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Tomorrow’s Applications – An Overview

The convergence of multiple new technologies is driving businesses to transform themselves into tomorrow’s enterprises. In the near future, every business will need to be a digital business with most of activities in the value chain being digitized. The rise of consumers who are aware, socially connected and geographically separated requires enterprises to place customer centricity at the core of every strategy that they formulate.

Driven by this new generation of consumers, business realities are changing. Today, they are characterized by three needs: to respond to emerging trends proactively; to envelope the end customer into the value chain through personalization; and to engage simultaneously with multiple layers of the ecosystem.

Information technology (IT) can no longer be a collection of disaggregated systems operating in inefficient silos. Instead, IT must be at the center of organizational strategy, driving growth by creating systems and networks that are seamless, efficient and available on-demand. In tomorrow’s organization, IT is no longer the support to strengthen competitive advantage. IT is the competitive advantage.

To traverse the chasm between where most organizations operate today and the end state, IT must leverage new technologies to deliver business goals thereby transforming from being an enabler to becoming the core of ongoing business.

As IT (both infrastructure and applications) and business become increasingly inseparable, the technology levers shown below play a key role in the transformation journey. While IT aligns with the imperatives of building an organization that is agile, efficient and proactive, it also needs to help address the needs of tomorrow. IT organizations should build roadmaps that clearly outline how these nine capabilities are built into the IT landscape to achieve business objectives.

These nine capabilities shown below have a large impact on application portfolios and on the way applications function. Businesses ignoring these trends or focusing too narrowly on modernization will soon realize the limitations of their approach. This POV will help enterprises evaluate the technologies against their business plans and create pathways to incorporate them into appropriate segments of enterprise applications.
1. Business Insights
What’s happening NOW?

Until recently, the following questions were of utmost relevance in decision making – ‘What happened? And, why did it happen?’ Today, the key decision-making questions are ‘What’s happening right now? And how can we be prepared to respond proactively to what is likely to happen?’ It has become imperative to understand business events at ‘run-time’ and adopt a proactive approach.

Business insights involve providing useful and relevant information to businesses to make the organization more effective and successful in their business goals. It ranges across several alternatives including marketing insights and strategies, customer insights, financial insights and strategies, competitive insights, and operational insights, among others. These need to be made available on-demand and on a real-time basis.

There is a strong existing demand to adopt business insights and improve the business agility across business functions. This demand ranges from marketing to loyalty management, from demand forecasting to inventory analysis and other processes integral to business functions. Insights enable the business to take timely and proactive decisions to gain market share with improved business outcomes. Organizations can leverage insights to drive innovation towards improved efficiency and effectiveness of business processes and strategy.

In the current business landscape, with the consumerization of IT and increased personalization, business insights help organizations understand the target market segment and customize offerings/products or promotions. This can be achieved by leveraging technologies ranging from consumer behavior analytics to merchandizing analytics.

Shifts

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<td>Reactive Organization</td>
<td>Proactive and inference based Organization</td>
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<td>Siloed decisions</td>
<td>Enterprise decisions</td>
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Technologies enabling the shift

- Visual Analytics
- Modeling & Simulation
- Forecasting
- Data mining
- Extraction
- Comprehension

Impact on Applications

- Business applications will be tightly coupled with intelligence engines thereby impacting the design paradigms
- Applications will be annealed to handle huge data volumes and parallel processing will be required to handle the data
- The applications will gradually be integrated with non-traditional databases to allow handling of unstructured data, in-database analytics processing returning quicker results than traditional relational databases.
New business realities in a global marketplace have forced organizations to re-think how their applications are built, deployed and run. From infrastructure to applications, each part of the stack requires radical redesign. Cloud computing provides many of the answers for the vexing issues posed by this shift. The paradigms of Infrastructure, Software and Platform-as-a-Service (IaaS, SaaS and PaaS) are now central to the way enterprises become more agile in a cost effective way.

**Infrastructure-as-a-Service**

Businesses require dynamic on-demand infrastructure to support organizations in becoming agile, allowing them to scale up or down as needed. Historically, infrastructure was always built with the idea of scaling up, which is no longer true going forward.

**Software-as-a-Service**

SaaS has emerged as the strongest type of Cloud implementation for enterprises. Subscription-based models for software usage, particularly for non-differentiated business functions like email and customer relationship management (CRM), have made Cloud-based systems attractive to businesses. The price of SaaS based application usage is very attractive when compared to the cost of on-premise, perpetually licensed software.

**Platform-as-a-Service**

A relatively new entry into the Cloud area, PaaS started as an extension of the SaaS trend where developers could write small code snippets to customize Cloud-based software. However, with the increasing acceptance of Cloud, generalized development environments are gaining traction.

### Shifts

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<td>Manually provisioned IT infrastructure</td>
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<td>Siloed information</td>
<td>Integrated insights</td>
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<tr>
<td>Custom software for generic business process</td>
<td>Enterprise decisions</td>
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### Technologies enabling the shift

- Multi-Tenancy
- Resource Virtualization
- OS Virtualization
- Dynamic provisioning
- Pay as you consume
- Parallel processing
- In-Memory databases
- QoS assurances

### Impact on Applications

- Existing applications need to be modernized to enable them to exist in and interact with a cloud based environment
- Applications need to be designed to work on virtual environments
- Scale up and scale down considerations should be built into the architecture of the system
- Applications should be increasingly fault tolerant
The mobility space has undergone a revolutionary change and has permeated every aspect of our life. As a technology, this has achieved universal (over 85%) coverage faster than any other in history. Mobility has been at the center of technology innovation for quite some time now. Mobile devices have an edge over other forms of technology owing to their processing/computing power and the potential applicability of the same. Other devices like tablets, phablets, etc., with high computing capabilities have further accelerated the acceptance of mobile devices.

Enterprises today are ready to embrace the power of mobile in three dimensions with equal enthusiasm – B2C (the pioneer in this area), B2E and B2B. They are looking at transforming the underlying business processes to exploit the power of mobility and unlock its potential for further advantage in core business operations. Enterprises are exploring ways to tap the potential of mobility to engage and build mobile workforce solutions. These can bring in efficiencies and cost savings across related workflows and processes while allowing the workforce to be connected with enterprise systems at any time and any place. This can transform the way the workforce operates – having access to real-time data, seamless collaboration with peers, and enterprise connectivity on-the-go. Mobile worker apps for sales force and field service operations are poised to bring about a transformation in service and operational efficiency levels. The advent of bring your own device (BYOD) as corporate policy furthers the cause of B2E mobility.

Mobile devices are opening up newer possibilities in the B2B realm. They are harnessing the power of mobility to enhance the effectiveness and efficiency of core B2B transactions by providing seamless connectivity on-premise as well as off-premise, utilizing the computing power of enriched mobile devices combined with data residing on the cloud where needed.

### Shifts

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<td>Web applications</td>
<td>Multi-channel applications</td>
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<td>Company provisioned hardware</td>
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<td>5x8 application access</td>
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<td>Limited connectivity</td>
<td>Always online</td>
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<tr>
<td>Simple behavior of applications</td>
<td>Context awareness</td>
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### Technologies enabling the shift

- Mobile devices and accessories – phones, PDAs, tablets, keyboard, authentication devices, add-on sensors
- Location and network technologies like - GPRS, 4G, NFC, bluetooth
- Middleware technologies – MEAPS
- Device and app management tools
- Security and federation/identity management capabilities
- Context awareness

### Impact on Applications

- Multichannel will be the de facto mode for application design.
- Backend layers will be integrated directly with the mobile layer.
- Enterprise content management (ECM) tools and processes will need to be upgraded to manage multi-channel content
- Multi-channel UX will be important and integration with new digital platforms/products will be on the rise.
- Applications will need to be built in a network and protocol agnostic manner
In a changing business and IT landscape, key stakeholders and decision makers of an enterprise are responsible for enabling the business to grow revenue and improve customer experience. They also need to manage, design and co-ordinate the setup of secure infrastructure and applications, enable data loss detection and prevention systems, and analyze and mitigate business risks. This technology enabler ensures that appropriate policies are enforced and the infrastructure and applications are capable of ensuring secure and trusted transactions.

Increasing cost pressure, elastic infrastructure environments and mobile workforces are forcing enterprises to rethink their IT security strategy. The focus is to not only secure customer data and transactions but to protect and mitigate the enterprise's own business risks. Technology capability ensures that the right set of security controls and policies are enforced in order to secure the applications and infrastructure, guarantee trusted connections and ensure adherence to compliance and regulatory requirements.

Today, data security concerns continue to be the significant adoption barrier to a virtualized, dynamic and on-demand provisioned environment. While the benefits of adopting such an infrastructure environment are well-known, overcoming this risk is paramount. Trusted transactions – a conglomeration of technologies and tools – can provide levels of guarantee for secure data transactions and acceptable levels of risk.

The technology capabilities in this track effectively secures an enterprise network, devices, applications, identities, and transactions, creating a trusted ecosystem that enables users to know with whom or what they are communicating. It also protects data with appropriate guarantees that transactions will be secure.

### Shifts

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<td>Security within enterprise boundaries</td>
<td>Virtual Security</td>
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<td>PC and Server security</td>
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<td>Controlled user based</td>
<td>Global User Base</td>
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<tr>
<td>Within firewall</td>
<td>Outside Firewall</td>
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</table>

### Technologies enabling the shift

- Network and application security modeling and security assessment
- Federated identity management systems
- Security virtualization
- Cloud-enabled identities
- Remote device management
- Single-sign on systems
- Encryption and Masking
- Real time data analytics

### Impact on Applications

- Security design first approach will be adopted for consumer facing applications
- Increased adoption of standard security layers
- Applications will need to be able to manage multiple identities
5. User Experience
New age UX - Immersive Experiences

User experience is a broad term that encompasses traditional human-computer interface design and extends it by addressing all aspects of a product or service as perceived by the user. In today’s rapidly changing IT landscape, it is not enough to have a product or a service that the customers can use only in a functional way. There needs to be a way to stand out in the crowd.

Consumerization of technology as a whole has brought the User Experience (UX) dimensions of doing business to the fore. UX is now recognized as central to success of any digital business. Products and systems are made or broken on the basis of the refinement of the experience they provide. From multi-channel UX to immersive UX, the trend has inexorably pulled the discussion about UX from the back room to the board room.

Enterprise employees now have better technologies at their disposal in their personal domain than at work. This has led to an increased demand for usability, personalization and engagement from enterprise systems. The fact that good UX has a direct impact on user productivity and employee satisfaction is now a well-recognized paradigm.

One of the emerging trends in User Experience is immersion – the state of consciousness where an artificially created environment surrounds the user completely reducing the effect and awareness of the real space around him or her. Natural user interfaces are allowing us to interact with computers directly, similar to the way we interact with the physical world. Immersive technologies will play a key role in the experience provided to users in the near future.
6. Anywhere Computing
All pervasive sensors, real-time computing

More than 10 billion embedded microprocessors are produced every year at prices that decline at a fast pace, making electronic devices more pervasive than ever before. These devices with multiple sensors connect through wired and wireless networks of increasing capacities. They are changing the traditional method of data collection, human-computer interaction, computing, and storage. With businesses needing more data collection and analysis in real time, anytime and anywhere, the conventional computing model of data collection and data flow is changing.

Technology that meets this business demand is evolving very fast. The rapidly falling cost of microprocessors, miniaturization of processors and sensors, and emergence of low energy transmission protocols are some of the key enablers. Net result is that computing devices – embedded sensors, controllers, and actuators – are getting smarter, smaller, cheaper, and ubiquitous. They provide seamless computing, communication and collaboration technologies to the enterprise. Supported by this trend is the increasing capacity to process, analyze and visualize very large amounts of data captured by these sensors and convert them into actionable insights. Retail, manufacturing, communications, healthcare, energy and utilities, and transport are some of the sectors that will benefit significantly from this capability.

Businesses are innovating their processes and business models by deploying such technologies. Customer buying preferences are assessed in real time at a given location and prices are dynamically changed. Businesses are embedding their products with sensors to track their movement and monitor the environment. For healthcare this means that physicians are able to monitor vital parameters of chronic patients over a period of time without the patients having to visit the hospital. In these scenarios, big data technologies, on cloud or otherwise, are helping businesses leverage insights to do more.

**Shifts**

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<td>PC-based computing</td>
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<td>Deliberate sensor usage</td>
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<tr>
<td>Human-driven data aggregation</td>
<td>Device-driven big data collection and actionable insights</td>
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**Technologies enabling the shift**
- Complex Event Processing
- Context Aware Apps
- Remote Device Management
- Sensors and Sensor Webs
- Smart Objects
- Ad-hoc networks
- Tags, Actuators
- NFC, RFID

**Impact on Applications**
- Applications with real time understanding of behavior of person, object at any time, any where
- Ability to sensing of environment at real time and provide real-time insights and data visualization
- Automation in sensing and control in variety of operating environments
- Increased expectation to make decisions on the basis of the information gathered
Organizational learning is the way an organization learns and adapts to changes in the environment (technology, processes and operations). A learning organization ensures that tacit and explicit knowledge is retained in the organization as people move and as the organization grows. It infuses technology, processes and policies that manage the creation, recording and transfer of knowledge.

The success of any organization relies on the knowledge of its people. Owing to rapid change in technology and processes, it is very important for organizations to align to these changes and learn new things to remain competitive, improve quality and productivity. As globalization takes root, a dynamically changing workforce is becoming a reality. Aging workforce in the western world and in Japan is forcing organizations to adopt practices that promote retention of knowledge.

Classroom training and documentation have served as traditional mechanisms for learning. Today's consumerized society provides multiple means to achieve the same end goals. Blogs and wikis provide avenues to create and deliver knowledge in a peer-to-peer mode. Self-paced e-learning modules that are available on-demand enable learning when needed. Growth of social media and instant communication within the enterprise has enabled employees to reach out to relevant individuals faster. Powerful search engines tie all these artifacts together for easier and faster access.

Organizations need to invest in systems that enable such learning.

These include social platforms that provide tools for blogging, wiki creation, instant messaging, and search. Advanced features like intelligent and customizable notifications, feeds, workgroup formation, and discussion forums can add significant value to an organization's learning capability.

### Shifts

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<td>Classroom learning</td>
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<td>Instructor driven learning</td>
<td>Peer learning</td>
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<tr>
<td>Waiting for knowledge</td>
<td>Exploring knowledge</td>
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### Technologies enabling the shift

- Collaborative learning
- Blogging, wiki platforms
- Powerful intranet search engines
- Social media for the enterprise
- Tacit knowledge capture systems

### Impact on Applications

- Applications need to consider integration with instant messaging to facilitate peer learning
- Applications should provide robust search capability to mine organizational knowledge repositories
8. Green BPM

The need of today to build a stable and secure future

Sustainability is defined as a key aspect across three dimensions – environmental stability, economic viability and performance in the social sphere. Organizations have a commitment to run green operations as society today depends on the preservation of our ecosystem and sustainability of the environment. This makes it imperative for organizations to be environmentally conscious and do their bit to ensure that scarce and depleting natural resources are utilized optimally. Enterprises can undertake such initiatives following a two-pronged approach that emphasizes the green IT paradigm, and focuses on optimum utilization of resources for conducting business operations using technology as an aide to reduce environmental impact.

With ever-increasing energy consumption, gaseous emissions and natural resource consumption, organizations have to focus on resource utilization and optimization with a commitment toward strict implementation of green strategies. Green strategies encompass all aspects of the organization from core operations to support functions like infrastructure and IT.

Sustainability efforts can involve elements that constitute the foundation of green IT/computing like green data centers, server virtualization, thin client, desktop energy management, carbon emissions management, commitment to enforce green IT architecture, and resource management through optimum utilization of paper, building paperless offices, and the transformation of business functions. It also focuses on processes that allow optimum utilization of resources, reduce energy consumption and are eco-friendly such as green supply chains, green product lifecycles etc., with no undesirable impact on business functions.

| Shifts from Organizational strategy to Sustainability | 
| Operations from to Green operations | 
| Architecture from to Optimized architecture | 
| Overall system optimization from to Tier-based optimization | 
| Established organizations from to Socially respected organizations | 

Technologies enabling the shift

- Green data centers
- Server virtualization
- Optimization (algorithmic efficiency, terminal servers, business process optimization, capacity optimization, etc.)
- Paperless offices (optimization approach)
- Green architecture implementations
- Adoption of green maturity models
- Energy profiling and monitoring technologies

Impact on Applications

- The process of application design will undergo a change as ‘Green Architecture’ will converge with the application architecture
- The portfolio of applications will undergo an optimization exercise for a greener operational metrics
- Special applications will emerge that will help with the overall assessment of the green index that will be required for green certifications and monitoring, spanning across core applications and infrastructure
9. Digital Business

The new age consumer demands digital business & digital engagement

Consumer technology has outpaced enterprise technology. Today’s consumers are leveraging powerful devices to get connected with each other and enterprises on a real-time basis. There are three trends that define this space – self-serviced, personalized and virtual. Each of these trends require enterprises to embrace digital means of doing business even when their core product may not be digital.

From telephone bills to car oil change reminders, analogue ways of working are no longer acceptable to the consumer. It is no longer sufficient to have a snazzy customer facing website or an enterprise resource planning (ERP) system to run businesses. Enterprises need to devise new value propositions that drive usage of digital technologies. And each of these digital technologies needs to be self-serviced. The sheer convenience that self-service brings to the customer coupled with reduced operational costs for the enterprise make a compelling case for self-service.

One of the key ways through which digital business can provide new differentiators is by embracing new means of engaging with consumers in a personalized manner. Digital engagement, an important part of digital business, encompasses multiple means that an enterprise can leverage to communicate with consumers. These include social media (Facebook, Twitter), blogging, self and peer care, multi-channel interactions, etc.

Another significant trend is virtualizing the real world for consumers. From augmented reality-based approaches to full blown virtual reality, the trend towards digitizing the real world interaction/process into something meaningful for the user is an increasingly rewarding process for the enterprise.

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<td>Systems of record</td>
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<tr>
<td>Siloed employee groups</td>
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<td>Connected employees creating a learning org</td>
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Technologies enabling the shift

- Enabling social media on web presence
- Digital identity established outside the enterprise (e.g., Facebook login), Digital Signatures
- Social media analytics
- Self and peer-care enablement
- Collaboration within enterprises (blogging platform, IM, wiki, polls, ratings, discussion forums, etc.)
- Mobility and Cloud storage

Impact on Applications

- Integration between systems needs to be real-time and with tight coupling
- Back-office systems need to be re-designed to exchange information with customers in real time
- Application availability will need to be significantly upped to service consumers directly
Enterprises are constantly striving to transform their business to cater to evolving market segments, demanding customer base and changing demographics.

Conclusion

They are persistently innovating to build a digital enterprise that is sustainable and agile with a focus on continuous engagement with the stakeholders by leveraging evolving technologies.
With the customer at the center of the value creation process, application stacks and systems have to be modernized to create an end experience that is driven by technology capabilities aiming at:

- **Efficient operations**
- **Insightful**
- **Intelligent business processes**
- **Engagement from experience**

Additionally, enterprises should ensure that the business is sustainable, ready to adapt to changing business environments, and utilizes the best in class technology capabilities to drive innovation and differentiation.

At the convergence of these technology themes lies the power to transform current IT portfolios of an enterprise. The core application stacks and IT systems that form the foundation of business today need to be revitalized by embracing these themes to achieve desired business outcomes.

The journey towards building applications for tomorrow’s enterprise is a whole new paradigm driven by technology enablers that support business transformation and fuel growth.

- **Product Design**
  - Mobile
  - Rich in experience
  - Green & efficient

- **Customer Support**
  - Self-service
  - Predictive & Proactive
  - Anytime anywhere..

- **Customer Care**
  - Co-creation
  - Inclusivity
  - Consumer centric

- **Fulfillment**
  - Personalized
  - Digitized
  - Secured

- **Demanding**
  - Empowered

- **Connected**
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