

Issues in Mobile Computing – IST Advisory Group report ”Scenarios for Ambient Intelligence in 2010”

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Lesson Outline

- Four Scenarios in Ambient Intelligence
- Critical socio-political factors
- Business and industrial models
- Key technological requirements
- Research clusters

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Scenarios

- Maria – Road Warrior
- Dimitrios – The Digital Me (D-Me)
- Carmen – Traffic, Sustainability & Commerce
- Annette and Solomon in the Ambient for Social Learning

Maria

After a tiring long haul flight Maria passes through the arrivals hall of an airport in a Far Eastern country. She is travelling light, hand baggage only. When she comes to this particular country she knows that she can travel much lighter than less than a decade ago, when she had to carry a collection of different so-called personal computing devices (laptop PC, mobile phone, electronic organisers and sometimes beavers and printers). Her computing system for this trip is reduced to one highly personalised communications device, her 'P-Com' that she wears on her wrist. A particular feature of this trip is that the country that Maria is visiting has since the previous year embarked on an ambitious ambient intelligence infrastructure programme. Thus her visa for the trip was self-arranged and she is able to stroll through immigration without stopping because her P-Comm is dealing with the ID checks as she walks.

Maria

A rented car has been reserved for her and is waiting in an earmarked bay. The car opens as she approaches. It starts at the press of a button: she doesn't need a key. She still has to drive the car but she is supported in her journey downtown to the conference centre-hotel by the traffic guidance system that had been launched by the city government as part of the 'Aml-Nation' initiative two years earlier. Downtown traffic has been a legendary nightmare in this city for many years, and draconian steps were taken to limit access to the city centre. But Maria has priority access rights into the central cordon because she has a reservation in the car park of the hotel. Central access however comes at a premium price, in Maria's case it is embedded in a deal negotiated between her personal agent and the transaction agents of the car-rental and hotel chains. Her firm operates centralised billing for these expenses and uses its purchasing power to gain access at attractive rates. Such preferential treatment for affluent foreigners was highly contentious at the time of the introduction of the route pricing system and the government was forced to hypothecate funds from the tolling system to the public transport infrastructure in return. In the car Maria's teenage daughter comes through on the audio system. Amanda has detected from 'En Casa' system at home that her mother is in a place that supports direct voice contact. However, even with all the route guidance support Maria wants to concentrate on her driving and says that she will call back from the hotel.

Maria

Maria is directed to a parking slot in the underground garage of the newly constructed building of the Smar-tel Chain. She is met in the garage by the porter – the first contact with a real human in our story so far! He helps her with her luggage to her room. Her room adopts her 'personality' as she enters. The room temperature, default lighting and a range of video and music choices are displayed on the video wall. She needs to make some changes to her presentation – a sales pitch that will be used as the basis for a negotiation later in the day. Using voice commands she adjusts the light levels and commands a bath. Then she calls up her daughter on the video wall, while talking she uses a traditional remote control system to browse through a set of webcast local news bulletins from back home that her daughter tells her about. They watch them together.

Maria

Later on she 'localises' her presentation with the help of an agent that is specialised in advising on local preferences (colour schemes, the use of language). She stores the presentation on the secure server at headquarters back in Europe. In the hotel's seminar room where the sales pitch is take place, she will be able to call down an encrypted version of the presentation and give it a post presentation decrypt life of 1.5 minutes. She goes downstairs to make her presentation... this for her is a high stress event. Not only is she performing alone for the first time, the clients concerned are well known to be tough players. Still, she doesn't actually have to close the deal this time. As she enters the meeting she raises communications access thresholds to block out anything but red-level 'emergency' messages. The meeting is rough, but she feels it was a success. Coming out of the meeting she lowers the communication barriers again and picks up a number of amber level communications including one from her cardio-monitor warning her to take some rest now. The day has been long and stressing. She needs to chill out with a little meditation and medication. For Maria the meditation is a concert on the video wall and the medication....a large gin and tonic from her room's minibar.

Dimitrios

It is four o'clock in the afternoon. Dimitrios, a 32 year-old employee of a major food-multinational, is taking a coffee at his office's cafeteria, together with his boss and some colleagues. He doesn't want to be excessively bothered during this pause. Nevertheless, all the time he is receiving and dealing with incoming calls and mails.

He is proud of 'being in communication with mankind': as are many of his friends and some colleagues. Dimitrios is wearing, embedded in his clothes (or in his own body), a voice activated 'gateway' or digital avatar of himself, familiarly known as 'D-Me' or 'Digital Me'. A D-Me is both a learning device, learning about Dimitrios from his interactions with his environment, and an acting device offering communication, processing and decision-making functionality. Dimitrios has partly 'programmed' it himself, at a very initial stage. At the time, he thought he would 'upgrade' this initial data periodically. But he didn't. He feels quite confident with his D-Me and relies upon its 'intelligent' reactions.

Dimitrios

At 4:10 p.m., following many other calls of secondary importance – answered formally but smoothly in corresponding languages by Dimitrios' D-Me with a nice reproduction of Dimitrios' voice and typical accent, a call from his wife is further analysed by his D-Me. In a first attempt, Dimitrios' 'avatar-like' voice runs a brief conversation with his wife, with the intention of negotiating a delay while explaining his current environment. Simultaneously, Dimitrios' D-Me has caught a message from an older person's D-Me, located in the nearby metro station. This senior has left his home without his medicine and would feel at ease knowing where and how to access similar drugs in an easy way. He has addressed his query in natural speech to his D-Me. Dimitrios happens to suffer from similar heart problems and uses the same drugs. Dimitrios' D-Me processes the available data as to offer information to the senior. It 'decides' neither to reveal Dimitrios' identity (privacy level), nor to offer Dimitrios' direct help (lack of availability), but to list the closest drug shops, the alternative drugs, offer a potential contact with the self-help group. This information is shared with the senior's D-Me, not with the senior himself as to avoid useless information overload.

Dimitrios

Meanwhile, his wife's call is now interpreted by his D-Me as sufficiently pressing to mobilise Dimitrios. It 'rings' him using a pre-arranged call tone. Dimitrios takes up the call with one of the available Displayphones of the cafeteria. Since the growing penetration of D-Me, few people still bother to run around with mobile terminals: these functions are sufficiently available in most public and private spaces and your D-Me can always point at the closest...functioning one! The 'emergency' is about their child's homework. While doing his homework their 9 year-old son is meant to offer some insights on everyday life in Egypt. In a brief 3-way telephone conference, Dimitrios offers to pass over the query to the D-Me to search for an available direct contact with a child in Egypt. Ten minutes later, his son is videoconferencing at home with a girl of his own age, and recording this real-time translated conversation as part of his homework. All communicating facilities have been managed by Dimitrios' D-Me, even while it is still registering new data and managing other queries. The Egyptian correspondent is the daughter of a local businessman, well off and quite keen on technologies. Some luck (and income...) had to participate in what might become a longer lasting new relation.

Carmen

It is a normal weekday morning. Carmen wakes and plans her travel for the day. She wants to leave for work in half an hour and asks Aml, by means of a voice command, to find a vehicle to share with somebody on her route to work. Aml starts searching the trip database and, after checking the willingness of the driver, finds someone that will pass by in 40 minutes. The in-vehicle biosensor has recognised that this driver is a non-smoker – one of Carmen's requirements for trip sharing. From that moment on, Carmen and her driver are in permanent contact if wanted (e.g. to allow the driver to alert Carmen if he/she will be late). Both wear their personal area networks (PAN) allowing seamless and intuitive contacts.

While taking her breakfast coffee Carmen lists her shopping since she will have guests for dinner tonight. She would like also to cook a cake and the efridge flashes the recipe. It highlights the ingredients that are missing milk and eggs. She completes the shopping on the efridge screen and asks for it to be delivered to the closest distribution point in her neighbourhood.

This can be a shop, the postal office or a franchised nodal point for the neighbourhood where Carmen lives. All goods are smart tagged, so that Carmen can check the progress of her virtual shopping expedition, from any enabled device at home, the office or from a kiosk in the street. She can be informed during the day on her shopping, agree with what has been found, ask for alternatives, and find out where they are and when they will be delivered.

Carmen

Forty minutes later Carmen goes downstairs onto the street, as her driver arrives.

When Carmen gets into the car, the VAN system (Vehicle Area Network) registers her and by doing that she sanctions the payment systems to start counting. A micro-payment system will automatically transfer the amount into the e-purse of the driver when she gets out of the car.

In the car, the dynamic route guidance system warns the driver of long traffic jams up ahead due to an accident. The system dynamically calculates alternatives together with trip times. One suggestion is to leave the car at a nearby 'park and ride' metro stop. Carmen and her driver park the car and continue the journey by metro. On leaving the car, Carmen's payment is deducted according to duration and distance.

Out of the metro station and whilst walking a few minutes to her job, Carmen is alerted by her PAN that a Chardonnay wine that she has previously identified as a preferred choice is on promotion. She adds it to her shopping order and also sets up her homeward journey with her wearable. Carmen arrives at her job on time.

Carmen

On the way home the shared car system senses a bike on a dedicated lane approaching an intersection on their route. The driver is alerted and the system anyway gives preference to bikes, so a potential accident is avoided. A persistent high-pressure belt above the city for the last ten days has given fine weather but rising atmospheric pollutants. It is rush hour and the traffic density has caused pollution levels to rise above a control threshold. The city-wide engine control systems automatically lower the maximum speeds (for all motorised vehicles) and when the car enters a specific urban ring toll will be deducted via the Automatic Debiting System (ADS).

Carmen arrives at the local distribution node (actually her neighbourhood corner shop) where she picks up her goods. The shop has already closed but the goods await Carmen in a smart delivery box. By getting them out, the system registers payment, and deletes the items from her shopping list. The list is complete. At home, her smart fridge screen will be blank.

Coming home, Aml welcomes Carmen and suggests to telework the next day: a big demonstration is announced downtown.

Annette and Solomon

It is the plenary meeting of an environmental studies group in a local 'Ambient for Social Learning'. The group ranges from 10 to 75 years old. They share a common desire to understand the environment and environmental management. It is led by a mentor whose role it is to guide and facilitate the group's operation, but who is not necessarily very knowledgeable about environmental management. The plenary takes place in a room looking much like a hotel foyer with comfortable furniture pleasantly arranged. The meeting is open from 7.00-23.00 hours. Most participants are there for 4-6 hours. A large group arrives around 9.30 a.m. Some are scheduled to work together in real time and space and thus were requested to be present together (the ambient accesses their agendas to do the scheduling).

A member is arriving: as she enters the room and finds herself a place to work, she hears a familiar voice asking "Hello Annette, I got the assignment you did last night from home: are you satisfied with the results?" Annette answers that she was happy with her strategy for managing forests provided that she had got the climatic model right: she was less sure of this. Annette is an active and advanced student so the ambient says it might be useful if Annette spends some time today trying to pin down the problem with the model using enhanced interactive simulation and projection facilities. It then asks if Annette would give a brief presentation to the group. The ambient goes briefly through its understanding of Annette's availability and preferences for the day's work. Finally, Annette agrees on her work programme for the day.

Annette and Solomon

One particularly long conversation takes place with Solomon who has just moved to the area and joined the group. The ambient establishes Solomon's identity; asks Solomon for the name of an ambient that 'knows' Solomon; gets permission from Solomon to acquire information about Solomon's background and experience in Environmental Studies. The ambient then suggests Solomon to join the meeting and to introduce himself to the group.——

In these private conversations the mental states of the group are synchronised with the ambient, individual and collective work plans are agreed and in most cases checked with the mentor through the ambient. In some cases the assistance of the mentor is requested. A scheduled plenary meeting begins with those who are present. Solomon introduces himself. Annette gives a 3-D presentation of her assignment. A group member asks questions about one of Annette's decisions and alternative visualisations are projected. During the presentation the mentor is feeding observations and questions to the ambient, together with William, an expert who was asked to join the meeting. William, although several thousand miles away, joins to make a comment and answer some questions. The session ends with a discussion of how Annette's work contributes to that of the others and the proposal of schedules for the remainder of the day. The ambient suggests a schedule involving both shared and individual sessions.

Annette and Solomon

During the day individuals and sub-groups locate in appropriate spaces in the ambient to pursue appropriate learning experiences at a pace that suits them. The ambient negotiates its degree of participation in these experiences with the aid of the mentor. During the day the mentor and ambient converse frequently, establishing where the mentor might most usefully spend his time, and in some cases altering the schedule. The ambient and the mentor will spend some time negotiating shared experiences with other ambients – for example mounting a single musical concert with players from two or more distant sites. They will also deal with requests for references / profiles of individuals. Time spent in the ambient ends by negotiating a homework assignment with each individual, but only after they have been informed about what the ambient expects to happen for the rest of the day and making appointments for next day or next time.

Critical Socio-Political Factors

- Ambient Intelligence should
 - facilitate human contact.
 - be orientated towards community and cultural enhancement.
 - help to build knowledge and skills for work, better quality of work, citizenship and consumer choice.
 - inspire trust and confidence.
 - be consistent with long term sustainability – personal, societal and environmental – and with life-long learning.
 - be controllable by ordinary people – i.e. the 'off-switch' should be within reach.

Business and Industrial Models

- **Initial premium value niche markets** in industrial, commercial or public applications where enhanced interfaces are needed to support human performance in fast moving or delicate situations (such for example as Maria's).
- **Start-up and spin-off** opportunities from identifying potential service requirements and putting the services together that meet these new needs.
- **High access-low entry cost** based on a loss leadership model in order to create economies of scale (mass customisation).

Business and Industrial Models

- **Audience or customer's attention economy** as a basis for 'free' end-user services paid for by advertising or complementary services or goods.
- **Self-provision** – based upon the network economies of very large user communities providing information as a gift or at near zero cost.

Key technological requirements

1. Very unobtrusive hardware
2. A seamless mobile/fixed communications infrastructure
3. Dynamic and massively distributed device networks
4. Natural feeling human interfaces
5. Dependability and security

Research clusters

- Enabling hardware – including fully optical networks, nano-micro electronics, power and display technologies.
- Open platforms: for interoperating networks based upon a corporate effort to define a 'service control platform'.
- Intuitive technologies involving efforts to create natural human interfaces.

Research clusters

- Developments in support of personal and community development: including socio-technical design factors, support for human to human interaction and the analysis of societal and political development.
- Metacontent services developments to improve information handling, knowledge management and community memory, involving techniques such as smart tagging systems, semantic web technologies, and search technologies.
- Security and trust technologies in support of privacy safety and dependability.