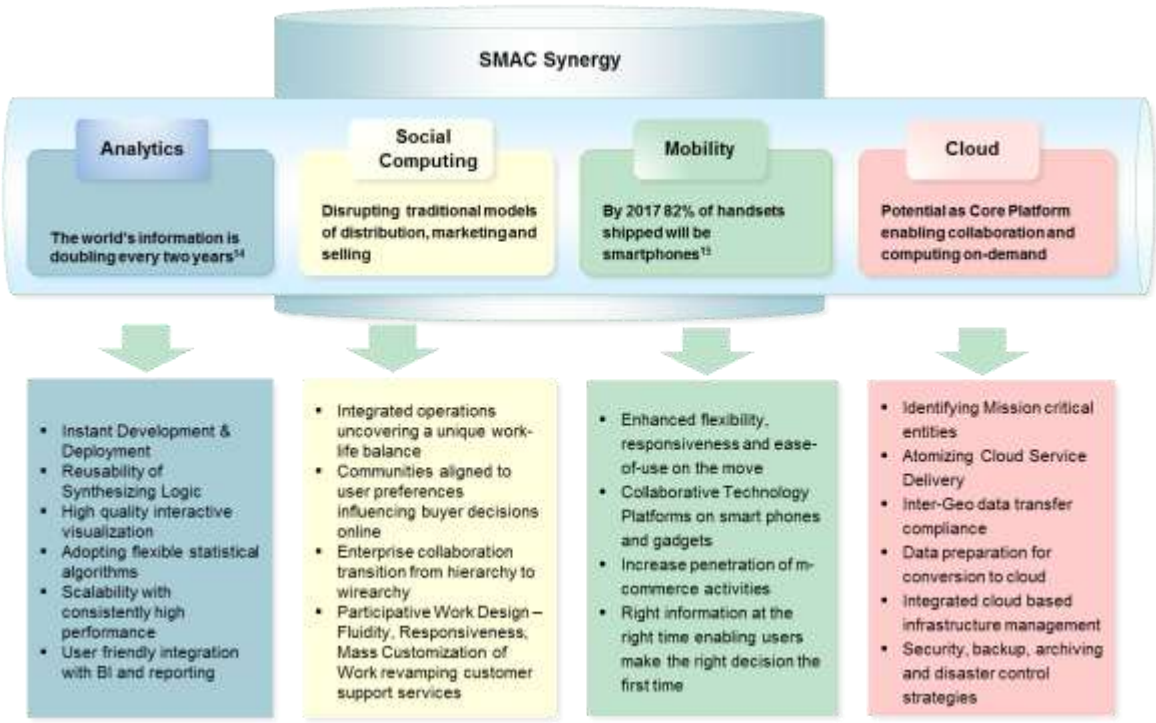

Figure 2: SMAC Synergies

Figure 2 outlines the key driver in each segment of the SMAC stack and business benefits of implementing the technology. During implementation a key accelerator would be choosing

the right set of monitoring tools and event automation systems aligned to the product/service lines of business. This would in turn help in faster realization of benefits mapped to the design rationale.

S+M+A+C Stack vs S/M/A/C Discrete

The discrete implementation of SMAC components has their own scope and benefits compared to the overall stack. Figure 3 depicts the approximate percentage of self-actualization across the spectrum. The pies indicate a percentage of 25-50-75-100 based on the features availability as a broad representation. This can vary based on customers' business, operational, technology, and IT landscape. The capabilities analyzed include On-Demand Market Analytics, Collaborative Computing, Flexible Infrastructure, Smart Mobile Solutions, Dynamic Service Delivery, and Real Time Business Impact Management (BIM) on an Event Driven Enterprise Architecture.

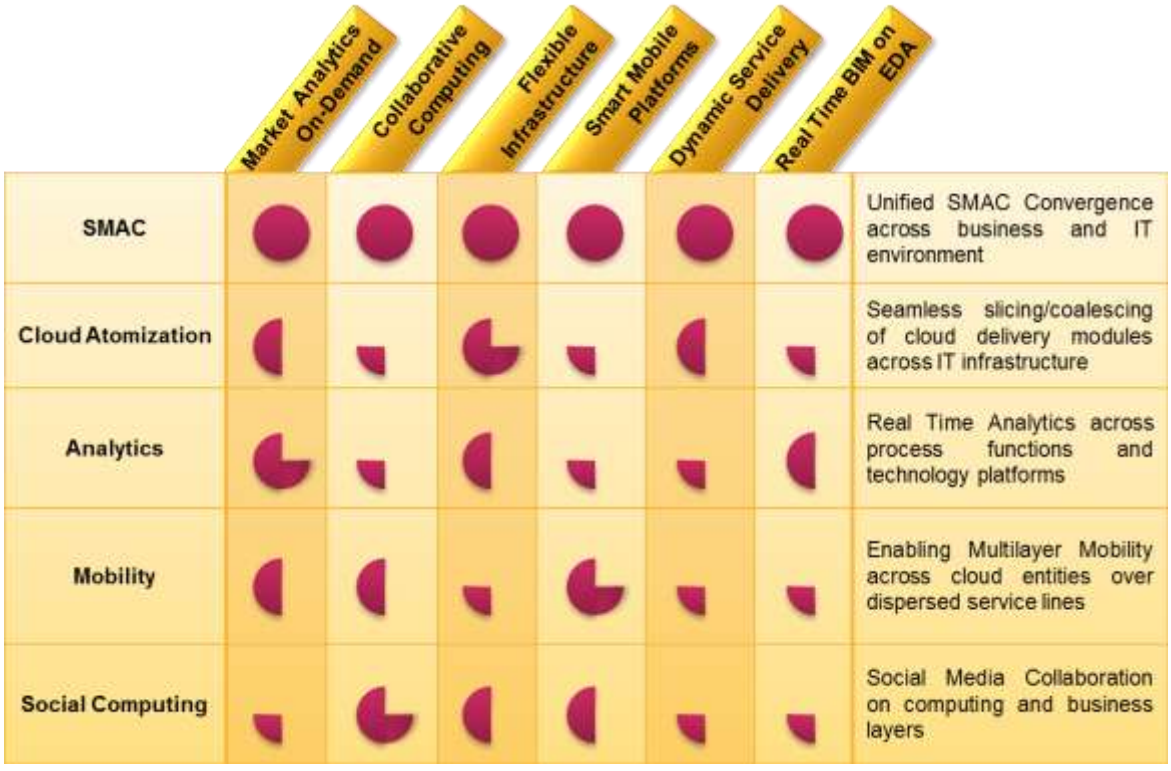

Figure 3: S+M+A+C Stack vs S/M/A/C Discrete

An integrated infrastructure is often in place today with definite trends (SOA, cloud computing, open-source, social networking platforms, and communication services) that are changing the way we work and connect. As SMAC improves the overall customer

experience which is critical to any industry, it also accompanies an innovative products and services overhaul by means of collaboration with customers, employees, and suppliers. This would continue to mature as more organizations start adoption.

SMAC Consideration Factors

One will need to follow pre-defined criteria to ensure that the decisive factors are considered before adopting SMAC by evaluating below aspects:

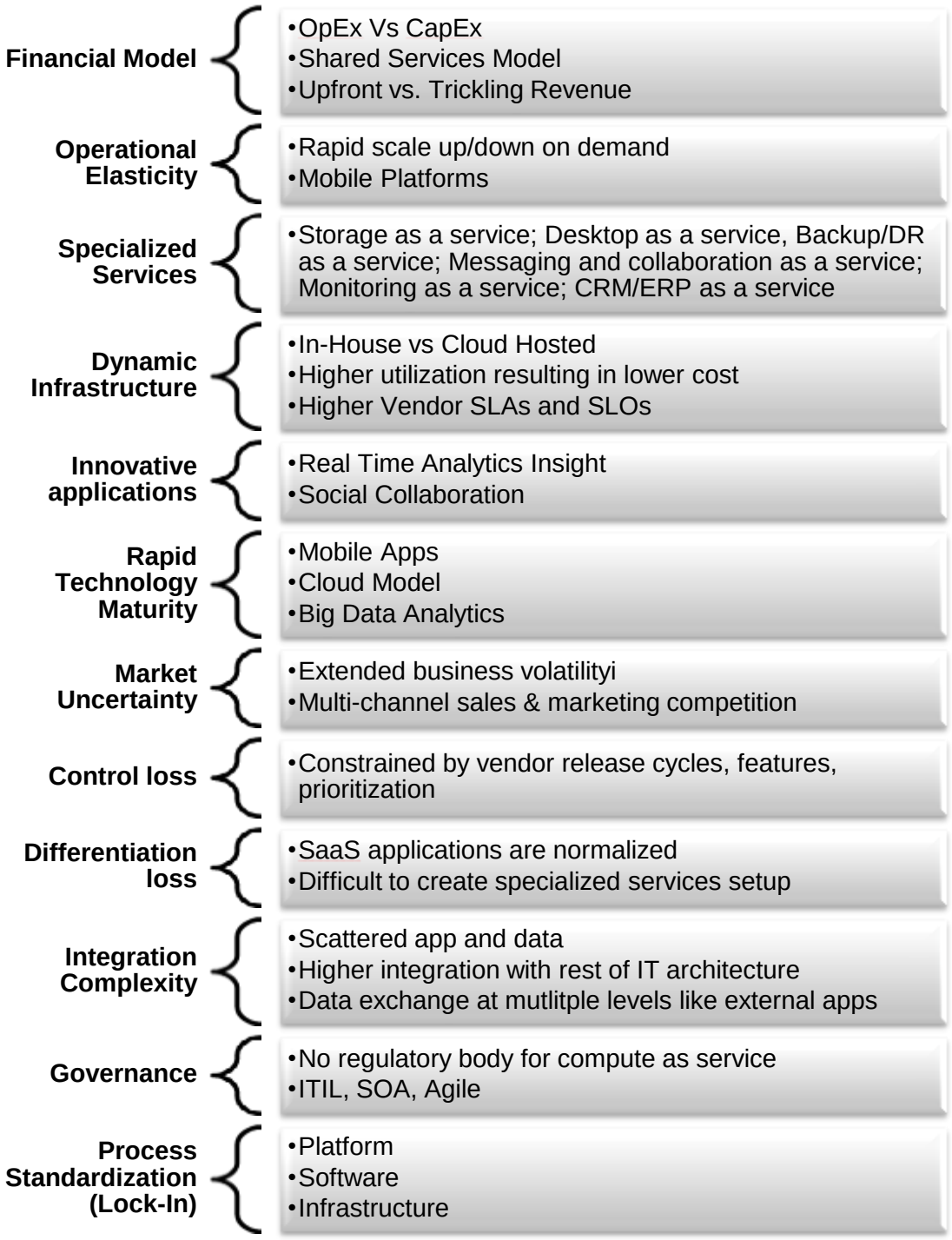

Table 2: SMAC Consideration Factors

SMAC Service Delivery Architecture

The SMAC Service delivery being envisioned leverages the Atomized Cloud Service Delivery Model, DevOps- On time provisioning of business apps development, maintenance, and migration, Real Time Analytics, and Mobile based Social computing platforms. The SMAC Service Delivery reference architecture illustrated in Figure 4 primarily consists of five entities working synchronously.

1. **Analytics Trigger**: This is the demand variability interface for sensing external and internal factors which would affect service delivery. It sends signals to the DevOps platform when it senses seasonal usage variations, situational demands, patterns in sales channels, and so on to ensure a consistent application performance irrespective of demand fluctuations. This accelerates the release of application changes across development, test, staging, and production channels.
2. **DevOps Platform**: This is a software development method that stresses communication, collaboration, and integration between software developers and IT professionals. DevOps is a response to the interdependence of software development and IT operations. It aims to help an organization rapidly produce software products and services.[16] Refer to Appendix C for DevOps reference architecture.
3. **SMAC Engine**: This is the central processor linking the App based Devops with the Infra based Cloud engineering bed. It is event-driven coupled real time with:
   a) Analytics aimed at realizing Business Intelligence between different functional entities of the application world
   b) Mobility aimed at Comprehensive Collaboration between different operational entities of the infrastructure world

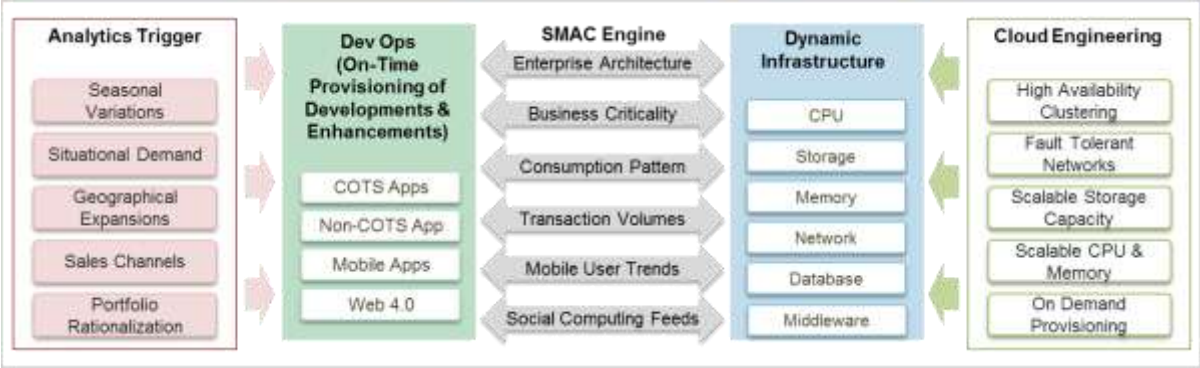

Figure 4: SMAC Delivery Architecture

4. **Dynamic Infrastructure**: This brings in a smart approach for Infrastructure scaling needs to address concerns of commercialization, standardization, and governance in conceiving, developing, operating, and maintaining cloud delivery. It works closely with Cloud engineering bed for flexible and accurate infrastructure capacity planning of CPU, storage, cache, databases, network, and middleware. Cost savings and improved service level objectives are attained in the end geared with quality improvements in service delivery features and functions across portfolio.
5. **Cloud Engineering**: This section engineers atomized cloud service delivery on the fly based on processed information from diverse sections like systems software, web, performance, information security, social platforms, risk, and quality; in order to meet the customer's business requirements. The delivery focuses on the features and functions associated with an all-inclusive cloud service offering matching Best-In-Class (BIC) industry solutions. This helps overcome inefficiencies due to underutilization of operational/computing resources or not having specific business agility. Hence, the methodology adopted in the cloud engineering bed consists of identifying atomization areas of focus to suit various business scenarios, i.e. client needs such as reducing costs and/or managing large or complex number of applications required to run their daily operations.

SMAC Maturity Assessment

The SMAC service maturity can be determined by the five attributes of Scalability, Multi Tenancy, Wirearchy Index, Collaborative Analytics, and Metadata-driven Design as depicted in Figure 5.

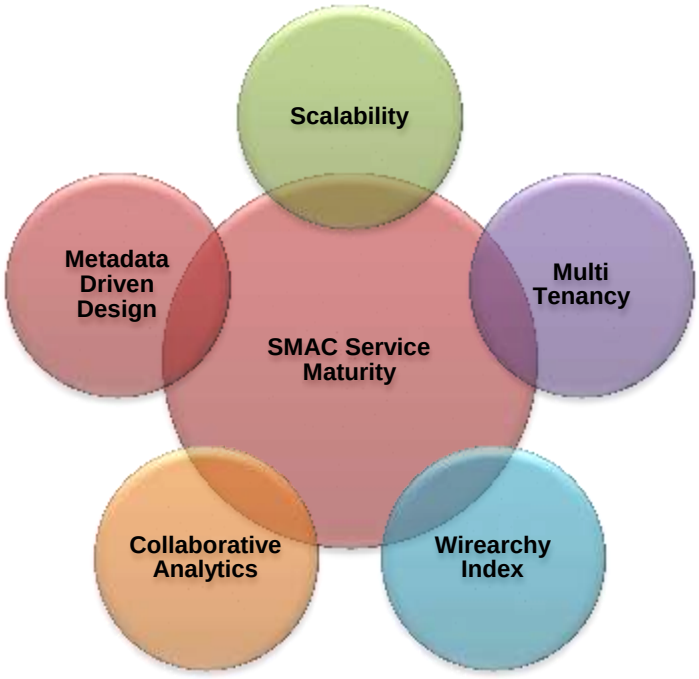

Figure 5: SMAC Service Maturity

1. **Scalability**: Scaling the architecture means maximizing concurrency and using resources more efficiently especially during instances like optimizing locking duration, statelessness, sharing pooled resources such as threads and network connections, caching reference data, and partitioning large databases.
2. **Multi-tenancy**: Multi-tenant architecture maximizes resource sharing across tenants that is still able to differentiate data belonging to different users. Here, a single instance of the software runs on a server, serving multiple clients (tenants). Multi-tenancy is often contrasted with a multi-instance architecture where separate software instances (or hardware systems) are set up for different clients. With a multitenant architecture, a software application is designed to virtually partition its data and configuration and each user works with a customized virtual application instance.

3. **Wirearchy Index**: As the Internet has moved through the dot.com boom and bust, and integrated software encases most organizational activities, the dynamics of hierarchy have begun to morph into a new dynamic called wirearchy. Wirearchy is a dynamic flow of power and authority, based on information, trust, credibility, and a focus on results, enabled by interconnected technology and people.[17] Wirearchy Index is about the power and effectiveness of people working together through connection and collaboration. Its derived value is directly proportional to better understand, instantiate, and act towards effectiveness in an interconnected networked world much faster.
4. **Collaborative Analytics**: The business impact of bringing analytics together in a collaborative environment has immense potential to transform organizations. Collaborative analytics refers to the penetration of using multifaceted analysis to manage enterprise interactions across people, processes, platforms, tools, and technology. The synthesized outputs take enterprises to a technological high when they begin using "next best action"-based event driven architecture for automating real time business execution.
5. **Metadata-Driven Design**: In this configuration, instead of customizing the application for each customer (requiring code changes), one allows the user to instantly configure the application through metadata. Software architects widely use metadata to abstract function from logic. Metadata creates a logical self-describing framework for allowing the data to drive application features and functionality and helps in closing the gaps between design process and implementation.

SMAC Implementation Framework

The step-wise phased approach toward realizing an Enterprise SMAC model is illustrated in Figure 6.

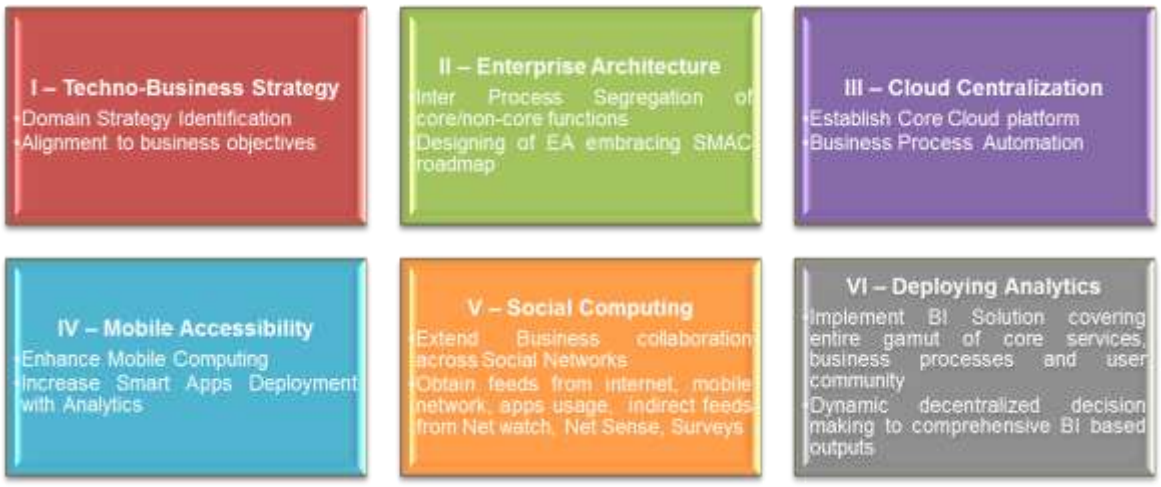

Figure 6: SMAC Implementation Approach

Phase 1: Adopt a Techno Business Strategy

Enterprises should design an IT charter remaining cognizant of the convergence benefits of social, mobile, analytics, and cloud. The implementation of the stack should be with the business rationale of adopting each component, i.e. improving business processes, optimizing operations, enhancing non-linear service scope with product innovations, multi-channel collaborations, better sales coverage, real time insight to customer requirements and market trends, and so on. This phase involves data gathering of current systems; due diligence to identify business drivers; discussions with business users; SMAC stack assessment; and scoping of augmented services and ROI estimation of implementation.

Phase 2: Design EA encompassing IT For Integrated Systems

SMAC adoption requires revamping conventional enterprise architectures. Accordingly, enterprises have to develop dynamically scalable, agile, redundant, and symbiotic computing based interfaces encompassing technologies on and off premises. This would be flexibly decoupled services oriented architectures like an Event-Driven Architecture (EDA), also known as Event-Driven SOA with advanced orchestration capabilities.

While earlier efforts to enhance operational efficiency through dynamic resource scheduling and operations management solutions helped, they had limited effect on strategic goals or enterprise innovation. Moreover, those systems often run in silos and lack the functionality key to success in today's dynamic event-driven, service-oriented environments. This phase is to perform Analysis; adopt process optimizations; service improvements; identify areas of consolidation, automation and virtualization; select suitable applications, tools and plot Delivery Model Design aligned to SMAC compatibility with the enterprise DNA. Improved alignment of IT resources with institutional priorities results in higher utilization and improved efficiency.

Phase 3: Cloud Centralization

Incorporating Cloud as the central theme with Agile development and continuous delivery methods are needed for the transition of change in SMAC IT and B2B. This is further realized through DevOps- on time Provisioning based on complex on-demand scalable computation grid, which is accessible to users through web-enabled devices. The Cloud platform will incorporate centralization of analytics-based data processing. This means that rather than having private data spread over a number of systems (e.g. work computer, home computer, and mobile device) and spreading multifunctional BI apps across, data analytics can be deployed onto the cloud and accessed through various channels including smart mobile devices.

The cloud core provides the platform that can support the scalability, velocity, and data variety aligned with diverse mobile and social applications supporting real time analytics. The key benefit is reducing capital and operating expenditures through infrastructure pooling and improved utilization. Here, customer expense is minimized and thus lowers barriers to entry, as infrastructure is owned by the provider and does not need to be purchased for one-time or infrequent intensive computing tasks.

Phase 4: Mobile Access Enhancement

The new generation mobile apps are becoming one of the key value interfaces that help enterprises connect with their end customers, business/technology partners, sales channel, vendors, and employees anytime, anywhere, anyhow. In fact, mobile applications are ushering in a people-centric interaction from the conventional process-centric approach.

As mobile apps usage extends, technology architects are rethinking the way they design, develop, deploy, and manage mobile applications. This includes adopting an extensible MEAP (Mobile Enterprise Application Platform) or MDAP (Mobile Development Application Platform) that comprises a mobility-optimized integrated development environment, a mobile application server and client device interface to deliver essential data transformation, synchronization, and other computing services. A full-fledged MAP solution is built on an open, extensible architecture which is scalable based on mobile device management, network security, business dynamics, and modular analytics capabilities.

Today, mobile has become the primary delivery platform for social apps, smartphones, and other mobile gadgets and is an important source of the data fed into the analytics engine. The ability to customize mobile services based on service delivery levels and user preferences has led organizations in transforming a vital part of their transactional, productivity, and business applications to mobile devices.

The key benefit is the segregation of infrastructure and application dependency from localized resources. i.e. device and location independence enables users to access systems regardless of their location or what device they are using. Anytime, anyplace, any device access

Phase 5: Linking Social Networking

Linking social computing applies social networking processes and tools to enterprise functions, process operations, and business outcomes. It enables users to engage productively in innovative business contexts through collaboration on enhanced business activities interconnected with social content from internal and external networks of channel partners, public networks, and customers. The analysis of data feeds from social networks helps to explore new product/service insights, expand process completion vantage points, options for faster sales channels, improved customer relations, and identifying market opportunities.

Today, all user transactions, system interactions, and events from the social web can be processed real time by Big Data platforms for instant decision making. This is realized by the orchestration of business intelligent service agents. As social computing ecosystems evolve; the EDA orchestration engine determined in Phase 2 should be able to integrate with them, mainly through a set of open APIs supporting them.

Phase 6: Embedding Business Analytics

The rise in the amount of both structured and unstructured data being generated is directly related to social, mobile, and cloud applications in place. The real-time analysis of data generated in these spheres can bring significant value for enterprises across various areas such as product/services innovation, sales and marketing, customer care, and more. Big Data refers to the collection, storage, and analysis of data that is very large in size. Its attributes are widely known as 3Vs – volume, variety, and velocity.

Offloading analytics processing operations by enabling use of dynamic assets to handle peak loads catering to increased efficiency and ability to scale would help to meet user demands quickly. Advanced analytics and Big Data can help unify an enterprise's investments in social, mobile, and cloud technologies, delivering powerful insights that leverage all three categories of investment. This would pave the path for a paradigm shift for adopting an EDA in the technology industry. Firms are adopting different analytics solutions to enhance service levels, improve predictability, and achieve business agility. This also in turn provides cost leadership and service excellence to quickly address market changes and challenges across geographies.

SMAC Influence on Business Impact Management

SMAC implementation would have a profound impact on business service management. While each component of the stack has its own value differentiation on enterprises, the convergence of these technologies is creating newer avenues for business to innovate and create better value to customers. The evolution of service delivery from a people-centric, to service oriented, to business driven approach is illustrated in Figure 7. The highlights during each phase of this journey are also depicted in the graphic.

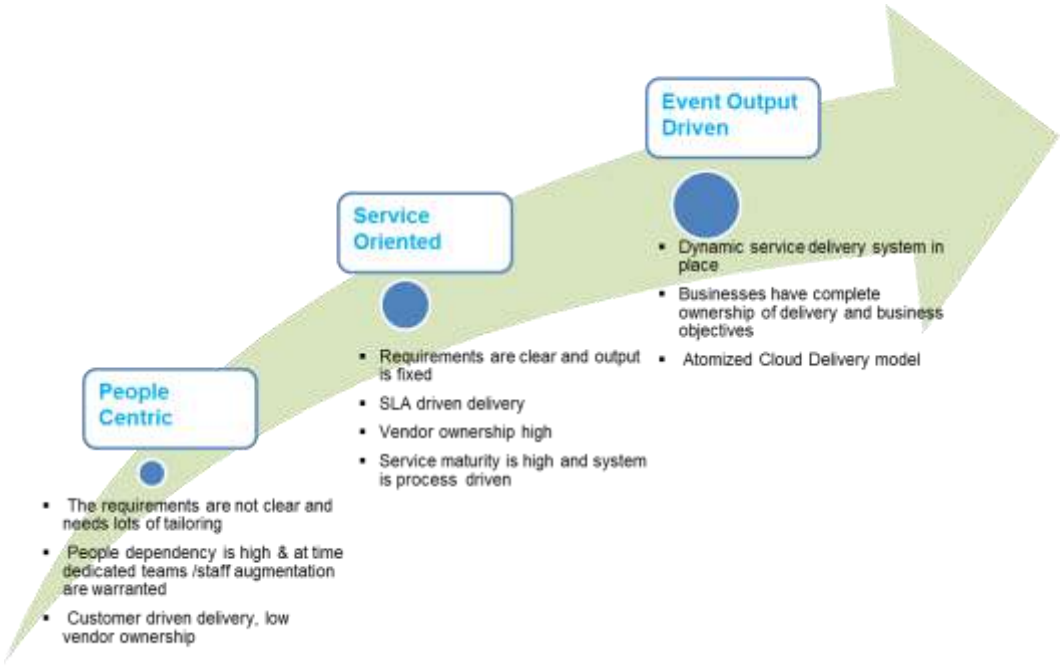

Figure 7: Evolution of Business Service Management

The convergence is realized when mobile users utilize a smartphone app interface as the front end, social computing provides a platform for collaboration with feeds for analytics, and cloud provides the underlying infrastructure with built-in or customized analytics capability for intense data processing. Combining analytics and mobility is a significant enhancement in the Atomization of Cloud Services in particular. It ensures the seamless flow of refined information, functional logic, and process integration among business entities between, within, and outside the cloud. (Source: Atomizing Cloud Service Delivery with Analytics & Mobility from EMC Knowledge Sharing 2012)

Business Benefits of SMAC

Business benefits toward realizing SMAC-based Service Architecture include:

Functional Benefits	
1	Flexible reach for end users
2	Anywhere access, desktop, mobile and web
3	User customized service options
4	Enhanced user accessibility
5	Dynamic Alignment to market volatility
6	Wider Social Messaging and Collaboration options
7	Enriched Real-time Business Intelligence
Operational Benefits	
8	Dramatically enhance service level and improve SLAs with reduction in cycle time
9	Reduced operational, DC, Support costs and predictable budgets
10	Instant Provisioning, Extensibility and Scalability
11	Seamless software upgrades and migration
12	Geo redundancy with robust Service continuity and Disaster recovery
13	Flexible Pricing options on service and fees
14	Improve Predictability and Availability of Services
15	Automatic Quota implementation
16	Flexibility of Interoperability with current support infrastructure and investments
17	Enhanced adherence to Operations and Process Maturity affecting CSATs

Table 3: SMAC Business Benefits Snapshot

Refer to Appendix D for customer experience outlook on enhanced SMAC values.

Future and Conclusion

SMAC is becoming a top priority of CIOs today. The very foundation of SMAC is the broader concept of convergence of shared infrastructure, mobile accessibility, real-time analytics, and collaborative services. This enables enterprises to get their businesses up and running faster, with easier manageability and less maintenance, and enables IT to more rapidly adjust IT resources (such as servers, storage, and networking) to meet fluctuating and unpredictable business demand. SMAC tries to bring the best of both worlds onto a common stage. The future of SMAC depends on the future of social computing adoption across mainstream business applications coupled with mobility and analytics in the cloud.

According to Forbes, CIOs use a "combination of social, mobile, analytics, and cloud strategies to stay competitive, differentiate themselves, and provide a great customer experience." Consequently, those who fail to leverage SMAC could fall to the competition. SMAC-based service delivery is definitely going to play an increasing role in the next generation of computing systems and technology.

The future of SMAC would be linked to machine-to-machine connectivity, also called M2M, which has begun altering how businesses function and flourish. The lMachina Research report predicts the M2M market will grow from $200 billion to $1.2 trillion in 2022. Indeed, according to Cisco, the next nine billion devices connected to the Internet in 2020 will incorporate some form of M2M—linking the physical world to the global web via sensors that will take continuous readings from their immediate surroundings and deliver that information to the cloud. SAP's prediction is even larger; they suggest that 50 billion devices will be connected to the global web by 2020. (Source: The SMAC Report, Q4 Systems Corporation publication)

Appendix A: Technical References

Footnotes

1. Gartner report "Market Trends: Monetizing Gartner's Nexus of Forces in the Enterprise Software Markets."
2. Investor Relations, Facebook, 2013 (http://investor.fb.com/)
3. Statistics from http://expandedramblings.com
4. Gartner report "Forecast: Devices by Operating System and User Type, Worldwide, 2010-2017, 1Q13 Update."
5. http://www.gartner.com/it/page.jsp?id=2028315
6. "Putting big data and analytics to work", McKinsey, http://www.mckinsey.com/insights/marketing_sales/putting_big_data_and_advanced_analytics_to_work
7. "Big Data, Big Analytics" by Michael Minelli, Michele Chambers and Ambiga Dhiraj
8. IDC EMC study, 2011
9. Cliff Saran, “Gartner: Business Intelligence Still Highest Priority for CIOs,” ComputerWeekly, April 2, 2012, http://www.computerweekly.com/news/2240147762/Gartner-BI-still-the-Number-One-priority-for-CIOs
10. http://www.informationweek.com/cloud-computing/infrastructure/gartner-tells-outsourcers-embrace-cloud/240159246
11. http://www.huffingtonpost.com/vala-afshar/the-top-100-cloud-computi_b_3756172.html
12. http://www.gartner.com/newsroom/id/1963815
13. http://www.eweek.com/small-business/cloud-solutions-grab-big-slice-of-government-it-budgets-idc/
14. http://www.emc.com/collateral/analyst-reports/idc-extracting-value-from-chaos-ar.pdf
15. http://www.displaysearch.com/cps/rde/xchg/displaysearch/hs.xsl/131121_smartphones_to_pass_global_mobile_phone_shipments_by_2017.asp
16. http://en.wikipedia.org/wiki/DevOps
17. http://www.wfs.org/husband.htm

Bibliography

1. Computing in the Clouds by A. Weiss
2. The World Is Flat, by Thomas L. Friedmann
3. An Introduction to SaaS and Cloud Computing by Ross Cooney
4. Cloud SLAs by Jonathan Shaw (Analytics.InformationWeek.com)
5. Cloud Computing and IT's Future by Nicholas G. Carr & Alan Turing
6. The Grid: Blueprint for a Future Computing Infrastructure by I. Foster and C. Kesselman
7. Christakis, Nicholas A., and James H. Fowler. Connected: The Surprising Power of Our Social Networks and How They Shape Our Lives. Little, Brown and Company, 2009.
8. Wikipedia description of Craigslist, http://en.wikipedia.org/wiki/Craigslist
9. “Analytics: The Real-World Use of Big Data.” IBM, Said School of Business at the University of Oxford, October 2012 (http://bitpipe.computerweekly.com/detail/RES/1350645781_191.html)
10. EMC Knowledge Sharing 2012 Article- Atomizing Cloud Service Delivery with Analytics & Mobility by Mohammed Hashim

Websites

11. http://www.emc.com/emc-plus/index.htm
12. http://www.cognizant.com/smac
13. http://collaborate.nist.gov/twiki-cloud-computing/pub/CloudComputing/ReferenceArchitectureTaxonomy/NIST_SP_500-292_-_090611.pdf

14. http://www.ciol.com/print_article/ciol/features/207232/mobile-apps-vehicle-cognizant-computing
15. http://www.cutter.com/content-and-analysis/journals-and-reports/cutter-it-journal/sample/itj1302/itj1302c.html
16. http://www.bpap.org/media-room/820-smac-intensifying-pace-of-business-transformation
17. http://www.itbriefcase.net/the-future-of-business-intelligence-has-arrived
18. http://my.gartner.com/portal/server.pt?open=512&objID=270&mode=2&PageID=3862698&resId=2585618
19. http://ibmdatamag.com/category/big-data-and-warehouse/big-data-big-data-and-warehouse/

Appendix B: 2020: When Computers Outnumber Humans 10 to 1

By any definition, the SMAC market shift is occurring faster—and at dramatically greater scale—than prior technology shifts as illustrated in Figure 9. (Source: Don't Get Smacked-Future of Work, November 2012 from Cognizant Technology Solutions)

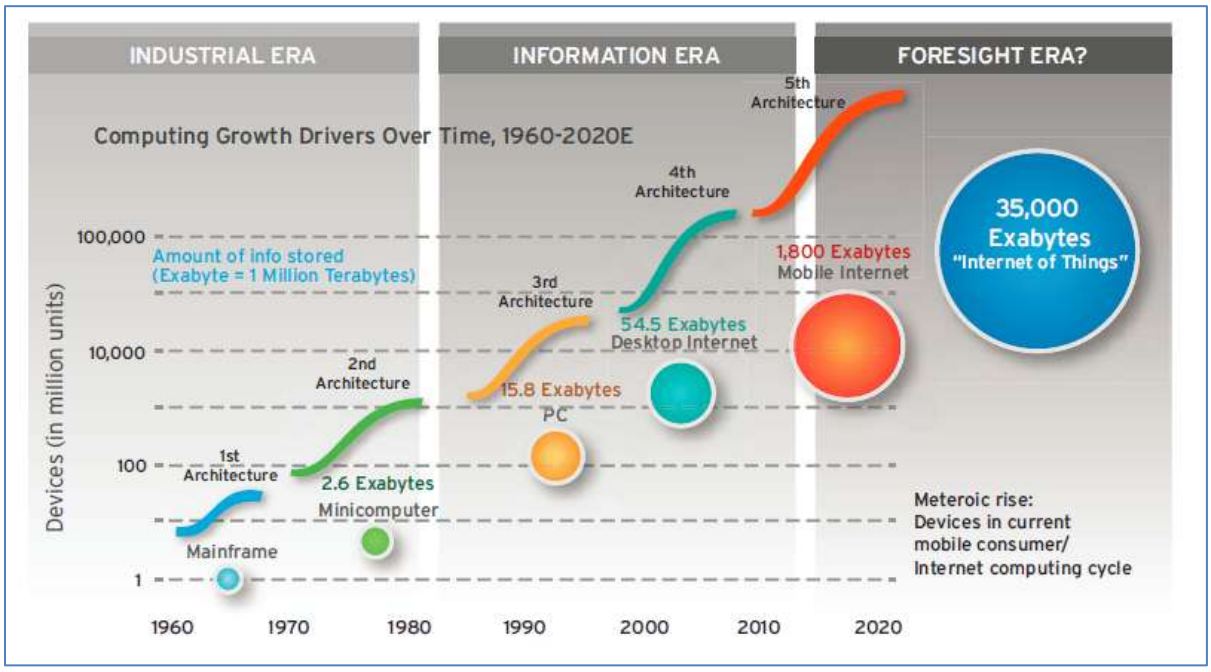

Figure 8: 2020: When Computers Outnumber Humans 10 to 1 (Source: Cognizant Technology Solutions)

Appendix C: DevOps Reference Architecture

Leveraging a DevOps reference architecture is important to help organizations define the capabilities and tools that will be used to implement their DevOps environment. The reference architecture should embrace open standards where possible. Figure 9 includes an example DevOps reference architecture with key standard technologies called out specifically in the area of cloud and lifecycle integration. (Source: Cloud Standards Customer Council Convergence of Social, Mobile & Cloud: 7 Steps to Ensure Success (2013).

Figure 9: DevOps Reference Architecture

Appendix D: Customers' Experience of SMAC Value Delivered

The confluence of SMAC trends is driving this shift in business value. PwC anticipates that information associated with products and services will increasingly account for a rising share in the customer's experience of value delivered, as illustrated in Figure 10. (Source: Through the looking glass-Emerging trends from www.pwc.in)

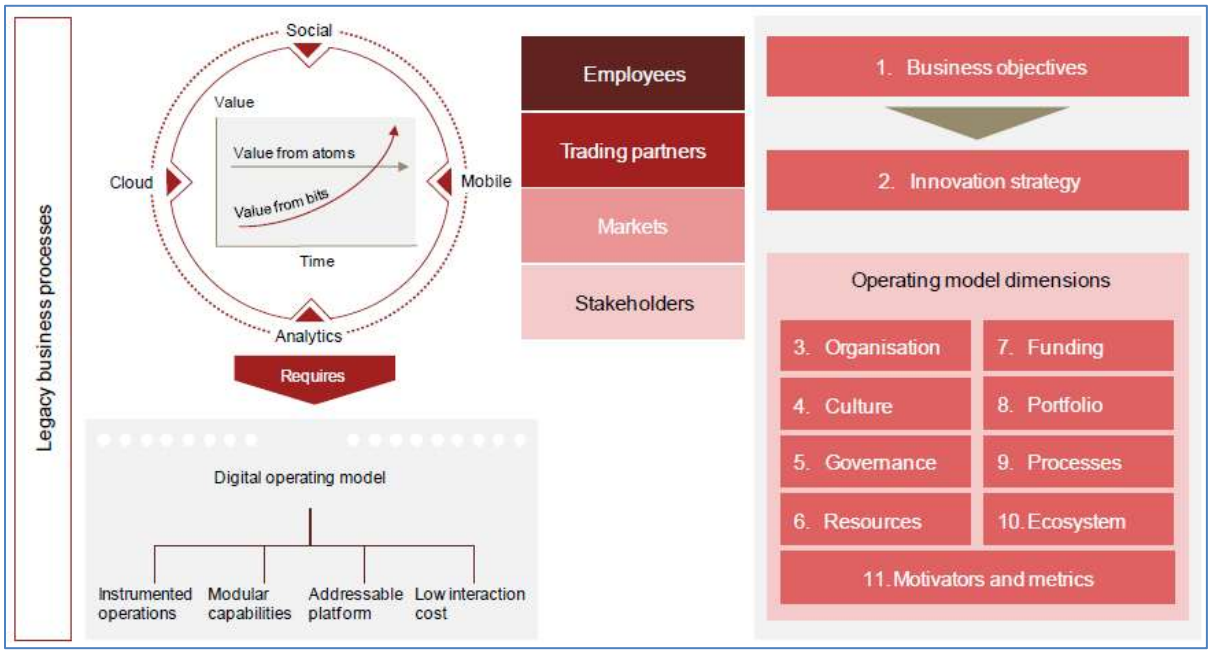

Figure 10: Customer's experience of value delivered (Source: PwC)

Appendix E: The Omni-channel Approach

To be truly customer-centric, business leaders need to think like a customer and view their business from the outside-in, experiencing it as a customer would. Today, that means taking a look at all the channels through which you interact with customers and rationalizing those points of engagement so that the company appears as one single entity, sometimes called an “omni-channel” approach as illustrated in Figure 11. (Source: Future Of Work Enabler: Customer Empowerment And Engagement, November 2013 from Cognizant Technology Solutions)

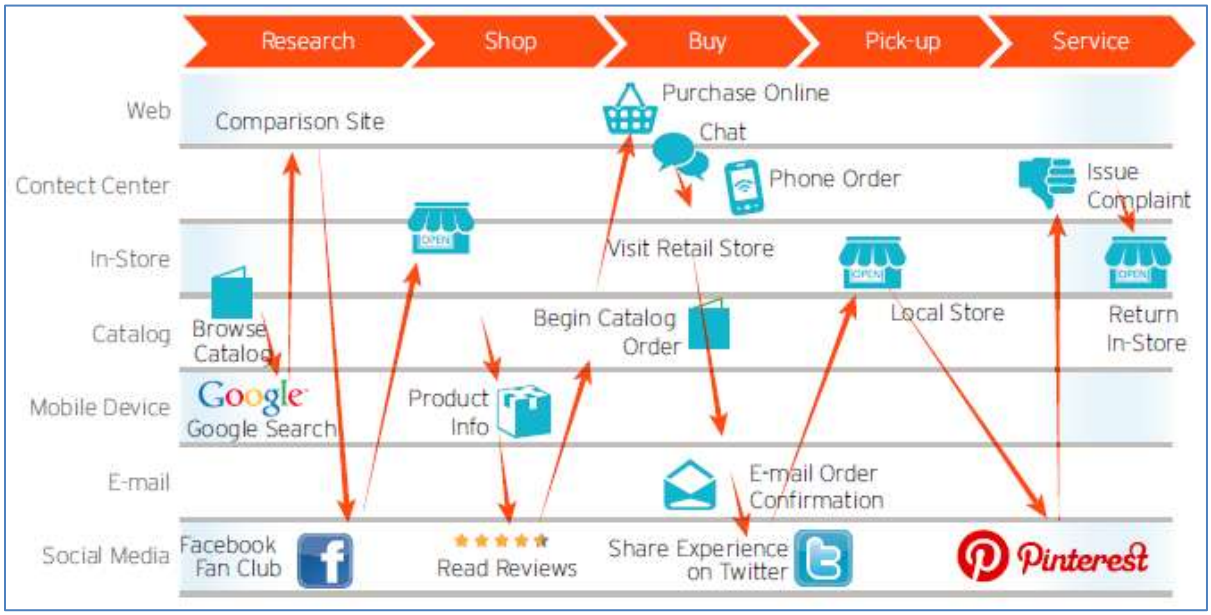

Figure 11: The Omni-channel Approach to Shopping (Source: Cognizant Technology Solutions)