Information Systems of the Future

A challenge for governmental decision makers is to chart the contours of the market and socio-economic structures 6-15 years ahead. Given the current short product life cycles in ICT, such time-frames are far beyond the business horizon, because they reflect a generation of technology and services. A discussion framed in the context of current software and middle-ware problems therefore leads towards a rationalization of past decisions, rather than a technological outlook or challenge to enter new markets. A possible way out of this dilemma is to identify the boundary conditions and challenges software technology may encounter in a rapidly evolving field. Once identified, we may be able to pro-actively act in terms of concrete stimulus of small and large projects in light of their potential of opening new frontiers of IT.

As a small case study, we take three steps into the future. Through these futuristic examples, we can chart the contours of possible activities and how they relate to the near future software development activities. Likewise, they encapsulate the contours of possible product/market combinations.

The ingredients to realize the visions are readily available. The hardware can be produced at low cost, power can be obtained from batteries or solar cells, the processing capabilities are readily available. Java has become a platform-independent framework to describe algorithms, Jini technology provides a basis to distribute and publicize services, agent technology is trying to identify and re-use effective learning technology.

However, the competition in the market is such that no one company is able to research and develop the complete infrastructure needed to bring the visions about. Rather, a cooperation between companies and public-sector research centres is necessary if they are ever to be realized. This would take the form of a nationally recognized expertise centre with strong ties to selected industries and research groups (satellites). In terms of our visions, a company like Philips might take the steering and monitoring role, while several public (EU) labs develop (partial) solutions. The outcome is not necessarily a product, but a software/technology base that has intimate experience in the key software problems: scaleability, autonomy, self-repair and -adaptation.
Research at CWI is strongly focused on such interaction with the private sector, both as a participant in contract research, and as a project partner in many public-private EU projects.

2005 - An ambient climate control system

19:00 the garden sprinkler installation collects the temperature and humidity levels of the thermometer pods distributed in the garden by wireless access. It contacts the local weather forecast site and obtains the weather prediction. It generates a sprinkling scheme and sends it to the respective sprinkler installations, which realize the plan autonomously using up-to-date information.

20:00 the lawn sprinkler starts its 40-minute rain program, but is interrupted by the dog, who disconnects the water hose. The sprinkler detects this and sends a wireless message to the house to warn the gardener. He being out, the message is forwarded to his car, from where he instructs the sprinkler system to suspend the program until he returns home by 22:00.
This reply is also picked up by the home air conditioning system, which adjusts its plans to have lowered the temperature to 18 ºC by 22:00.

22:15 the owner reconnects the water hose, and the sprinkler continues the plan taking into account the actual soil humidity reached before it was interrupted. The gardener installs some new thermometer pods of the latest model. Upon activation they gracefully integrate with the system, sharing historical data about the premises.

2010 - Ubiquitous video at your fingertips

There are 1000 TV channels available from various broadcasters in the Netherlands; moreover, all public video archives (Nederlands Audiovisueel Archief, Museums, libraries) are digitized and stored on large public servers. However, more channels lead to more confusion. There is no time to see everything and no time to find what one is really interested in.
Everyone has various mobile devices capable to receive and display any type of audiovisual data format for entertainment (see a movie in the train), professional use (video conference in the car) or educational purposes (training video, university lecture).

How will technology provide solutions? Every home has a digital vault for keeping data from TV and radio broadcasts, PCs, digital camera and Internet. The user does not need to be aware of the existence of the vault: the different devices interface seamlessly with it.

The vault is connected to an intelligent module which filters, indexes and organizes the data automatically based on metadata from service providers, devices, the user and the information contained in the data itself, using algorithms for image/video/ audio/speech/text analysis and natural language processing

Service providers will also provide general metadata, such as genre information, short textual summary, boundaries of informative video segments, such as news reports and topic units in a documentary and topics of these segments. More specific metadata comes from the user. This allows the extraction of (parts of) different programs interesting to the user. Here the development of content models describing the video segments of interest are required and the extraction of suitable effective features is necessary for detecting highlights.

2020 - PolyTabloids

6:30 Mark is awakened by his clockradio. As soon has he sets his foots on the floor, the sleeping room control center warns the coffee machine downstairs to start preparing a nice espresso. Still half asleep, Mark picks up the PolyTabloid, an A3-sheet of electrified material, from its printer.
With the coffee near at hand, he sits at the kitchen table. As he touches the Poly, pieces of text appear. Upon seeing a photo of a riot last night against a gasoline station in Chicago, he draws a circle on the image with his finger and calls up an enlargement. The Poly interacts with the WallDisplay, telling it to show the news-broadcast associated with the news item. In the basement, the newsflash is located by the Media Server among the hundreds of news casts collected last night. It is beamed up and the electronic copy of Van Gogh's Sunflowers is replaced by the inferno of a burning gas station.
Still unsure about the reason for this attack, he issues a search for related news items by pointing out the words on the Poly. His Media Search Engine retrieves a few more documents from his home archive, giving precedence to information already privately classified, or related to his work as logistics manager.

10:00 Mark enters the board room with his PolyTabloid filled with relevant information on the incident, including a 3D model for a quick-replacement station. The PolyTabloid with the dossier is taken by a secretary for authorized inclusion in the company's media archive. After inspection of the latest news bulletins it becomes clear that there is no relationship with the riot crowd and the well-guarded brand name of the oil company.

It doesn't take the board long to decide that a video message to its personnel is warranted and budget is freed to take this opportunity to create a new station. External communication quickly produces the necessary message using the fast local media based and those directly accessible from the agents, the message is packaged for multi-channel delivery, with the appropriate visual and audio packaging.

11:00 All field operators receive a message on their wristwatch. Its polymer top shows a short video message of the director. The office workers at the same time receive the high-volume video message on their laptops or PolyTabloids.