

# Slow Food, Slow Growth....Slow Ict.The Environmental Intelligence Perspective

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Based on a report by the Information Society Technologies Advisory Group (ISTAG), this article examines the phenomenon of Environmental Intelligence, analyzing its possible scope and social consequences.

( 1) More or less a decade ago, I started cooperating on a project that was to turn into one of the biggest thrills of my professional life. At the Institute of Prospective Technological Studies, we were tasked by the ISTAG to chart the future of Europe´s information society ( 2). European policy makers needed an independent vision which went beyond the infrastructure one being propagated mainly by the United States ( 3). The result was a comprehensive concept, called Ambient Intelligence (ISTAG 2001) ( 4).

We produced a European project for 2010 en beyond based on several visions of the future and what they implied for Research and Development in Information and Communication Technologies. Our focal point was that within a not too distant future, our real environment would be filled to the hilt with intelligent hard and software. It would allow us to envisage what we would be able to do as employee, citizen, student, human being, you name it.

That is why Ambient Intelligence is more than “ubiquitous computing” – one of the futuristic visions which was then especially popular in the United States.

Let me back up this vision with some excerpts:

*Ambient Intelligence (Aml) stems from the convergence of three key technologies: Ubiquitous Computing, Ubiquitous Communication, and Intelligent User Friendly Interfaces. In the Aml vision, humans will be surrounded by intelligent interfaces supported by computing and*

*networking technology which is everywhere, embedded in everyday objects such as furniture, clothes, vehicles, roads and smart materials even particles of decorative substances like paint. Aml implies a seamless environment of computing, advanced networking technology and specific interfaces. It is aware of the specific characteristics of human presence and personalities, takes care of needs and is capable of responding intelligently to spoken or gestured indications of desire, and even can engage in intelligent dialogue. 'Ambient Intelligence' should also be unobtrusive, often invisible: everywhere and yet in our consciousness – nowhere unless we need it. Interaction should be relaxing and enjoyable for the citizen, and not involve a steep learning curve. Ambient Intelligence is therefore more than an enhanced internet. The idea of Ambient Intelligence is that if, as seems inevitable, we are going to be increasingly surrounded by such devices then for the health, comfort and sanity of human society, we had better develop intelligent intuitive interfaces capable of recognising and responding to human needs individuals in a seamless, unobtrusive and often invisible way. That is why we worked with the abbreviation of Ambient Intelligence as Aml – it should signal a move beyond concepts such as 'user-friendliness', which tends to objectify the relationship between people and technologies (as 'users'). Aml should be based on a more seamless and humanistic notion such as a people friendly information society. ( 5)*

The last statement explains why the group of experts also enjoyed the French «jeu de mot» or pun, involving the Aml acronym : «Ambient Intelligence : mon meilleur Aml.» It went to the core of the issue : Technology in general and ICT specifically had to be at the service of mankind.

The fact that such a statement and message was propagated by a group of prominent representatives of industry and research carried special weight. Few had expected this from a group of people traditionally considered to be nerdy. And even fewer had expected this from a Directorate General of the European Commission often reproached for being too technocratic and technology-driven.

Because of this message and the authority of ISTAG, this vision had quite an immediate impact. Probably the first to take it on board was industry itself, and Philips quickly embraced Aml. It later reached ICT policy circles at large and only much later did it spread to academia. Even now, the ISTAG report is still extensively quoted and remains one of IPTS's most downloaded reports. The reason might well be that it is one of the few documents which so clearly sets out an ambitious European vision: Technology driven for sure, but technology at the service of our societal ambitions.

When we assess now what was said about the future at the time, we have to acknowledge that reality falls short of the vision we had in mind. After all, we still don't live in intelligent environments which proactively help us out. Still, we have to say that a great many elements of our vision have become commonplace.

The technological drive has taken us to the point that we are now in the midst of the development of the so-called ubiquitous networks, considered one of the most important building blocs of Aml. On top of that, every ECT company is committed to user-friendly innovation, which was one of ISTAG's key recommendations. It allows for the development of Radio Frequency Identification (RFID) devices and meshed networks, which, in turn, foster

proactive intervention. And the list goes on.

In fact, only two bottlenecks we listed in the report are still relevant ( 6). The question remains how we have to store and provide power to all the end-use equipment. Aml counted on powerful batteries that would stay alive well beyond a single day and preferably would be able to re-energize themselves. A second bottleneck in this intelligent environment centers on the need for proactive software which is able to anticipate or efficiently support all human behavior. I am not competent to judge the battery problem. But it does not seem impossible to me that the massive investment into developing alternative energy will produce a byproduct that will solve the issue. In practice, the first laptop cases with fitted solar panels are already up for sale.

It leaves the lack of intelligent software as the most essential bottleneck on the road to a fully functioning intelligent environment. But the Web 2.0 developments give us hope. If this movement is seen as a comprehensive search for bottom-up knowledge creation and management, it does not seem too farfetched to me to assume that this bottleneck will be fixed soon. Much is already there for all to see. Now, you can travel through New York, smartphone in hand, and your user profile will immediately show you which restaurant is most to your liking. You will be able to check the upcoming live sessions at a nearby jazz club and book a prime seat. If you like that handsome diner at the other table, check out whether the Facebook profile dovetails with yours. Or, buy-crimefree-guaranteed.com cannot only provide you safe lodging but send you a simulation of your flat at the same time. All in real time, of course.

Examples are rife to show that, when it comes to software based proactive knowledge, we have moved well beyond the expectations of 2000.

## The Most Important Technological Trend of the Last Decade

“Beam me up, Scotty!” .... Well, it still doesn't work. Scotty's transporter remains a figment of Star Trek fiction. Not that Aml scripts ever predicted differently. ISTAG always considered Aml as a sort of “Reality ++,” a significantly improved and more pleasant reality which viewed Aml as an upgraded version of the real world.

However, in retrospect, it is fair to say that the technological Aml vision and scenarios were on the mark. Even better, it seems to me that we are ever getting closer to turning it into reality. Though obviously, the target date of 2010 will be missed and not all expectations will be met.

A decade ago, no one had for example even heard of Web 2.0. So it comes as no surprise that ISTAG saw the future of knowledge-friendly software primarily as a massive increase of databases which, distributed on the old pre peer-to-peer paradigm, would first be stored in one place to be applied somewhere else later. Since it was the predominant reasoning around the turn of the millennium, it explains why the ISTAG experts, perhaps against better knowledge, considered it the future of smart software. With Web 2.0 that old dream of ‘adaptable software’ and ‘content on the fly’ became a reality. Technologically, I consider the impact of Web 2.0 therefore to be the most important development of ICT in the last decade. Specifically because



the whole Web 2.0 movement, which goes well beyond You Tube and Facebook, turned the old communication paradigm on its head: the end user (whoever that may be) also becomes a content provider (You Tube, LinkedIn), a capacity provider (peer-to-peer) and an interface provider (open software).

The most fundamental criticism that the Aml movement could face centers on the fact that the vision was excessively based on an individualist conception of the future of services, including software. But next to no one would have anticipated a decade ago that the social dynamic of Web 2.0 would have had such a thorough impact on industrial logic. It turns Web 2.0 into a relevant correction to an Aml vision which proved too blinkered.

Such a change of paradigm, during which three components of a whole communication system (networks, interfaces and services/content) are simultaneously changed, is extremely rare.

It is the reason why I consider it the biggest leap forward in the history of the whole ICT revolution since the introduction of the PC. Only diehard technophobes will claim that Web 2.0 is just a passing phenomenon. Just consider how different things were less than five years ago. When in those days someone sought to sway European policy makers in both the private and public sector, it was still considered fashionable to call the ICT revolution dead since everyone had a laptop and a PC. ( 7)

So, I not only consider Web 2.0 to be the most important breakthrough of the last twenty years but also the most important stepping stone toward Aml. To put it differently: because of the intertwining innovations in the areas of networking, interfacing and knowledge creation through Web 2.0, there no longer is any reason to assume that the technological evolution toward more Aml will not materialize. All the more so because the whole dynamic boosting Web 2.0 creates a more bottom-up, socially driven vision of the future and pushes aside the ICT's top-down individualistic view. Anyone now assessing the future of media has to take the success of You Tube, and its message that each viewer also wants to be a broadcaster, into full account. Anybody seriously involved in 'traffic management' now has a bigger job analyzing how location-based services can be improved rather than wondering whether the Internet highway needs any more lanes. When it comes to knowledge enhancement, the point no longer is to produce that knowledge yourself, but rather to integrate the elements of the Wikipedia dynamic.

All this has crystalized my vision of our technological future. Over the coming years, we will only have more shared and distributed networks, more intuitive and more end user-driven content and knowledge creation. So, over the next decade, the real question is not what might happen to technology since that, in principle, has few limits. Time and again, we have been wrong about what the limit of that 'sky' could be. Now, everything indicates that technology is not the highest hurdle. Moore's Law has risen from the grave as many times as it has been buried.

## **Now that more and more Aml type of technological Progress is a Given: What Will We Do With It?**

It is a lot tougher to predict what kind of Aml will emerge in the future. A decade ago, the



assumption among experts was it would inevitably lead to "More and faster:" More supply, more channels, faster services, more interconnection, more "any content, any service, anywhere, anytime," to quote the ad of a major European Telecom company. Based on such assumptions, it would have to lead to a "hyperefficient" society, backed by hyper efficient citizens with a hyper efficient education who are hyper efficient in dealing with technology ...

Unbridled economic growth and hyper capitalism were without any question its socio-economic cornerstones. It was even taken beyond the point of absurdity. At the height of the first internet wave, some companies came onto the market offering to pay consumers if they used their services. Call it ultimate capitalism in which Adam Smith's invisible hand pays back what it should have taken.

In the end, it didn't really come to all that. "Of course," we now say. The non-material economy was not achieved. The daily rush-hour traffic jams are living testimony to that. The suspension of time and space through ICT – the end of distance – never became reality. Just look at the ever increasing workload and job pressure, the relentless rise in business travel and the fact that the success of Silicon Valley could not be replicated any place else. Wherever the world truly turned smaller (for example through a better use of logistical management) we only created different problems (like global competition and dependence).

However, we should not turn ourselves into Monday morning quarterbacks and reassess this utopianism with belittling pity. The Parisian students of the May 1968 revolt had a vision of "sous les pavees, la plage! – beneath the cobblestones, the beach!" And even though they could not create their ideal society, one has to say that, clearly, the post-1968 world is different from the one that preceded it. And it does carry the seeds of May 1968 utopia. And just like the May 68 hype, the first internet bubble might have been a necessary phase. In abstract terms, and based on the work of Carlota Perez ( 8), it can be argued that during times of technological paradigm change, creativity should be given free rein. If only to shake up those old technological concepts : to come up with peer-to-peer in a Unix world does take a radical leap of faith.

And in a sense, some of those wild, wacky ideas of yore did survive and make it to today. All right, sites that paid us to log on, as was predicted before the dotcom bubble burst, they never materialized. But look at the Google model, where everything is free because technology has turned targeted, tailored advertising into reality. So in a sense, it can be seen as a derivative of this initial "everything-must-go" vision. And nobody had anticipated that the concept of open software would turn the existing models in digital distribution upside down. At first it was illegal, like Napster, before they turned legit with initiatives like i-Tunes. And all that in turn helped lead to a creative commons with tens of thousands of licenses, yet another development no one had expected and one that would give a very strong boost to make main stream the movement of open innovation ( 9).

In short, all the unlikely conjecture of the first internet hype may have sounded crazy enough, but in a sense, a lot of it stuck. So, to assess the future of Aml, we should not only extrapolate based on technical know-how but also look at the way technological trends are embedded in societal reality and vice versa.



## Aml and Europe´s Challenges

Here too, the case is pretty straightforward. If we look at the major challenges facing Europe and probably the rest of the world too, over the coming decades, we can discern an emerging consensus on three of them. They are interrelated and they are big.

1-Economic growth in a global world has to be guaranteed; because growth allows for job creation, the funding of our welfare society and much more. It has been almost unanimously agreed that this European growth must be based on the knowledge economy. What else is Europe left to compete with in this globalized world, given the fact that we do not want to see our standard of living slide into a drastic decline.

2-A second gigantic challenge is Europe´s demographic evolution. How does the continent manage the graying of society and more immigration. Slowly, Europe´s population pyramid is turned onto its head and it shows in an increasingly negative dependency ratio (less youngsters that have to take care of more elders.) Immigration is only part of the solution and engenders a different problem \_ integration.

3-The third challenge is green \_ how can we produce and consume enough energy while maintaining the ecological balance.

It is clear that in all three challenges, ICT, as an enabling technology, has enormous contributions to make. It is evident that if we consider Aml a “knowledge based environment,” future Aml applications will be needed to boost our creativity on the global stage (the first challenge). Such applications will be needed to develop Ambient Assisted Living (10) services to contain the cost of health care (the second challenge). And ICT will be needed to create virtual working environments which are CO2-free (third challenge).

In other words, it is to be expected that the future developments will become part of these major challenges. It raises the question what these services and applications will look like. Again, I think the sky is the limit. But it is beyond question that there will be enormous demand.

To some extent, the high level of risk capital investment and the management of these projects by people who also boosted the internet boom and the Web 2.0 breakthrough underscore this analysis.

It looks like the future is bright for ICT and that we can again look forward to 10 years of plenty with the ICT world if they are developed as part of the solution of the globe´s major problems. Yet, it doesn´t mean that there is no dark side attached to these visions and scenarios. And they have to be taken seriously, lest they overshadow the bright side.

## The Dark Side

ISTAG already warned in its original version that Aml carried a load beyond the positive message. Specifically, there were warnings about the invasion of privacy and because of this, it was stressed that Aml had to be controllable or 'on demand.' Some 'dark scenarios' spun a dreaded vision of a threatening technology which could, potentially, turn Orwellian (11). If our desire for a safe, protected world becomes too obsessive, it can push Aml, as such dark scenarios rightly predicted, down the slope toward total control and total loss of privacy.

But an Orwellian collapse because of our increasing need for security and control is only one aspect of what could possibly offset the positive development of Aml. A second scenario emerges from the darkness when we link the evolution toward Aml with the convergence debate : the dovetailing of ICT, biotechnology, robotics and nanotechnology. Bill Joy, one of the former top brains of Sun Microsystems first warned us about this in a by now infamous article in Wired (12). It was infamous because a technophile like Joy called for a thorough assessment of where the sector was heading. He was the first to state that the ICT evolution toward nanorobots and enhanced humanity could lead to a sort of "Minority Report" society. And he added that because of the irreversibility of such trends there needed to be careful consideration of the consequences.

The impact of all this is such that for the first time in human history, science will make it possible that people and their environment will be modeled at will, affecting both the deepest core of mankind and nature alike. It has always been one of mankind's deepest ambitions to control the world and extend human life, but the convergence of biogenetics, robotics and nanotechnology will allow for a giant leap forward in this process. Especially the combination of these three disciplines will allow for applications to make your head spin. What about independent mini-drones which will be able to travel through your body and perform medical chores where necessary.

The fear raised by Joy's article is that the process will be irreversible. Much like Genetically Modified Organisms, once they are massively released in nature there is no way to retrieve them. Joy also said that a critical assessment has become impossible because, among other things, military applications appear to be too good to be true. The concept of a "smart soldier" has been touted. A sort of Blade Runner character who is completely wired up and full of nanotechnology. So he can see at night through infrared lenses, needs almost no rest because of perfect diet and implant based sleepmanagement, can continue to fight despite a shattered knee since nanorobots will instantly regenerate it. And he will probably be directed by laptop from 20,000 kilometers away because, after all, he is only a tiny node within a whole network.

It is not even the issue whether this convergence will materialize – which, by the way, it will. First and foremost, I have a strong belief that the natural resistance of the ordinary citizen will be close to nonexistent. Most people would probably be committed proponents of early genetic intervention if it is clear that their unborn child would suffer from leukemia? Ethically, that is an easy one – who would want a child to have leukemia. So lets make it a bit more complicated. Would we also back such an intervention if the embryo would develop a harelip, heavy asthma, whether it would become autistic, or whether it would have an intelligence deficiency which would make it dependent on parental care throughout life? I think that even in the latter cases, many people would back genetic brinkmanship. It reinforces my conviction that we have only

seen the beginning of genetic manipulation. It does not take a flight of fancy to realize that people would gladly become 200 years old.

If it takes being fully wired with technology, I have no doubt they would be lining up too. And, just to return to that smart military technology we were discussing, would it not be great it would allow us to let our leg grow back after it was smashed in a car crash?

On top of that, this convergence and evolution of Aml perfectly dovetails with something no one could have predicted a decade ago : the security neurosis following the terrorist attacks in the United States and Europe. It fits into the dark scenarios, since the attacks can be used as an all purpose solution to start registering each and everyone \_ and everything. The potential of ICT is phenomenal. If all of our phone calls are registered, all of our data traffic scanned, all of our payments and purchases monitored through bar codes or RFID, if we have to biometrically check wherever we go, and if all this data is constantly linked, then any interested party, will know about 90 percent of what we do during the day. If all of this is linked to our real-time monitored physical movements, we are getting pretty close to a Minority Report scenario.

And again, the citizen will have no doubt when faced with the question: you want security or privacy? Here is why it is not as simple as it seems : ICT's enormous archiving and tracing techniques did allow us to catch the Madrid terrorists within a week. Their phone traffic was archived; it was quickly known where they bought the mobiles that set off the bombs. By linking intelligent software, investigators knew within 48 hours where to look. And find they did.

In short, we need a far broader debate about the future of technology and mankind. We need to know where Aml is heading and how it can contribute to the three challenges the ICT world is facing – economic growth, sustainability and aging. And this is all the more so because the imminent scientific and technological developments are increasingly hard to fathom for our "human" brains.

Take Iraq. It is now evident that the decision to go to war was not based on too many rational grounds (and this even apart from the debate whether it was justified). Yet at the same time, it puts a process in motion which could not be stopped. Compare this to a tribal conflict 2,000 years ago when perhaps a few people died before bloody battle was ceased because one of the sides was simply exhausted. Add high-tech weapons to today's conflicts and we get the most brutal slaughter imaginable.

We see the same lack of 'natural' restraint when it comes to genetic manipulation and the monitoring of e-mail traffic. It takes precious little effort to get the ball rolling, but once it catches some momentum it becomes almost impossible to stop it. There still is a 'fix' possible for nuclear energy but it will be as good as impossible to retrieve all genetically manipulated wheat from our food chain if it becomes obvious in twenty years time that it is harmful to half the world population.

In summary : the whole evolution toward Aml and convergence doesn't allow for much of a test and trial run and implies that we will have to carefully think through everything beforehand. And because the technological question has an easy answer – technologically, nearly everything is



possible \_ it is clear to me that the most important debate about the future of ICT has to center first and foremost on the ethical aspects. To put it differently, what kind of an Ambient Intelligence do we really want?

We will be able to learn from the errors we made a decade ago when we first set up the scenarios. Despite the rhetorical emphasis on consumer/mankind, Aml was a vision where technology drove the application and thus disregarded developments on the consumer side. On top of that, Aml saw mankind as strongly individualistic and underestimated the power of social interaction. If those scenarios had to be rescripted today, Web 2.0 would have a strong impact. Learning lessons from this, we have to ask how can we embed the Aml trends into the major challenges our world is facing while leaving the dark scenarios behind.

## Food and the future of Aml

The length limitations on this article only allow for a broad indication of a number of policy objectives. As a Belgian, I want to use an analogy relating to something which is dear to my heart (and stomach) – the slow food movement (13). In itself it is nothing more than a call to return our food culture to its essentials. Honest, seasonal products prepared, and tasted, at ease. We will happily chuck out those year-round fresh tomatoes that have either been grown in greenhouses or hauled from halfway across the globe at a staggering ecological cost. Instead, we want products from that magical Francophone place called “terroir” – that mix of time, space, soil and soul – for which we will pay fair prices. Slow food as the obvious alternative to fast food and its global monoculture. Good food, no doubt about it, but also based on quality when it comes to both the ingredients and the whole farm-to-fork process.

If we take this analogy further, we can say that the first Aml scenarios were the result of the fast food ideology. How can we use ICT to produce faster, produce and consume more, live longer and stronger? It comes as no surprise that one of the most quoted Aml scenarios involved “Maria” as a sort of super businesswoman who was flying around the world, managing her company up in the air, yet woman enough to find the time, largely because of Aml, to be a mom raising kids (even though mainly by smartphone). Maria thus as the typical exponent of ‘fast growth.’

We increasingly see that the major challenges we will face, and which already have found a voice in the Global Justice Movement and the slow food movement itself, will increasingly push the debate toward what I would call «slow growth.” A metaphor for having a the good life, obviously, but not at the cost of the environment or the quality of life.

A slow growth approach of Aml will stress the improvement of the quality of life through ICT and convergence instead of the improvement of human performance (14). Slow growth will use Aml to grow old with dignity instead of using Aml to work three additional hours a day. Such a vision of Aml stresses the development of services which will explore our collective knowledge to promote efficiency instead of services that target improved controls or additional machine-based intelligence.

Now, if our assessment of the societal trend toward slow growth is correct, it means that the

dominant paradigm for the further development of Aml must, logically, be 'slow' too. What is more, Aml will have an essential role in any slow scenario of our future because such a slow scenario is only attainable if we know how to use our collective knowledge to the fullest. This is exactly the potential of Aml 2.0.

## Notas

[1] The author has written this article in a personal capacity. He is indebted to all his colleagues at SMIT (VUB), IPTS (JRC-ES) TNO and DG INFSO with whom, over the past 15 years, he debated and worked on the future of the information society.

[2] IPTS – one of the seven research hubs of the Joint Research Centers of the EC. ISTAG is a mixed industry-research-academia "High Level Group" which advises the Directorate General responsible for European information society policy (DG INFSO) on research programs.

[3] More specifically, the plans the United States developed on the Information Highways around the end of the 1990s. J.C. Burgelman (1996) Issues and assumptions in communications policy and research in Western Europe: a critical analysis. pp. 123-153 in P. Schlesinger, R. Silverstone & J. Corner (eds.) International Media Research. A critical Survey. London & New York: Routledge; en ook J.C. Burgelman (1996) Policy challenges to the creation of a European Info Society, pp. 59-86 in J. Servaes (eds.) The European Info Society. A reality check. Bristol: Intellect. (Burgelman 1996, 1996a).

[4] ISTAG (2001), Scenarios for Ambient Intelligence in 2010. IPTS. 4) For a more contextual version of the Aml storyline, I refer to J.C. Burgelman & Y. Punie (2006) Information, Society and Technology, pp.17-34 in E. Aerts & J.L. Encarnacao (eds.) True visions. The emergence of ambient intelligence. Heidelberg, Springer.

[5] K. Ducatel, M. Bogdanowicz, F. Scapolo, J. Leijten & J-C. Burgelman (2005) That `s what friends are for – Aml and the Information Society in 2010 pp. 181-200 e-Merging Media. Munchen, Axel Springer Verlag.

[6] The following five categories of requirement were used: (1)A seamless mobile/fixed web-based communications infrastructure; (2) Very unobtrusive hardware; (3) Dynamic and massively distributed device networks; (4) A natural feeling human interface, (5) Dependability and security.

[7] This was based on a number of internal reports which were only partially published, see C. Pascu, D. Osimo, M. Ulbrich, G. Turlea & J.C. Burgelman (2006) The potential disruptive impact of Internet 2 based technologies. First Monday, Volume 12, Number 3.  
[http://www.firstmonday.org/issues/issue12\\_3/pascu/](http://www.firstmonday.org/issues/issue12_3/pascu/)

[8] C. Perez (2002) Technological Revolutions and Financial Capital: The Dynamics of Bubbles and Golden Ages,2002, Edward Elgar, Cheltenham, U.K.

[9] OECD (2008) Policy Issues Paper – Business Symposium on Open Innovation in global networks.

[10] AAL : generic term for Smart ICT based services which can be used in health care.

[11] D.Wright, S.Gutwirth, M.Firedewald, E.Vildjiounaite & Y.Punie (2008) Safeguards in a World of Ambient Intelligence. Springer.

[12] “Why the Future doesn’t need us, Wired 2004.  
<http://www.wired.com/wired/archive/8.04/joy.html>

[13] [http://en.wikipedia.org/wiki/Slow\\_food](http://en.wikipedia.org/wiki/Slow_food)

[14] Zie bijvoorbeeld J.C. Burgelman, R. Compano, N. Malinovski, O. Da Costa, I. Mattson, A.K. Bock & M. Cabrera (2006) Converging Applications for Active Ageing Policy, pp. 30-42 in Foresight, Vol 8/2.