

Current and Upcoming Technology Trends [and the *effect* thereof on BPM]

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October 2008

Introduction

These current and developing technology trends are shaping the future of the IT market as we know it. Our research revealed the following popular buzzwords and evolving trends.

1. Green IT

Green IT, also known as Sustainable IT, is becoming a huge influence on various levels in the industry.

Power efficient IT:

Gartner's prediction: "By 2009, more than one third of IT organizations will have one or more environmental criteria in their top six buying criteria for IT-related goods."

Initially, the motivation for this will be driven by the cost-saving factor.

Power efficient IT means reducing the cost in monetary and environmental terms to generate power used for things such as:

- Powering all computers in standard sized organization
- Heat created
- Air conditioning / Cooling costs for servers and data centres

CO₂ footprints:

Gartner's prediction: "By 2010, 75 per cent of organizations will use full life cycle energy and CO₂ footprint as mandatory PC hardware buying criteria."

Since the economic gain for organizations is not easily definable when it comes to CO₂ footprints, the effect hereof will only be realized once laws are passed and regulations are in place which will govern purchasing criteria.

Green Credentials:

Gartner's prediction: "By 2011, suppliers to large global enterprises will need to prove their green credentials."

Vendors will start competing on a "greenness" level, and we'll see computers being rated for their greenness like other home appliances such as fridges and air conditioners.

Industry Impact:

New markets and business types will emerge focusing on certification of IT and strategic advice on the subject.

Green sourcing will drive vendors to provide green credentials.

For IT organizations, the reasons to go green will include:

- Environmental Concerns – although probably the least influence
- Cutting Costs, by being more power efficient
- Corporate Image (Corporate Social Responsibility (CSR)) – getting green credentials
- Regulation – currently regulations are big in the EU, but the US is catching up. In SA, the Department of Environmental Affairs and Tourism has already announced that a carbon tax and cap-and-trade system will be released during the next two years.
- Shareholder and Public Pressure

(CIO Insight)

In general, businesses will have to adapt to use less paper, use smart device hardware able to use sleep modes, handle e-waste such as silicon chips effectively, and adapt to use sustainable hardware.

Virtualization software, such as **VMWare**, is also high on the list for contributing to Green IT, by allowing multiple operating systems and setups to be run from one machine, thus using less power whilst providing capabilities of multiple computers.

A company already on the green-IT bandwagon, is **GreenPrint** - a small start up company in Portland who recently announced an environmentally friendly font pack. Its flagship font — *Evergreen* — puts the maximum amount of text it can fit on a page while still maintaining readability. Evergreen reduces your paper footprint by 15-20% when compared with Times New Roman and Arial. Not only that, but the T's looked like tiny trees! It predicts that big companies can save up to 4,000 trees a year, 12,000 tons of emitted carbon, and pocket an extra \$2 million a year in paper and ink savings.

Green IT and BPM:

A part of the idea behind BPM itself is already a huge step towards contributing to a company going green. BPM attempts to automate large parts of a businesses' daily

processes, and through doing this, contributes to a paperless environment.

A well implemented BPM offers a business a working solution requiring less processing power, less time and caters for large volumes of processing to be done at any moment. This all spells more power efficiency and a smaller carbon footprint being left behind.

Thus, any organization implementing a BPMS to drive their processes, will not only end up reaping the benefits that BPM brings to a business, but also boost their “green status” with all the positive environmental implications of BPM.

This should also be a driving point in governmental organizations such as the healthcare industry, where a lot of redundancy can be overcome with a BPM solution.

2. Software as a Service (SaaS)

Gartner's prediction: “By 2012, 33% of business application spending will be service based...
...instead of product license based.”

Software as a service is a model of software deployment where an application is hosted as a service provided to customers across the Internet. For the consumer, it reduces up front costs of software purchases, while providing the vendor with a long term revenue stream. The industry is already gradually moving towards this model.

Good examples of a current popular SaaS used by the man on the street, are **Google** Docs and **ThinkFree** MyOffice –services allowing the user to view and create spreadsheets, presentations and documents online.

SaaS and SOA:

Software as a Service can also take advantage of Service oriented architecture (SOA) to enable software applications to communicate with each other. Each software service can act as a Service provider, exposing its functionality to other applications via public brokers, and can also act as a Service requester, incorporating data and functionality from other services.

BPM – SaaS as Delivery Method:

Technology platforms are constantly changing and causes for constant updates in applications. Much in the same way software as a service will benefit other applications, BPM will also benefit from this trend.

Current BPM offering in the form of SaaS, includes:

- Modules – Some portions of the BPMS offered as a service, such as form design
- Templates – Subscription based processes acting as simple templates to build onto
- Hosting BPM solutions

(Khan, Business Process Trends, 2008)

Full fledged BPM as SaaS will offer customers the full power of BPM in a hosted environment, where changes can be made on the fly.

As BPM vendors grow to embrace the powers of Web 2.0, key aspects of their applications will be in positions to be migrated to web browsers.

The challenges of integration with other applications will also be eased thanks to virtual application appliances and cloud computing trends.

SaaS as a delivery method can expand the customer base for BPM, from only medium to large and government corporations, to small and event driven organizations through subscription services.

BPM and SOA:

Today, business models are changing fast from a pull to a push model. Unified BPM and SOA frameworks are becoming a necessity, which will allow for processes to be exposed as services instead of applications. Further, a need for point to point integration with other legacy systems will be avoided through the service approach.

Using BPM in conjunction with SOA will enable organizations to respond faster to ever changing business requirements.

3. More Mobility

Gartner's prediction: “By 2012, as much as 50% of travellers will not take their laptops with them...instead, the use of mobile devices, such as smartphones, will considerably increase.”

Change in the Industry:

Both the IT industry and consumers will be affected with the mobile market boom. Companies will have to exploit these trends to take advantage of the changing market, or be left behind.

Some companies and industries taking huge steps in the mobility market include:

- **Asus** is well known in the lightweight mini notebook / netbook market with its EEE PC. By 2009 a model will be released with built in 3.75G HSUPA and WiMax support.
- **Apple** also seems to be technologically ready to make the switch. Its current notebook, the MacBook Air is extremely miniaturized, while preserving the same computing power a regular design would offer. This is also sure to boost their market share even more in the coming future.
- **HP** recently unveiled its vision of the future, showcasing a range of wireless devices it anticipates to have in many homes by 2012. These include a wireless hub carried around on your person connecting mobile devices to the internet and interacting with gadgets such as foldable digital paper and coffee tables doubling as displays.
- Smartphones with powerful processing and connectivity capabilities are becoming a standard, and more powerful software supporting them is taking the use thereof even further. The **Apple** iPhone's intelligent multi touch interface is on the forefront of mobile interfaces, using touch gestures and movements to navigate. **Microsoft's** Windows Mobile 7 seems to be rivalling this soon with a similarly powerful touch interface.
- Open source software will also be making leaps in the mobile industry, as their popularity is already evident in mobile devices such as netbooks.

Networks:

The fast evolution of networks, and the devices supporting and utilizing the technology, will be a huge factor contributing to increased mobility.

- **4G (Fourth Generation)** communication technology prototypes are already in testing phases by Japanese company **NTT DoCoMo**. Initially speeds of up to 100 Mbit/s while moving and 1 Gbit/s while stationary were achieved, and recently 5 Gbit/s at a speed of 10km/h was reached. The first commercial network of this sort is expected to be released in 2010.
4G networks will be a full IP, packet switched network and be based on IPv6. (As opposed to 3G, which is based on parallel infrastructures consisting of circuit switched and packet switched, and use NAT to assign IPv4 addresses).
- **IPv6**, announced back in 1999, is expected to be a forced implementation by 2011, being the answer to the shortage of IP addresses as more devices connect to the Internet. Some actually argue that Africa, "thanks" to a lack of legacy architecture, is well ahead of the pack in implementing IPv6. This could lead to a faster deployment of 4G technologies locally.

With the fast development of these networks and devices utilizing it, the use of web based applications, storage and services, and trends like cloud computing and SaaS, will undoubtedly be boosted.

BPM – Delivery Methods:

On the BPM front, the move to more mobility will have a huge impact on one of the trends seen to be shaping the future of BPM - Delivery Methods:

- **Unified Communications:** (UC) is a commonly used term for the integration of disparate communications systems, media, devices and applications.

Gartner states "The largest single value of UC is its ability to reduce "human latency" in business processes."

As people are constantly driven to do things faster, the driving forces delivering work tasks will also need to adapt.

For example, many current BPM suites have smartphone or PDA views, but have yet to build a fully integrated BPM client for these devices; Sales and executive personnel are constantly on the move and not always at their desks; the youth is used to IM services as communication methods; BPMS systems move towards more mission based applications and away from back office.

This all drives the move to different delivery methods, and as BPM moves to be more in line with Web 2.0 standards (discussed later), development of these is a must for BPM vendors in the future:

- Instant Messenger Clients – Presence based task deliveries with response tracking
- E-mails converted into actionable items sent to Smartphone/PDA devices with Online/Offline functions that allows for batch uploads when back in range.
- SMS with simple Yes – No responses.

4. Cloud Computing

Gartner's prediction: "By 2011 – companies will buy 40% of their IT infrastructure as a service..."

Cloud computing is an Internet based development and use of technology. IT related capabilities are provided as a service, enabling users to access these technology-enabled services from the Internet (the cloud). Knowledge of, expertise with, or control over the technology infrastructure that supports

them can be of a limited nature. The need for a company to invest in its own server farms is also greatly reduced.

Cloud computing incorporates software as a service (SaaS), Data as a service (DaaS), and Web 2.0.

SaaS, clouds and SOA all approach the concept of a mainframe, but address the scalability requirement.

Industry:

Recently **Microsoft** announced their cloud, dubbed Windows Azure. It provides developers with the flexibility and ability to create applications while taking advantage of their existing skills, tools and technologies such as the **Microsoft** .NET Framework and Visual Studio. Developers can also choose from a broad range of commercial or open source development tools and technologies. Space on the Azure platform will be rented out to users.

Data centres:

To provide the infrastructure necessary for these long term investments, companies are making aggressive investments in data centre capacity across the world. **Google** have been building several dozen data centres for their cloud offering, while **Microsoft** is building 27 data centres with average size of 500 000 square feet across the globe.

New computer architectures feeding these new technologies for software virtualization, such as **VMWare**, will also continue to grow rapidly.

As SaaS and SOA takes off, the use of Data Centres and thus cloud computing will increase. Those companies comfortable to be part of the initial deployments, will path the way for the mainstream companies to adopt this trend soon after.

5. Apple Mac

Gartner's prediction: "By 2011, Apple will double its U.S. and Western Europe unit market share in computers."

Apple's unit shipments year-over-year grew 32% according to **IDC** and 29.4% according to **Gartner**— more than six times the industry average.

As **Gartner** measures it, Apple's market share hit a record 9.5% in calendar Q3, up from 7.7% in the same quarter a year ago.

(CNN Money, 2008)

Apple's presence in the mobile market through the iPhone and their small sized notebook solutions will also be a driving factor in their market share as the industry moves to operate in a more mobile environment.

6. From Web 2.0 in the mainstream to Web 3.0 and beyond

Web 2.0

Web 2.0 is a term suggesting a changed approach to the World Wide Web. It does not refer to a change in the technical approach but rather the utilization thereof by software developers.

Real world examples of companies embracing Web 2.0 technology are **Facebook**, **eBay**, **flickr** etc.

Web 2.0 has many different definitions due to its widespread use and application. Putting it all together, one can conclude that it has 3 main characteristics:

- Collaboration or sharing information and ideas.
- Merge information from various sources that is relevant to collaboration.
- Rich Internet Application (RIA), providing internet users with enhanced internet experiences.

Where does BPM fit into Web 2.0?

- **Collaboration:** The growing popularity of Web 2.0 applications such as blogs, wikis, instant messaging, forums, Internet document sharing etc., allows for BPM solutions to be leveraged to use these technologies to provide similar capabilities to BPM users. BPM is evolving into a rich platform which enforces structure and compliance when needed, but also supports real-time and ad hoc collaboration as and when needed.
- **Information Merge:** The BPM client is a good example of information merging. It pulls information from a number of sources such as databases, Web Services, document managers, process servers and often other integrated applications too.
- **RIA:** More vendors will be moving towards rolling out their products using the new technologies and capabilities Web 2.0 offers, to make BPM fit to be described as a RIA. RIA is developed using technologies such as AJAX, **Adobe** Flex, **Java** and **Microsoft** SilverLight, providing the user with a rich user interface. Other software packages already use these technologies, and it's a matter of time before BPM products all include these enriched interfaces.

(Khan, Business Process Trends - BPM and Web 2.0, 2008)

Companies, who adapt and continue to develop BPM as a Web 2.0 solution, will gain competitive advantages while being on the forefront to move to new technologies as they emerge.

Web 3.0

Web 3.0 is one of the terms used to describe the evolutionary stage of the Web that follows Web 2.0. In the analogy to file

system permissions, Web 1.0 was "read-only", Web 2.0 is "read-write", and Web 3.0 will be "read-write-execute".

Web 3.0 has also been defined as the third decade of the Web (year 2010–2020) during which it's suggested that several major complementary technology trends will reach new levels of maturity simultaneously including:

- **transformation** of the Web from a network of separately siloed applications and content repositories to a more seamless and interoperable whole.
- **ubiquitous connectivity**, broadband adoption, mobile Internet access and mobile devices;
- **network computing**, *software-as-a-service (SaaS)* business models, Web services interoperability, distributed computing, grid computing and *cloud computing*;
- **open technologies**, open APIs and protocols, open data formats, open-source software platforms and open data (e.g. Creative Commons, Open Data License);
- **open identity**, OpenID, open reputation, roaming portable identity and personal data;
- **the intelligent web**, Semantic Web technologies such as RDF, OWL, SWRL, SPARQL, GRDDL, semantic application platforms, and statement-based datastores;
- **distributed databases**, the "World Wide Database" (enabled by Semantic Web technologies); and
- **intelligent applications**, natural language processing, machine learning, machine reasoning, and autonomous agents.

(Wikipedia)

Where does BPM fit into Web 3.0?

Many aspects towards which BPM is, and should be moving, such as SaaS, DaaS, mobility and intelligent applications, are described as being complimentary aspects to Web 3.0, and will probably flow from and build onto evolving Web 2.0 technologies.

Web 3.0 is also called the "Internet of Services", i.e. besides the human readable part of the web there will be machine accessible SOA services which can be combined / orchestrated to higher level of services. This fits well into the move of BPM being unified with SOA, and being delivered as a service rather than an application.

Web 3.0 might also be the driving force behind intelligent processes. A trend identified as a present and future development in BPM, is Human Interaction Management (HIM). HIM doesn't necessarily evolve solely from Web 3.0,

but will definitely be impacted by it given the environment it's expected to operate in.

- **Human Interaction Management:** HIM is a business process requiring human knowledge, judgement and experience. It is divided into collaborating roles, which are then assigned to the appropriate people via a Human Interaction Management System (HIMS). The HIMS not only co-ordinates work activities but also exchanges messages and documents automatically on behalf of the people involved, with full version control and history. A HIMS is also used to manage the work and integrate it with organizational strategy/tactics, via separation into "levels of control". Active processes can be changed on-the-fly as people agree on next steps for the work.
 - During the flow of a business process, the BPMS collects an output. Interactions leading to this output are not recorded.
 - With HIM, the way users are solving problems outside of the BPMS are now being captured – The system can learn how problems are solved
 - The end user can then access data on how others have solved similar problems and their methods applied. This improves processing and turn-around times.
- **BPM that thinks:**
 - **Semantic Searching:** Using semantic search methods, users will be able to "ask" the system for some context, instead of simply searching for some process variables.
 - **Artificial Intelligence:** The process engine will be able to "learn" the business rules by interpreting the way users process items.
 - Although not full fledged AI systems as commonly thought, BPMS are expected to move towards more intelligent processing and searching capabilities.

(Adolf, 2008)

What is Web 4.0?

It has been described as *The Ubiquitous Web*: Conducting intelligence in to smart networks. Intelligent networks will be communicating with other intelligence networks. Also called the WebOS, it implies that machine intelligence has reached a point that the Internet becomes the planetary computer – a huge web of intelligent interactions. Some go as far as to say that by 2029, this WebOS will be parallel to the human brain in processing power. Whether this is for real – we'll have to wait and see.

7. Open Source

Gartner's prediction: "By 2012, 80 per cent of all commercial software will include elements of open source technology."

When Open Source is mentioned, **Linux** is most probably the first name for many that come to mind. The development of Linux in its many forms has been at the forefront of Open Source's penetration into the market.

By 2012 **Linux** will have matured into three basic usage models. Web-based apps rule, virtualization is a breeze, and command-line hacking for basic system configuration is a thing of the past. The OS will become a bigger attraction to those seeking a low cost alternative to **Microsoft's** offering.

- **Licensing:** Ranging from completely free to 'low cost fully supported' versions
- **Desktop:** Even though the command line will always be an option, radical changes to the desktop and UI is expected, as already shown by KDE 4 and the Mac OS X inspired gOS desktops.
- **Hardware:** By 2012, the strong brand presence will become more apparent, especially in the mobile market, as already seen currently in various manufacturers' netbook offerings (e.g. Asus EEE PC). By 2012 an expected 40 million mobile devices powered by Linux will be shipped that year alone.
- **Applications and storage:** More of the same in much more advanced stages completely compatible with Microsoft and other paid-for application offerings. With the cost of storage space drastically dropping, space organizing file systems such as Sun ZFS open source file system is becoming popular.
- **Configuration:** Easier configuration will be a requirement to suit the crowds not into command line configuration setups.
- **Virtualization:** Virtualization in the Linux kernel will allow side by side operating system instances to run to allow for either easy migration or native functionality expansion.
- **Servers:** Linux has fared best on servers thus far and will definitely continue to bloom in the arena. The virtualization capabilities of the OS allows for it to be mutable for use as both a server platform and container for other operating systems.

(Yegulalp, 2008)

Open Source and BPM:

A question asked in some sources is, "Will 'free' be a disruptor in BPM?" The short answer is "no".

In a report by CBR, acknowledging the most influential BPM and integration suites, open source products received an undeniable mention. In the integration and BPM space, open source is playing an increasingly valuable role. Companies who Thomas Prinsloo of Procentrica

cannot afford huge capital investments in expense BMPS, can test the waters with the Open Source offerings and also benefit from the advantages of BPM.

Notable roleplayers in the open source BPM arena include **JBoss** as an integrator, ESB projects including **Celtix**, **ServiceMix** and **Sun's** Open ESB, and **Intalio** and its BPMS 4.0, which supports BPMN, BPEL and BPEL4People, and which, of course, is free. Undoubtedly, Open Source developments will continue to play an influential role in BPM.

8. Nano Technology

Nano Technology have been creating a lot of hype without bearing much fruit. This year however, nano technology received a boost in the form of nanotubes. Initially identified as a material for making transistors in chips, it turns out they are pretty excellent filters for fluids and gases. **Seldon Technologies** has invented a way to tune carbon nanotubes to remove all impurities, including viruses and metal toxins, without the use of power, chemicals or UV light. A sample product, usable in 3rd world countries or emergency situations, is a large nanomesh straw that allows a person to suck super pure water from a fetid puddle of water.

The future lab testing hereof includes experimenting on injecting plasma fluids into the body using these tubes.

(Forbes, 2008)

Other mentionable nanotech trends include, but are not limited to:

- Photovoltaic Paint/Liquid Solar Cells
- Biological Electronics
- Multifunctional Dendrimers (Combination Disease Imaging and Treatment)
- Regenerative Neurotechnology
- Self-Cleaning and Self-Freshening Clothes

(Forbes, 2004)

On the computer chip development front - At a recent Embedded Systems Conference in Boston, **VIA Technologies** demonstrated the VIA Nano processor-based Mini-ITX board.

9. 3D Printers

Gartner's prediction: "Through 2011, the number of 3D printers in homes and businesses will grow 100-fold over 2006 levels."

The technology lets users send a file of a 3D design to a printer-like device that will carve the design out of a block of resin. A manufacturer can make scale models of new product designs without the expense of model makers. Or consumers can have models of the avatars they use online. Ultimately,

manufacturers can consider making some components on demand without having an inventory of replacement parts. Printers priced less than \$10,000 have been announced for 2008, opening up the personal and hobbyist markets.

Many sources argue the growth of this trend, and with the digital distribution of information, the demand for printers

might not be as high. It also does not exactly fit into the business technology spectrum. Most probably not a tech trend that will be seen in every house hold because of the high price, it might nevertheless be a technology trend which could impact us in ways not currently imagined.

References

Adolf, J. (2008, April 23). The Future of BPM: Six Trends Shaping Process Management. *SRA International, Inc.* , 23-29. Washington, DC, Washington, USA: Architecture and Process.

CIO Insight. (n.d.). *5 Reason Business Go Green*. Retrieved October 28, 2008, from CIO Insight: <http://www.cioinsight.com/c/a/Research/5-Reasons-Business-Go-Green/>

CNN Money. (2008, October 16). *Macintosh share of the U.S. market tops 9%*. Retrieved October 29, 2008, from CNN Money: <http://apple20.blogs.fortune.cnn.com/2008/10/16/macintosh-share-of-the-us-market-tops-9/>

Forbes. (2004, October 21). *Nanotechnology's Disruptive Future*. Retrieved 10 30, 2008, from Forbes.com: http://www.forbes.com/2004/10/21/cz_jw_1021soapbox.html

Forbes. (2008, October 23). *The Coming Creativity Boom*. Retrieved October 28, 2008, from Forbes.com: <http://www.forbes.com/intelligentinvesting/forbes/2008/1110/036.html>

Gartner. (2008, January 01). *Gartner Highlights Key Predictions for IT Organisations and Users in 2008 and Beyond*. Retrieved October 28, 2008, from Gartner: <http://gartner.com/it/page.jsp?id=593207>

Khan, R. N. (2008, October 1). *Business Process Trends - BPM and Web 2.0*. Retrieved October 29, 2008, from Business Process Trends: <http://www.businessprocesstrends.com/>

Khan, R. N. (2008, June 01). *Business Process Trends*. Retrieved October 29, 2008, from Business Process Trends: <http://www.businessprocesstrends.com/>

Wikipedia. (n.d.). *Web 3.0*. Retrieved October 29, 2008, from Wikipedia: http://en.wikipedia.org/wiki/Web_3.0

Yegulalp, S. (2008, August 14). *What Linux Will Look Like In 2012* . Retrieved October 29, 2008, from Information Week: <http://www.informationweek.com/news/software/linux/showArticle.jhtml;jsessionid=0PCDPMQZ52VHYQSNDLRSKHSCJUNN2JV N?articleID=210002129&pgno=1&queryText=&isPrev=#mon>