

Workshop Report



Scenarios Workshop, 9 -10 September 2009, Brussels – Society, economy, psychology and human interfaces

Interaction between technological factors and socio-economic, psychological and human interface factors

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1 Introduction

Needs analysis was the original goal of the workshop, and is a crucial element required for the design a future internet. Here we summarize the highlights with key findings being set out in brief. A further working paper based on the workshop findings in more detail is also in preparation.

Workshop agenda 9-10 September 2009 was as follows:

- Day 1 – internal meeting with discussion of key themes – technical, economic, social, psychological and human interface factors in plenary session
- Day 2 – scenario building of a future internet using three socio-economic scenarios as a background in separate breakout groups with 10 outside experts

(list of attendees to follow in separate Appendix of notes of workshop)

2 Workshop Highlights: What will the future internet look like?

- **An open internet:** The degree of openness of the (current and future) Internet, the freedom to use it and the values it expresses was an important point of discussion throughout the 2-day workshop. The need for extending control over the network in order to combat security and privacy violations, as problematic as it might seem, was seen as potentially inevitable. However, it was agreed that this should not in any way constrain innovation, new business models or consumer choice.
- **An inclusive but customizable internet:** The issue that provoked much, if not most, of the debate during the scenarios workshop day was the threat of possible exclusion for a significant proportion of the EU population, and the effects this might have on dividing European society. Some participants found that the whole idea of gaps in society being magnified by technology was entirely unacceptable – even though this might be due to reasons of access, digital illiteracy, technophobia etc. At the same time,

forced inclusion was viewed as worse than forced exclusion. And there was no black and white, connected or disconnected. The freedom to participate was seen as multi-faceted: the when, the where and the how.

- Therefore, the need to design an internet which would enable all to participate was more controversial than might first have been expected. This also confirms the undeniable socio-economic and psychological dimension to any design effort. The general conclusion was that the internet should be open to participation by all in a technically and socially neutral manner, with no barriers stemming from digital literacy or predilection. Overall this implies that the internet of the future should be reconceived on *sociable design* concepts. This means that the engineering of an infrastructure has to include more sophisticated user interfaces (ie. the internet was originally designed for text line interfaces, as in a primitive operating system such as MS-DOS, but today users may want to use a Wii sensory interface with speech recognition and in the future should further developed).
- **A multiple and multi-faceted internet:** Based on the issues outlined above, a common theme emerged as to whether there would be one internet or multiple internets, differentiated by capabilities and the protection of users. The general conclusion was that in the future, there would be multiple internets, based on preferences and personalization, rather than the single environment we have today.
- **A ubiquitous internet:** The power and success of the future internet lies in ubiquitous, open standards. This is the basis for a next generation of interoperability and technological neutrality. Thus any differentiation for specialised internets must operate on top of a common technical platform. Design goals should make full use of mobile communications as they represent the most common access technology today. They also represent the most personal form of communication.
- **An internet of European values?** The notion that the internet should express and reflect a common set of European values was endorsed by some participants, but was also seen by others as an intensely political matter. The main concern was that any form of European xenophobia should not be imposed. Values are a contentious matter, as they vary from culture to culture, and it is difficult to agree on common values. However, the stifling of freedoms through over-protection is a common European value, and it was agreed that more generally, the future internet should not be designed for technocrats, governments and businesses, but for ordinary European citizens, while protecting their security and privacy and limiting government surveillance and Orwellian-like control.
- **An internet of identities:** Personal identity and identification (for personal and national security) was an issue that was raised with great consistency over the two-day workshop. The question of creating an internet identity layer was raised, and it was suggested that users should actively own and protect their own identities, giving them far better controls over its use. In order words, users should have control of what is released, and information transmission should be minimized at the point of collection. Only then can full or partial anonymity be achieved, for purposes of personal security (e.g. child online protection) and privacy safeguards. Some participants felt that identity protection (or rather too much anonymity) can be a double-edged sword, that is to say that it might protect perpetrators of harm as well as the law-abiding citizen. Technology must aim to identify and distinguish innocent and malevolent actions. Finally, a balance must be struck between over-regulation and under-regulation, a safe society and a surveillance society.
- **A trusted internet:** An important notion linked to the identity question is that of trust. This is a question of perception and thus rather complex, and linked to psychological factors. It was suggested that the internet be re-engineered around this theme. This would imply rethinking security and privacy together with resilience. In this case, the potential failures in the case of attack or accidental damage have to be accepted and provided for. Back-ups and contingency plans are needed, particularly as the internet has grown to become a critical infrastructure, on both a technical and socio-economic level.
- **An internet transparently governed:** Discussions on the above (trust, identity, ubiquity, inclusion and openness) led to the overarching theme of governance and how can governments shape technology. Satisfactory governance is not yet with us and current internet administration has limited transparency. A future internet should have a more holistic, participative and transparent governance structure. Liability and responsibility need to become evident. The level of accountability needs to be heightened. The cost of the internet must be properly assessed. Developing nations will be the largest users and their concerns must be included. This has major implications for the engineering and design of a future internet. Furthermore, all aspects of daily life touched by the internet should be obvious to the ordinary user, so that they are aware of who is watching, who is collecting information about them and what is being done

with that information. As the internet becomes increasingly ubiquitous, it will become a matter of human rights.

- **A global internet:** Much of the governance issues for the future internet are related to political will and leadership in both business and government. The necessary change will certainly require global coordination and collaboration. Whether change can be effected incrementally or whether radical change is needed was an important point of contention. Also, as the majority of future users will be in the developing world, constructing a new internet on a poorer built-infrastructure is an important challenge
- **An innovative internet:** It is vital to stimulate innovation in adjacent internet technologies and application areas, such as health care, environmental sensors, location-based services and item-based connectivity. Human-computer and human-network interfaces may be very different in the future, with proxies and agents based on artificial intelligence and cognitive capabilities. The design of a future internet needs to take account of the vision of the Internet of Things. We expect a far wider view of future internet uses today's email, blogs and even social networking sites.

3 Summary of key findings on internet design requirements from the workshop

What follows is an analysis of the five major influencing forces on the design of a future internet. In analysing each of these areas, we have sought conduct an analysis of requirements, for the creation of a functional specification which might inform high-level architectural principles. This analysis is based on the interpretation of the scenarios and debates, recurring concepts and themes.

1 Technological and application influences on future internet design

1. There are number of adjacent technologies and applications technologies that will influence future internet design. Although we should expect to build on origins of internet with the newer trends becoming stronger eg semantic web, policies on net neutrality, etc. However we have seen some unexpectedly slow developments which should make us think carefully about what is possible as resistance/ barriers to technical upgrades exist: eg for IPv6 and multicast, and the persistence of best effort delivery whwn quality of service is at a premium (leading to lack of guarantees in throughput).
2. Perhaps the most pervasive change will be for mobile and nomadic working with an increasingly wide range of applications and technologies.
3. An important technology trend is towards the whole 'internet of things' ie far wider uses of the internet than just blogs and websites, with RFID tags, sensor networks etc, for both inanimate and smart objects
4. Sensor networks will be seen in many applications, with radio links. Developments in technology for medical care, elderly care etc, will use this technology. More generally, applications to do with care of people, based on the internet, will become important using surveillance technologies with vision, motion detection, sound and integrated sensory perception, etc. Such networks for health and other sensors (eg environmental sensors) will drive increased network traffic, due to their real-time monitoring functions.
5. The future internet will use positioning, navigating and knowledge of surrounding geography for proximity to points of interest far more, so location enabled applications (LEAs) will be important, especially for mobile applications
6. Advances in cognition with AI and pattern recognition for human Interfaces will make the user experience very different with agents and 'cleverer' human interfaces that can interpret human requests.
7. Other key trends today include: state management at web layer (seamless applications across networks like Google maps, Facebook etc), application layer multicast (data-centric networking, publish and subscribe), resource pooling through multi-path (for more robust handover), identity layer for the internet.
8. We need to be able to make a clear distinction between the technology of the internet and technology trends in general, e.g. Cloud computing – these may impact the internet's future engineering but we should be wary of saying they are the internet itself. Also, here one must be careful not to overstate cloud computing's significance.
9. An important consideration is the past – the inertia of current technology. So to some extent the internet engineering will always be incremental, or building out in new directions from the existing and communicating with that.

Discussion points:

- Distributed architecture or centrally controlled future internet? SaaS seems to imply less user control and more centralised operation, so does that conflict with current moves to more creative freedom in applications, with user defined structures.
- Do we want a dumb network with intelligence at the edges? Is that what telcos wish to maintain - as they strive for smarter networks they can control? A conclusion appears to be that we are endorsing pouring the intelligence into the device in the user's hand, and keeping the network very simple –is this right?
- Does the internet function the way it should function? Are supposed advances like IMS, NGN, QoS etc from networking suppliers just marketing speak without tangible results? Do the directions taken by major vendors in traditional telecommunications deliver anything useful for a future internet?
- Organisational mechanisms and human factors have to be taken into account more in internet design. To encourage an SME or entrepreneurs with new business models to use internet working more, we need to make the environment more conducive in terms of trust, awareness and skilling and re-skilling. This comes down to being a technical problem.
- Cloud computing: Note that internet history is less relevant here as the ratio of network capacity and storage capacity of data is quite different to that of 30 years ago. Storage capacity is currently going up fast. There are various different technical options possible for cloud computing support so the technical implications for the internet are quite widespread. For instance, if the application is content intensive and used by many people at once, should content be placed on caching servers and not centrally

2 Economic forces: Major influences on future internet design

1. The developed economies are now heavily dependent upon the internet, ranging from a foundation for general business (eg tele-working, sales, logistics, training, education) to new sector platforms (eg media, telecoms, retail, banking). Control in this complex environment is emergent and it is not yet clear whether current systems can provide the levels of availability and reliability necessary in the coming decade. An alternative view is that this lack of control is actually a strength. Nevertheless it means we have to look at governance and regulatory issues. The management system really needed might be quite different to today's, ie *transparent* - with clear *liability* and management responsibilities, instantly contactable be it for carriers, ISPs, portals, application service providers, etc and formalised in common SLA structures. So we need to consider these legal factors.
2. The future internet will have to be the foundation of a future knowledge society and knowledge economy.
3. Key factors for an internet-based economy include: access and take-up/affordability, utility and accessibility. Levels of demand will be set by prosperity, constrained by trust, business confidence, education in technology, and technical constraints such as throughput per unit cost.
4. The “dumb” nature of the internet as a simple high-volume “bit pipe” will continue to contribute to its fast growth, flexibility and support for innovation and “self-healing”.
5. Global scale is required as reach is everything - indicating that geographic internets are self harming economically. So the more interesting designs may be geographically based in terms of social and business *values*, but accessible worldwide eg one ‘character’ for the EU, one for Asia, one for USA, etc
6. The developing world will be the big influence on future internet design- it will be dominant in usage as the future is about the developing world, not the old (first and second worlds, the EU or the USA) – so the technical characteristics will tend to be set by:- a) low cost b) poor infrastructure c) ease of access by billions - as this will be the largest user market. This trend will feed back to set certain parameters that will change basic models of networks and attached devices within the EU.
7. Better transactional support will be necessary for business and consumers. A transaction oriented internet or a sub-division of the internet, for business and consumerism, may be needed.
8. The internet is innovative in terms of economic models which have generated economic benefit, as well as changing the commercial landscape - so perhaps its chaos is positive overall. Thus future internet designs should enable high flexibility, or at least not be overly rigid.
9. How can we influence the basic technology in terms of security – is it possible at all? What we have is a separation of a technological world from an economic world sitting on top of it. There is a “stealth” aspect to the internet in that its advance is often not noticed. If we design a new internet, perhaps the place to start is a human view (more of what people want). But in hand with this is an economic question of what is good for the economy.
10. For internet business, *identity is vital*. We thus need to imagine new forms of address classification with naming. Currently internet naming is handled by the domain name system, DNS. DNS applies to network devices, but in future we could need the equivalent of a DNS for humans – that is you *are* your URL, it is not held on your laptop. So it is possible to imagine applications for anytime, anywhere, any device– for which we would need to use a “personal space” or an “attributive digital domicile”.

11. Digital identity should be based on “partial identity” and therefore all the various pieces of identity never come together, thereby leading to overall “anonymity” (at the macro-level). Generally Information should only be transmitted on a ‘need to know basis’.
12. The internet’s use as an economic foundation comes down to trust and perception, and how to enable those attributes technically and on the network.
13. The internet has succeeded because of its relative ease of inter-operability as it brings simple technical standards that are common and universal – the economic aspect of this cannot be over-estimated. It must be continued in any new form of internet.
14. Not only are there concerns over identity and trust, but legal issues remain critical for economic progress in that a transparent legal framework is required for business, employment, consumer and citizen rights etc. Although legal solutions will not solve all problems a clearer legal framework for a future internet could help with positive perception and trust

Discussion points

- Can we really expect emergence of user-driven identity and control of personal data (an “economy of intentions”)?
- It is important to maintain the the openness, in that it includes people with new ideas, and businesses with new business models (some of which break, some of which disrupt for better or for worse, or just supplant previous models). This makes it a new business creation machine.
- Legal implications: as the internet creates business, it could influence contract, commercial and company laws. The Internet thus needs to support and enable four processes: –
 - Accounting and tracking of relationships eg in a transaction,
 - Authorisation, that an action is allowed
 - Authentication of parties in a business transaction in terms of both identification and permitted activities (eg who can be a merchant, who can be a bank)
 - Access – who can see what, who can do what, who must be informed of what activity or event
- The internet world is a speeded up world. However the rest of the ‘real’ world cannot keep up. E.g. court processes, emergency numbers, etc. So what will happen is that the internet will eventually change our institutions – if it is allowed to. This would result in a ‘Faster Economy’. Thus there is a limit to how much the Internet brings intensive and extensive economic competition set by the real world. If more economic activity and business transfers to the Internet, then as it does, the speed of global trade, and investment, will accelerate leading to greater liquidity.

3 Sociological influences on technical design of a future internet

1. The Internet is moving to be a major social interaction platform – which implies the internet must succeed as a social channel where complex human signs and markers (visual, audio, gestual) are not lost by the form of communication used.
2. However the internet must reflect social norms of acceptable behaviour – society sets strong constraints on activities and capabilities (although the internet can never be even a very incomplete reflection of our society). These constraints are likely to increase in the future as dependence rises and are to be reflected in its architecture and engineering. They form a key part of the future requirements spec.
3. In avoiding social exclusion by internet exclusion, it is not so much that a person is on the internet or not – but that the technologies can work for or against segregation. From that it follows that we need to be clearer about exclusion - what we need, like and what we do not.
4. Going further, the idea is to encourage people to want to participate (‘self-actualisation’) which is more than just being excluded - and also more than just being included at a passive level. This implies using services to create personal worlds and useful personalisation of services.
5. Our behaviour socially is not as separate persons but instead we interact so the norms of behaviour on the internet spread. Future applications will tend to be shaped *collectively* by many users - how much *individual* desires will push future applications, in ways that we perhaps cannot even imagine, is unclear but likely to be low. So the dominating applications are likely to be flexible (for personalisation) but large in scale – implying a requirement for real-time scalability in demand for the key base parameters – bandwidth, storage and processing power.
6. The interesting design question is how the various ways in which we link to people influence the internet itself. If the internet is a facilitating infrastructure – with open access for all – we should get a different internet if it is driven by this goal of openness. This condition imposes design criteria, eg that each person needs so much bandwidth, so much spare capacity, storage, etc.
7. A further implication of the above is that today the major direction for ‘killer applications’ over the internet is that everything becomes ‘social’. How the internet will push people to evolve in social relationships and

in terms of self will be a synergy between the two that will push the design of the Internet. However, the 'social' label may limit our perception of the future internet if that is the sole focus, so it has to be wider.

8. There will be a shift from the internet of PCs not first to an internet of things, but to an internet of persons. The impacts on technology would be on naming and addressing spaces (eg to make the existing DNS mapping not to PCs and content, but to individual people first, and secondly to things, including PCs).

Discussion points

- The design of the internet as part of everyday life should reflect values that "we the people" are comfortable with. That implies that it should not be exclusively industry values, or government values either. More specifically it should not be authoritarian or extremist values. Thus liberal values are the goal but without an extreme freedom that may cause intrusion and harm. However, fragmentation of the world into major politico-commercial blocks with multiple cultural norms would also risk a sort of technological nationalism or protectionism. So, for instance, Western democracies would not accept a single global framework which reflects current Chinese values (eg on censorship/ surveillance).
- There is strong feedback between things that change the rules of acceptable behaviour via the internet and social norms. This interaction between people and the internet will generate the new applications.
- There will also be a feedback loop in the reverse sense in that internet developments will change the socio-economic environment- eg how much and how we interact, which depends on access and bandwidth, as well as traceability and trust.

4 Psychological influences: major affects on future internet technical design

1. The key point for the internet's future (which is likely to lie in greater internet social usage) is a psychology of trust, which is linked with privacy and safety - ie that the internet should offer a degree of privacy in life it cannot offer today. This is driven by fears of intrusion and harm. Moreover, fear is culturally-, age- and socio-economically- sensitive. Each of these factors should be reflected in the flexibility for implementation of internet interfaces. Without these factors being addressed, internet usage will be inhibited and its diffusion will be undermined.
2. However this mistrust or fear is not just due to the Internet's intrinsic engineering but also because of the freedoms allowed to its major exploiters – the largest ISPs, portals and search engine services. Through what may have become an unhealthy customer intimacy, these service providers have all harnessed large-scale revenue generation. This is a pointer towards future governance rules.
3. The psychology of internet usage is also governed by the motivator of desire - but there is no hierarchy – people move back and forth between the twin drives of fear and desire. Thus to satisfy aspirational goals and desires, and in contrast with its protective stance, the future internet should be one of *individual* creative endeavors as well as individual privacy. Desire for personal freedom is more important. These two forces of desire and fear have strong engineering implications.
4. Ideally, to avoid exclusion due to technophobia or alienation, a future internet should be a most "flexible internet" (subjective, diverse), that goes with you and adapts to where you are, who you are and enables you to do what you want to do.
5. In terms of applications we can expect on a future internet, the immediate desire is always for more of the same thing (eg Henry Ford said that if he had asked his end users in 1900 what they desired, they would have asked for a faster horse) indicating that today's major applications (gaming, social networking, email et) will be important to a future internet but will by no means be the only ones.

Several key psychological themes will dictate future Internet forms of use:

6. Presence/belonging, ie being part of a family or group –looking at this drive explains the attraction of social networking and its expected growth. Immediacy may be taken further in family or close networks, so news is faster and people are electronically 'together' for most of the day. Major theme will be the questions of 'where am I' and where do I belong?'
7. Relationships vis-à-vis others – the internet (especially the mobile internet) with its always-on ubiquity is now changing the forms of human relationships. Demands on the internet will reflect this need for a more human form of contact
8. Contribution to society – people's position and impact on society – change with the internet, as one person can influence many others, while far more influences can be easily experienced by one individual than ever before – also a changed behaviour – more adventurous and demanding of technology enablers comes with some degree of digital omnipotence (eg the trend to mashups is perhaps a form of this)
9. Sense of self fragmentation with alienation through heavy electronic communications, with impact on values – morality, integrity, honour, plus a greater need for contribution to society to be fulfilled. Moreover the internet can give altered/distorted/illusionary perceptions with changed behaviour, so consideration

should be given to ways in which this could be reduced - but it may only be at application level, without infrastructure implications.

10. With digital omnipresence, dependence will increase so the effects of outages or deliberate scams or interference may be magnified, so that the pressures for protection, resilience and trust will be enormously increased beyond today's pressures

Three further questions arise that have design implications, all based on how to build and maintain **trust** on the internet:

11. Personalisation - "my" personal network over the internet – what it means, and how can it be attained – a key driver.
12. The strength of desires for immediacy - and what does 'immediacy' mean? What engineering requirements does this immediacy imply for rich media interactions?
13. How to facilitate relationships through the internet – which is linked to how to put a 'value' people's emotions That is, from a business viewpoint, what is the potential for commercial applications linked to emotions, or effectively, how to exploit the search for friendship, thrills, exploring new experiences etc.

5 Major influences on future internet design from the Human interface environment or 'experience'

1. It is crucial to understand what provides the best user "experience" for each user when choosing interface technology. A human interface environment is a possible description of this – ie a combination, extended from pure HCI, to include social and psychological factors. So we change the idea of human interface to that of user "experience". This must be an interface that is individual to one person, so a range of solutions will be needed. This becomes especially important for those with special needs.
2. Interfaces will be the key to digital inclusion. Without them we risk enhancing the gap between the haves and the have-nots as the class of those who are 'will-nots' will expand
3. Movement from text to images. Underlying impact – much more multimedia than before. If we use the internet far more, we want an internet substituting for the newspapers, for instance. That may mean audio-visual newspapers, without text, or very little. But it could mean interfaces that emulate newsprint – ie high contrast text
4. It is important to be able search for things that you don't know, but also that you do know. So is this a sort of search engine (Google) for your 'life'. But do we want that, really in terms of it intrusion from current concerns over ISPs, Google etc? We need an interface for protection of self but one that suits our modes of thinking and doing – so *we need "anonymous personalization"*
5. Users will require their own locus of control with far more situational awareness, as well as anonymity with prior warning of any potential impacts on that.
6. Identification is the transactional aspect of digital identity. Digital identity management is at the core, because it must be applied not only to people, but also to things/devices/environment that people interact with. Note that people's own identity is also linked with the identity of things in their environment and so can be used as pointers to identification (which follows the human processes of identification). There is also the question - can I not have multiple identities on the internet?

Discussion points

- Where does the internet stop? Where should intelligence be placed – the human interface seems to be in the device – but it could be in the network, or at the edge or on a server – either the application server, or a special human interface environment server that hosts personal HIFEs? This is all linked to the concept that there may be elements of an individual's human interface that could be all pervasive, and persistent, like identity. That could happen at the server level, but could be at other levels. Or will there be no more intelligence within the network than today so the HIFE has to be on the device?
- How to improve user attention is also an issue, especially in a context of competing content that may not be to the user's core interest, such as pop-up advertising (which may be distracting and there for commercial reasons). What we need is something as simple as possible for each user, and each user may have a range of capabilities. But the interface itself will be as complex as is necessary and so could be quite variable in sensory acquisition, processing power, data requirements etc.