

***** VAZA Discussion Paper *****

“New Skills for the 21st Century Knowledge Economy”

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(1) Summary and Objectives

- (a) This primary aim of this short discussion paper is to provide a practical reference for collaborative workshops and EU proposals during the course of the next 6 months – Jan to June 2007. The topic of knowledge is extremely broad, so in order to project accurate visions and proposals for the future, I briefly put some roots down into the past. These help to put the current dialogue on Web 2.0 and networked knowledge into an intuitive perspective for both the worlds of business and education.
- (b) In the final section of the paper I’ve attempted to make an initial “go to market” plan in order to communicate and deploy these proposals through consultancy, moderated workshops and subsequent training courses. I predict that the networked multimedia applications under the heading of “Web2.0” will have at least as great an impact upon business and society as the Internet had during the last 10 years. In particular, it will have profound impacts upon Business Strategies, Operations and Architectures, as well as all aspects of human education, learning and human skills development.

(2) Business Background

- (a) Since the emergence of the industrial revolution during the early 1800s, business has developed in a relatively hierarchical way, with “Boards of Management”, and the decision cycles typically measured in weeks/days, rather than hours/minutes/seconds. The invention of embedded computing and broadband networking mean that businesses have the opportunity to implement new strategies continuously through “real-time” operations. This has similarities with the computerised foreign exchange dealing desks that have been around since the 1980s, as well as the C4ISR – Command, Control, Intelligence and Surveillance Systems that are deployed by military establishments throughout the world.
- (b) The evolution and deployment of “real-time” business requires on-line access to both on-line knowledge sources as well as employees skilled in mobilising knowledge based applications within these new business architectures.

- (c) Finally, we note that business, government and academia will need to evolve new ways in which to adapt to “real-time” global operations, and learning. Web2.0 will prove to be yet another highly “disruptive” set of technologies for society, and this discussion paper explores ways in which we can harness these new tools for more efficient business development, and a new regime for all classes of educational establishment. The timeliness of this dialogue is indicated by the announcement just yesterday – 13th Jan 2007 – by the UK Government of major new initiatives in life-long learning in Britain.

Theme (A) *STATIC* Knowledge – From Printed Books to Databases

(3) The 1st 1000 Years – Monasteries to Colleges

In order to project the future of knowledge for the next 50 years it is necessary to explore the evolution of coded knowledge in the past. For at least the last 1000 years, knowledge has been coded and communicated through a succession of media from stone-tablets, papyrus scrolls, parchments, through to the printed book and, more recently, computer media & networked databases.

The early European Educational Institutions actually evolved from the monasteries, and were almost exclusively “all-male” institutions until practically the 19th century. The early colleges such as those at Oxford and Cambridge in the UK that were founded in the 13th century slowly grew into the structure of the present-day universities. This process was replicated throughout the Western World, including parallel developments in China, the Eastern World and then the Americas.

(4) BIG was Beautiful – Board Room, College High Table & Senate.

A key feature of both Educational, Business and Government Establishments in the past has been that they were strictly hierarchical, and “BIG was beautiful”. Business was managed and directed from the Board Rooms since the 19th Century, whilst the Universities are controlled from the Senate Committees of Senior Professors and Academics. These hierarchies were emphasised in academia by the “college high table” in the communal dining halls, as well as the hierarchical range of hooded gowns for graduation.

Within the British Government, the depth of carpet, quality of furniture, precise size of office, and access to a “drinks cabinet” all depended on your level of seniority. Some of these rights still have their legacy today within the corridors of power!

However, we’ll see later that the ready access to “real-time” networked knowledge will mean that during the coming 20 to 50 years, there will be fundamental disruptive changes to such centralised hierarchical organisations in all aspects of society. We’ll be moving from the bureaucracy of “Kafka’s Castle” to the peer-to-peer organisation that is more akin to the Web2.0 applications of “MySpace” and “YouTube”.

(5) Decisions and Development – Hierarchical to Organic

Hierarchical Management and Educational Structures are efficient for managing information flows in the absence of high-speed processing networks. However, we now have access to broadband wired and wireless networks wherever to go – From Arctic Lapland to the Sahara Desert – We can communicate and run our business interests from multimedia wireless internet connections or compact satellite uplinks.

During the last 10 years, we’ve moved almost seamlessly from the hierarchical to the meshed organic network as the more efficient mode of social organisation. Living multi-cellular organisms have used such bio-genetically wired networks for billions of years, and adapted to diverse environments. Humans have only seriously understood and developed organic organisational models during the last 50 years. Indeed, the genetic code was itself only decoded during the 1950’s by Crick and Watson.

In the next section we explore the impact of the Web2.0 mediated organic knowledge-based organisation upon the design and delivery of the educational curriculum for 21st Century students. In addition we discuss the evolving synergetic partnership between the worlds of education, business and government. The key dynamic in the past used to be “physical space”; whilst in the future it will be “real-time”. The new generation, as well as ourselves (!), now demand access to “instant messaging” – “instant on-line shopping” – Products, information, knowledge.....Everything should be delivered NOW! The customer is back in control, and *every* business has to adapt to operate within the “real-time” networked knowledge economy.

Theme (B) *DYNAMIC* Knowledge – Globally Interactive Web 2.0

(6) The Last 50 Years – Networked Intelligence

The Age of Cybernetics and Computing was born during the late 1940’s by pioneers such as Norbert Wiener and Alan Turing. During the last 50 years business, education and government have all become dependant upon “Information Technologies” which have already transformed the way in which we learn, work and pay our taxes! The emergence of the commercial Internet & e-Commerce - “Web1.0” - during the mid 1990’s led to a global epidemic of interactive web-sites as information was re-coded for multimedia databases, for access through all range of wired and mobile gadgets.

I was privileged to sit on the Board of the Trans European Academic and Research Networks (now TERENA) representing Digital Equipment Corporation during this quiet revolution from 1991 through 1998. The educational world became networked from London to Moscow, and on to Vladivostok – A true electronic Trans-Siberian Highway just 100 years after the 1st steel railway tracks across the Siberian Tundra. Now the universities are developing even higher speed mesh-based GRID Computing networks for shared resources and applications, particularly in high-energy physics, meteorology, and genetics research where parallel computing is now mandatory.

In 1997, just 10 years ago, the Internet was just an IT experiment within most businesses. Companies such as Amazon, and eBay were in their infancy, whilst

Google had yet to be founded! Now in 2007, the on-line consumer retail revolution is accelerating and seriously threatening several market sectors that have not fully adapted to on-line sales such as the Entertainment, Electronics and Travel Sectors. The new market entrants such as Apple/iTUNES, Easyjet, Ryanair and eBay are already major networked-based businesses, and on-line shops and B2B e-Commerce businesses are being set up every day, in practically every country of the world.

The key challenge for all businesses now is the integration of their physical legacy business and virtual on-line businesses to an efficient “real-time” operation. This is discussed under Theme (C) below, as well as previous VAZA discussion papers. At the same time, the required management and operations skills are swiftly changing, which is the central theme of this section.

Despite having invented the Internet and Web1.0, the educational sector has probably been one of the slower adopters of the new technologies within its organisation, curriculum and partnerships with the industrial community. I see a major consultancy, training and deployment opportunity during the coming 3 to 5 years to provide new educational tools, applications and architectures within the business world. The aim will be to enable companies to continuously mobilise and update their knowledge both at a micro-level for their “real-time” operations, as well as at a macro level for the life-long retraining of their staff from telesales to CEO.

(7) SMALL is Beautiful – Student & Staff in Control

In the early days of computing, and networking, BIG was beautiful. We had room sized computers, coast to coast fixed-line ATM Networks. Now the opposite is true as we move to ever smaller embedded computers within our mobile gadgets, as we look forward to devices such as the iPhone launched last week at the CES by Apple Inc. Whilst Web1.0 gave us Internet access and “Level 1” Search Engines such as AltaVista and Google, we’re now in the emerging Web2.0 with peer-to-peer file sharing (Napster, BitTorrent), and social network applications such as MySpace, Facebook and YouTube. YOU are in control, as strongly suggested in Dec 2006 when Time Magazine selected the individual – YOU – as “person of the year”, rather than the usual international celebrity or politician. This means that the tables are turning in all aspects of society in which the student, employer and citizen are being slowly empowered again, as the power slips from the historic hierarchical institutions.

What does this mean for the educational world? – Schools, Colleges and Universities.

- (a) Deeper Interactive Partnerships with Business HR Departments.
- (b) Greater awareness of the rapid changes in practical skill requirements.
- (c) Revised Government Policies to support life-long training from childhood through to the new proposed state retirement age of 65 to 70 years old.
- (d) Teachers and Lecturers as Student Mentors, with greater flexibility in the student curriculum, ultimately allowing fully customised agendas.
- (e) Empowering business employees to have access and time for study and learning throughout their professional careers, with bi-annual checks and “top-ups” as in the world of medicine, engineering and finance.
- (f) Providing additional grants to support training & re-training in mission critical tasks required by industry, government and national defence.

- (g) Deploy Web2.0 Networking Applications to support the distribution of training materials, on-line text books, as well as linking with the extended network of former students – “alumni” – to provide “top-up” courses.
- (h) Provide classroom training for network-based social integration – Getting meshed in the global “net” at an early age, as well as for more non-Internet literate senior citizens who missed out on the Web1.0 developments.

In summary, the consumer, student, employee and citizen are all now in a position to take control, as the hierarchical management pyramid is turned upside down by the power of Web2.0 community networking and knowledge-based applications.

(8) Relativity of Knowledge – “Micro-Universities”

During my own university training I studied mathematical logic, and the theorems of Gödel. Here I discovered that all knowledge was relative to the set of underlying axioms, and that in any sufficiently rich paradigm, there would be statements that are completely true, and yet cannot be proved! Such is the counter-intuitive nature of knowledge. Too often we think of knowledge as being static and absolute, and yet in reality it is dynamic, relative and self-organising. This is important to appreciate if we are to best forecast the implications and necessary supporting action plans for business, education and governments during the coming months and years.

If we integrate the developments in Web2.0 with the relativity of knowledge then we will see the emergence of thousands of local niche knowledge communities. We might even think of these as micro-universities that may eventually span every niche curriculum of knowledge known to man!

As an analogy, just 50 years ago, we had just One TV Channel (BBC) in the UK, which grew in the 1990’s to Hundreds of Satellite TV Channels. Now we see the emergence of thousands of on-line Professional and Amateur Video/TV Channels, including Social Sites such as YouTube that are attracting both traditional and new wave film makers.

So in the case of Education, we started with just a handful of colleges in the UK back in the 19th Century, which grew to hundreds of colleges and universities during the 1990’s. Now during the early 21st Century, I forecast that we’ll see the development of on-line “niche-knowledge” colleges as part of the global educational knowledge exchange. This represents the commercialisation of the 1st wave of social networks from sites like MySpace, FaceBook, YouTube and the comprehensive Wikipedia.

Just imagine that in 10 to 15 years time that you will be able to join an on-line college for any niche topic that interests you. Essentially this will be the on-line version of the Local City College with all their extra-curricular courses, including art, languages, car mechanics, financial analysis and computer training. Businesses will benefit through being able to specify precise skills that are required, and then select and recruit candidates that have successfully past the required niche courses – all within Web2.0.

So in summary, knowledge networks will become distributed and organic, and start to form the basis of scaled networked communities of “micro-universities” that support students on a global basis. Each “micro-university” course might have students from

20 or more countries, in which the on-line translation engines (as available already through Google) provide instant adequate translations of the relevant texts. Students at these new virtual educational establishments could range in age from 17 to 70 and design their own curricula in partnership with on-line mentors. Applications such as the highly successful virtual world of “Second-Life” could eventually result in virtual 3D environments for students to interact just as in a traditional college or university.

Theme (C) *SELF-ORGANISING* Knowledge – “Real-Time” Business

(9) The Next 50 Years – Stakeholder Implications

As background to this final theme I’d like to present a further analogy. Back in the 18th century, academics wrote numerous books entitled “A System of Geography” in which they try to present an accurate structure of both the “known” and “unexplored” physical geographical world. Of course in those days Australia, Africa and the Poles were practically unexplored and yet the exploration of physical “space” had practical commercial implications for business and the establishment of new trading routes.

Now we are at the threshold of new unexplored territory with regard to the exploration of the “temporal” dimension of networked knowledge. It is clear to everyone that the emergence of Web2.0 will have profound business and social implications even greater than the primary Web1.0. So my mission for this short draft discussion paper has been to also set out a long-term route-map for the unexplored concepts and continents within the realm of self-organising networked knowledge.

So what are the implications for the major stakeholders in the knowledge economy?

(a) **Multi-National Corporations –**

- “Real-Time” Business Intelligence and Competitive Information supporting daily updates for the market and sales plans. We could think of this as the establishment of a virtual networked “war room” for the management team.
- Migration from the physical Board Room and monthly Board Meetings to more ad-hoc online “Skype-style” discussions held as required between Directors from multiple locations, using diverse mobile multimedia gadgets.
- Life-Long Learning for all Employees until Retirement
- Increasing dependence upon independent networked “knowledge teams” for product and service research and innovation.
- Moving from outsourcing to “net-sourcing” for non-core business functions.
- Integration of the physical legacy business with new virtual on-line business.
- Strategic Business Management & Operations in “Real-Time” – 24/7
- Emergence of Pure Knowledge Products with basic levels of intelligence, such as the “wireless dust” already developed by the US DOD that is can form ad-hoc meshed wireless networks, communicating real-time multimedia intelligence from the battleground back to HQ.
- Recruitment of specific skills from selected niche “micro-universities”. In many certain cases these may be established, catalysed and sponsored by the MNCs. Physical versions of these emerged in the 1990s’ with examples such as the well known “DIGITAL University” and “McDonalds University”.

- Enhanced partnerships with the re-incarnated educational establishments in which every single employee is expected to sign-up for training with their preferred “micro-university” for a customised annual skill “top-up” course.

(b) Small-Medium Enterprises – from “MySpace” to “MyBusiness”

- The SME’s will proliferate since they’ll be able to leverage the widespread on-line availability of low-cost sources of niche-knowledge.
- Focus on their core business “genes”, and net-sourcing for all other functions, from any suitable location in the world, as in the case of call-centres today.
- During the next 10 to 20 years I see a whole new marketplace for SME’s to populate to provide the on-line services for the “micro-colleges” & “micro-universities”. Within the Web1.0 we saw the creation of thousands of ISPs to provide connectivity and web services. Now within Web2.0, we’ll see Knowledge Service Providers (KSPs) providing not just the infrastructure services but value-added niche knowledge exchanges – “micro-universities”.
- Increasingly many SME’s will simply exist on-line, without any physical office presence. Staff will typically be teleworking from home, travelling on sales calls, or attending meetings in business centres, hotels or restaurants!
- SMEs will migrate up the Web2.0 Networked Tools Ladder from the 1st Level - Intelligent Search (Google), through to 2nd Level – Social Networking (MySpace) up to the “yet to be invented and deployed ” 3rd Level – Knowledge-Based Business Networking (MyBusiness).
- Finally, SME’s will be able to utilise the Web2.0 tools to secure low-cost global business reach for marketing and selling their products and services.

(c) Employees

- I’ve got 4 children! During the coming 20 years I expect them all to have very different working lifestyles and careers to myself. As employees they’ll need to fully take control of their skills, job requirements, and lifestyle priorities.
- Employees will undertake continuous re-training to ensure that they’re able to perform effectively within an often chaotically changing environment.
- It seems likely that multi-tasking, and working simultaneously within several on-line virtual companies will become more and more accepted by society.
- Employees will have more freedom to determine their periods of vacation, and possible “gap-years” than has ever been possible during the 20th century.

(d) Universities

- We’ve already seen how the universities have evolved over the last 1000 years from monasteries. Their transformation during the next 50 years will be no less profound as they are both challenged and threatened by the new breed of globally available online “micro-universities”.
- Education both at private schools and universities is becoming prohibitively expensive for many students and families. The online availability of sources of low-cost networked knowledge will radically threaten this status quo.

- Universities will need to re-structure themselves as “real-time” businesses for the efficient communication of knowledge, within the lecture room, group tutorials, and through on-line teaching and mentoring. The student is king!
- Some leading universities such as Oxford and Cambridge in the UK already have distributed campuses within other countries such as Japan and USA. All universities and colleges now need to be giving thought to developing their business on-line, with particular regards to establishing customisable curricula that can be packaged as “micro-universities”.
- A key aspect of the university business development will be to review the way in which they can use Web2.0 tools to more effectively partner with industry. This could include greater interaction with former students through on-line alumni networks, and offering graduates low cost or “free” annual academic “top-ups” through on-line lectures and seminars.

(e) Schools

- Schools have traditionally taught pupils that knowledge was absolute, and that intelligence was highly linked to the ability to memorise lists of facts. Within the 21st Century this is no longer true, and certainly not useful to students.
- Increasingly the educational mission will be to enable school pupils to access and mobilise knowledge themselves, and to be fully adapted to work within the “real-time” enterprise. Search engines mean that encyclopaedic knowledge is no longer required, though training will be required to ensure that pupils exploit social networking to the full as an essential part of their future life.
- Schools in remote locations and developing nations should also benefit through access to low-cost knowledge and on-line text books in their native language. In addition, the more highly qualified pupils may have the opportunity to pursue careers working for on-line businesses that are based in quite different locations and countries of the world.

(f) Teachers

- In the 20th Century, it was generally accepted that teachers were trained just once for their career, and that their subject specific knowledge would never need updating except possibly in the case of the sciences & computing.
- Today, it is clear that all professional workers, whether they are teachers, engineers, doctors or financial specialists will also need to subscribe to life-long learning.
- The tools for teaching have changed significantly since my own school days of the scrolling blackboard, and fixed Victorian Style school desks. Already many pupils have laptops, as well as a range of other mobile gadgets such as mp3 players, mobile phones and games-machines. Future classrooms will have large network & Web2.0 enabled flat-panel displays for display of multimedia teaching materials drawn from servers across the world. Students will be able to download selected materials through the local wireless network for further detailed study off-site.
- Teaching in the mid-21st Classroom is likely to be more akin to giving an operations mission briefing in a well equipped hi-tech Military War Room than the static resource-poor classroom from the mid-20th Century.

(g) Students.

- As stated earlier, the Web2.0 revolution will start to empower the student to take control of their educational training. It is possible that by the mid-21stC that even the regular examinations could be customised to take account of the student’s chosen course curricula.
- Today, pupils are often playing computer games, and using mobile phones before even attending their primary schools. Such computing & basic networking skills are being learnt today in the nursery from age 1 year old!
- To some extent, education is about self-knowledge as articulated by the ancient Greeks more than 2000 year ago. Self-knowledge for the next generation of students will derive as much from their self-initiated social networks as from the classroom. As in business, we need to manage this integration of learning in the physical classroom, and learning, both academic and social, from the diverse on-line virtual social communities.
- Empowerment will challenge students to think even more for themselves with regard to their life goal, priorities, and educational interests.

(h) Governments

- So far, we have written very little about the implications for government. In fact, traditionally government policy has probably been the greatest influence on educational policy at all levels from Primary School, through to University.
- Government has a major role to play in enabling and funding the transition from the classroom and lecture theatre to “real-time” networked education.
- The emergence of the hypothesised “micro-universities” will need to be managed, since although there should be a free knowledge-economy, there may be certain knowledge modules that should be regulated. For example, training courses on designing, constructing and deploying nuclear weapons!
- An early dialogue between leading government, industry, and educational representatives, country by country within the European Union would be an excellent 1st step towards planning the roadmap for the next 20 years.

(i) Citizens

- Will citizens really be empowered in the future, or will governments simply set ever higher taxes to pay for “improved” educational resources?
- Well, already citizens have far greater access to on-line public and official information due to laws granting public access to personal information, as well as government, and EU funded programmes. This will probably increase during the coming 20 years, so providing citizens will even stronger lobbying and influencing powers within the national assemblies and parliaments.
- All citizens start life as students, and most progress to employees in some preferred line of work, which could even include being an artist or musician. In any case, mobilising knowledge to achieve life goals will become as important for “Joe Citizen” as for the Multi-National Corporation.
- Finally we comment that Web2.0 tools will enable governments to track citizen data across all aspects of YOUR private life, and the reality is that practically nothing we do will ever be absolutely private again in the 21stC.

(10) EMBEDDED Knowledge – New Educational Models

Traditionally the Educational Institutions have been our custodians of coded knowledge. This legacy started back from the ancient monasteries in the Middle East where the early parchments and books were protected from enemy armies, as well as from the physical forces of nature. Books were sometimes stored in chained libraries as in Hereford Cathedral to prevent theft. In addition, all changes and edits was conducted under strict rules and discipline by the relevant orders of religious monks.

Today, the model is not so different, particularly in the scientific, engineering and medical disciplines where all additions to knowledge are undertaken only after rigorous peer review that can take 1 or 2 years. Even the latest on-line Web2.0 – Wikipedia – has self-imposed real-time peer review that works remarkably well, with changes undertaken in just minutes!

So who will be the custodians of knowledge in the future. As mentioned earlier; all knowledge is ultimately relative to the underlying set of axioms. Once knowledge is on-line then the custodians may lose control. We can see the dangers already with the latest “Splogs” – which are essentially “Spam Blog” Files that are created by electronically scraping the results from search engines and then posting these, together with commercial “click-thru” advertisements on a “Splog” web-site.

The mission for the educational institutions at all levels of society will be to design strategies that allow them to harness the self-organising knowledge networks as the foundations of new styles of research, teaching and training courses. This will require new models and architectures for education which full leverage the powerful tools of Web2.0 and associated multimedia networking and display technologies. I’m proposing to develop some new architectural models in subsequent discussion papers.

An excellent 20th Century example of the positive relationship between education and national development is the former Soviet Union which invested heavily in scientific training and its prestigious Russian Academy of Sciences, transforming Russia from an agricultural to industrial economy. Major achievements included the 1st Orbiting Satellite – Sputnik 1 - (1957) and the 1st Man in Orbit – Yuri Gagarin - (1961).

The challenge now for the expanded European Community is to re-structure and boost investment in the educational sector and thence catalyse the transformation from an industrial to productive knowledge economy. Some of the expected business benefits from such investment are summarised in the final section below. During the last 1000 years, knowledge has in a metaphorical sense evolved from “solid”, to “liquid” and now in the 21stC to a “gas” in which knowledge travels at almost the speed of light across the global web. The successful universities, businesses and economies of the next 50 years will be those that start investment *now* in strategic programmes that “mobilise knowledge” within the framework of new architectural models.

In summary, schools, colleges and universities need to urgently start to design new educational models and strategies that enable them to remain the primary stakeholders and custodians of self-organising knowledge, teaching, training and basic research.

(11) \$\$\$ Business Payoff – New Business Architectures and Benefits

Well now we come to the all important finale where we summarise the positive business benefits for companies that mobilise knowledge for business develop. And then I make some suggestions for the next steps and “Go to Market Plan” for those that wish to take these ideas forward to commercial reality!

So here is a list of some of the benefits from mobilising knowledge from Web2.0:

(a) “Real-Time” Management Operations

- The traditional model of business management through regular (typically monthly) meetings of the Board of Directors originated from the industrial revolution more than 200 years ago. I believe that this model will become practically obsolete during the coming 20 to 30 years. It will be replaced by distributed real-time control and spontaneous on-line meetings that may be initiated by directors on a 24/7 basis, using available Business Intelligence.
- Benefits of such real-time strategic control include the execution of quick responses to short-falls in the sales pipeline forecasts, reaction to competitive announcements and market incursions, and rapid adaptation to changes in the financial environment, interest rates and government business policies.

(b) Intelligent Knowledge Products and Services.

- During the next 50 years we expect to see the further evolution of artificial networked life. Today we see many of the negative aspects of intelligent software such as the more advanced viruses and Trojan horses. However, as processing power becomes ever fast, and more embedded in devices, we’ll see examples of self-organising knowledge products and gadgets that will support us in many aspects of our daily lives including education and training.
- These new knowledge services will include the niche subject “micro-universities” discussed earlier in this document. Such a proliferation of knowledge-based commercial services will threaten the status quo of the traditional colleges and universities.
- Already we can see the film, music, TV and entertainment industries being strongly threatened both in market share and profitability by low-cost and “free” on-line multimedia sites such as YouTube, BitTorrent, and Google.
- Finally, we emphasis that advertising revenues will migrate a further step from the dynamic web-site to become embedded in the new knowledge services.

(c) “Net-Sourcing” Research

- In-House Research is typically an expensive and sensitive aspect of a corporation’s profit/loss account since, speaking from personal experience, it is often the first function to be downsized when the market is in decline.
- The benefit of the knowledge economy will be the relative ease with which both primary and applied research can be “net-sourced” to small independent teams and companies that provide specialised research services.

- “Net-sourcing” will reduce the time to market for innovative new products by permitting parallel multi-tasking to expanded teams. In addition, research can be “net-sourced” to independent research labs anywhere in the world.

(d) Time to Market

- The combination of more rapid research and “real-time” management operations will significantly reduce the time to market for new knowledge-based products and services. The last generation of computer mediated JIT systems and continuous prototyping was a revolution in itself. Now the global knowledge-networks will speed up new product & service cycles still further.

(e) Customised Products and Services

- Products and Services will be yet more customised to user requirements. Dell Computers was a pioneer in this marketplace, but in the next generation we’ll see a wide spectrum of products and services being customisable to “Your” requirements – Hence the emergence of “MyProduct” and “MyService” as well as “MyDegreeCourse”!

(f) Chief Knowledge Officer

- The CIO will gradually be upgraded to Chief Knowledge Officer, and their brief will be expanded, and linked more closely with the Human Resources & Legal Departments to include oversight of life-long staff training, company knowledge assets, patents, research programmes and collaborative ventures.

(g) Knowledge-Based Business Architectures

- It is clear from all that is written that the knowledge economy will catalyse Businesses to evolve fundamental new management architectures. These will be more organic than hierarchical, and will be open to “real-time” networking with partners, suppliers, educational & training establishing. In particular I’d expect the CRM systems to be updated to allow even greater interaction with customers, including quicker responses to product queries and technical issues.

(12) Next Steps

This discussion paper spans a whole universe of issues and ideas! What do we do next? Well my initial idea was simply to sit down and document the ways in which “knowledge” will become a hot topic for both the educational and industrial sectors during the coming 10 years. As I’ve written his paper it is clear that “mobilising knowledge” within the Web2.0 environment is indeed of extreme interest.

My suggestions for the next steps:

- (a) Organise experimental workshops on this topic sponsored by both leading Educational Establishments as well as businesses & government agencies that are open to such, possibly, controversial & radical ideas.

- (b) Consider ways to approach the EU, as well as National Governments to discuss ways in which “the team” could participate, moderate or catalyse European or National Government Programmes over the next 3 to 5 years.
- (c) Consider whether some of this work could be developed through sponsored partnerships within the next EU FP7 Programme – Deadline End-April 2007.
- (d) Determine ways in which these ideas could in parallel be developed through profitable business consultancy, training and solutions programmes. This could highlight the design and deployment of the proposed “micro-colleges” and “micro-universities” as on-line Web2.0 knowledge-based applications.

Finally, I should like to acknowledge the ideas derived from the great philosopher – [Teilhard de Chardin](#) - who wrote about the “[noosphere](#)” or “thought sphere” spanning the earth as an intelligent network of organic knowledge. Many of the ideas he developed in his book – *The Phenomenon of Man* (1955) - precisely characterise the developments that we envisage now for the next 20 to 50 years of human evolution.

About **VAZA** International

VAZA International was established by Dr David Probert with the following mission :

- I. To provide innovative strategic business consultancy in partnership with a network of *international* business associates.
- II. To create, publish and present visions and applications for new and emerging technologies. These may include 3G mobile & wireless networks, multimedia communications, on-line search, self-organising and learning networks and “real-time” collaborative computing & communications.
- III. To provide project management and mentor support for major national and international projects specifically in the fields of strategic business planning & modelling, multi-media networking, environmental protection, and the deployment of emerging & leading-edge technologies.

During the last 25 years, David Probert has provided the vision and thought leadership for many successful projects including :

- ***Long Range Planning Model (LRPM)*** – The 1st Dynamic Strategic Planning Model for British Telecom that was developed during advanced management research at Cambridge University during the late-1970’s. The model was used to support BT Board Level strategic analysis and decision-making both “pre” and “post – privatisation”.
- ***Computer Integrated Telephony (CIT)*** – Established and led British Telecom’s £25M EIGER Project during the mid-1980s’ to integrate computers with telephone switches (PABX’s). This

resulted in the successful development and launch of CIT software applications for telesales and telemarketing operations in a worldwide marketplace.

- ***Blueprint for Business Communities*** – Visionary Presentation for Digital Equipment Corporation during late-1980’s that included the creation of the “knowledge lens” and “community networks”.
- ***European Internet Business Group (EIBG)*** – Established and led Digital Equipment Corporation’s European Internet Group for 5 years, from 1994 to 1999. Projects included support for the national Internet infrastructure for the countries of Central and Eastern Europe, Russia & the Former Soviet Union and the countries of the Middle East. Dr David Probert was a member of the European Board for Academic and Research Networking (EARN/TERENA) for 7 years (1991 → 1998)
- ***Supersonic Car (ThrustSSC)*** – Worked with Richard Noble OBE, and the Mach One Club to set up and manage the 1st Multi-Media and e-Commerce Web-Site for the World’s 1st Supersonic Car – ThrustSSC.
- ***KolaNet*** – Established and led the KolaNet Project within the Arctic Kola Peninsula, Russia. This multi-national project run from 1992 to 1998 and provided Internet Communications, Web-Sites and Training to Research and Government Institutions within both Russia and the Former Soviet Union. The primary applications for KolaNet were the monitoring of radioactivity from nuclear power plants and sea-borne reactors as well as other harmful industrial chemicals & heavy-metals
- ***Secure Wireless Networking*** – Business Director & VP for New Venture to establish a portfolio of innovative secure wireless networking products with advanced technology partners from both UK and Taiwan. Dr Probert was also appointed as the New Products Director to a well-known UK Group plc in the networked security products sector prior to its successful acquisition by a US corporation.

Dr David Probert is a Fellow of the Royal Statistical Society, and he has a 1st Class Honours Degree in Mathematics (Bristol University), and PhD Degree from Cambridge University in the field of Self-Organising Systems (“Evolution of Stochastic Automata”). His bio is in: 2007-2012 Marquis “Who’s Who in the World”.
