Human factors in artistic research and development in multi- and interdisciplinary collaborations

Anne Nigten
V2 Lab, Rotterdam, the Netherlands
with Călin Dan (Romania/the Netherlands) and Thecla Schiphorst, Simon Fraser University (Canada)

As a guideline for this paper, I consider it important to provide some information about the domain to which I refer. In the digital art domain, several types of electronic arts can be distinguished, such as:

1. *Digitised art works; digitalisation of works that have been created in the analogue domain.*
This is usually done for archiving, documentation or publication purposes; I will not refer to this category in this essay.

2. *Static artworks produced with software tools in the digital domain.*
These tools are commercially or non-commercially available to create and to distribute work, e.g. prints, digital paintings etc. I will not refer to this category either.

3. *Dynamic and interactive artworks produced with software tools in the digital domain*.
There is a whole range of works that should be included here as time-based media productions both linear and non-linear. Moreover, interactive productions can also include linear video and audio productions, as audio-visual elements of interactive pieces, performing arts etc.

4. *Code-based art works[1], where software and/or hardware are the primary part of the art work.*

I will emphasise the last two categories: "dynamic and interactive artworks" and "code-based artworks".

In this paper I will elaborate on the shift in production team constellations that is currently taking place in the electronic arts. One can see a shift from projects developed from a single discipline to multi-disciplinary and/or mixed-discipline projects. When referring to the code-based artworks category, however, several references will occur to dynamic and interactive artworks produced with software tools as well as video and audio productions in interactive pieces.

This text forms part of a survey into ways of working and profiles of those involved in the multidisciplinary and interdisciplinary collaboration process within the electronic arts. My research contains several observations from work developed in the V2_Lab, in the period from 1998 until the present (mid 2002). I will mainly refer to observations from work developed in the V2_Lab[2] and works that have been presented at V2_[3]. The *Happy Doomsday!* project by Călin Dan and the *whisper* project described by Thecla Schiphorst are included as two case studies.

This essay concentrates on the roles of people in development teams and the position of the artist in different kinds of work processes. From experience of working in the V2_Lab, it appeared logical to examine ways in which artists work in different team constellations, rather than to base

profiles on the kinds of work created. The purpose of the study is to understand more about the process of making work and what this can eventually contribute to proposing models for collaboration between art and science in the field of design, soft- and hardware research, development and production processes. The aim is to discover commonalities, parallels or contradicting insights among different ways of working in the research and development area. The results should allow for a more detailed analysis of team constellations and ways of working together in the field of art, engineering and computer science. The hope is that this can contribute to a better understanding of the work methods in this field, and provide information that could be of benefit to other sectors, such as computer science. Several issues that are only briefly touched upon here are dealt with in more detail in previous texts or will be the subject of future study.

Artists have reacted in different ways to the tremendous impact of technology on our daily lives. The fact that these technologies are still in a developmental stage only serves to reinforce this diversity. Some artists reflect upon media from the periphery or through using traditional materials. Others go a step further and build their own media technology, and transform or design it for entirely different purposes, beyond the remit of pure comfort- or functionality-driven design. Underlying my motivation to describe or propose models for interdisciplinary collaboration is a firm belief that the design of media technology (and technology in general) should no longer be regarded as a purely technical issue. The impact of media technology on our cultural and social life means that collaboration in the design process is not only found in creating tools, nor for exclusively artistic purposes. Even "useless" concepts can be of cultural importance, and concepts or experiences are an important approach to perceiving technology and its role.

Outside my daily work environment, representatives from other fields also seem to experience the collaboration process as a complexity of unexpected collisions between partners from different backgrounds. My observations turned out to be as relevant for scientists as for artists and engineers. Looking into the reports of different collaborators in the fields of art, science and engineering, they showed astonishing parallels with obstacles I observed and outline later. Several issues mentioned, such as different work methods and misunderstandings caused by different vocabularies, could be the result of divergent expectations. Unexpected obstacles can arise when one member of the team takes an interdisciplinary collaboration approach as a point of departure, while the other partners use a multidisciplinary collaboration model.

V2_Lab is mainly involved in software/hardware-based art and software to support artistic development, following two collaboration models, based respectively on a multidisciplinary approach and an interdisciplinary approach. Although "multidisciplinary" and "interdisciplinary" are often used synonymously, I refer here to the definition of these terms provided by the dictionary[4]: "multi" is defined as "*many*" and "inter" as "*between, among, mutually, reciprocally*".

In this short discussion I'll elaborate on the work methods that seem to apply to the multidisciplinary and the interdisciplinary processes, in an attempt to provide more insight and understanding of the aims, the goals and the difficulties one can encounter. I refer to these two approaches and not to the outcomes of the processes, since different artistic qualities derive from both approaches, and these work process are referred to as indicators of quality or importance. It should be emphasised that a mix of these approaches is common and comes about in different parts of the work, and in different phases of one single artistic research and development project. The distinction made here between multidisciplinary and interdisciplinary is meant to provide more understanding of the way things are developed in the contemporary electronic arts and code-based art productions.

Multidisciplinary Approach

In multidisciplinary projects the artist(s) brings in knowledge from other, non-technical or less technically oriented areas; existing technical applications are re-used or combined in other constellations or for other purposes.

The collaboration model has several parallels to audio-visual or movie productions. The input of the team depends a great deal on the freedom provided by the artist, who is usually the team director. This artist-led work model can be found in several other art disciplines outside media practice. In general, an artist-directed team realises an art project after the initial artistic concept. The professions represented in these teams vary according to the skills of the artist and the project requirements, e.g. project manager, visual/audio designer, hard-/software programmers, interaction designer, guest researchers etc. The backgrounds of the people involved in the development of the project, and their technical, engineering jargon, is usually rather remote from the language spoken or used by the artist/director. Often an interpreter or mediator (usually the project manager or the coordinator) plays a key role in translating these different working methods and the jargon used, and interpreting text and communication using specialist knowledge. The graphical user interface (GUI) can be looked upon as a metaphor for the communication between all the disciplines involved; the iconography in storyboards, software architecture drawings and flow charts all have a role to play in communicating the remote backgrounds and vocabularies. It is interesting to note that many multidisciplinary projects have a strong focus on the GUI.

On some occasions the need for non-existing soft- or hardware becomes apparent during the creation process. In the event of repeated requests or a common need, new development trajectories start up either in laboratories or by individuals working in the art and engineering field.

Multi-tasking as a phenomenon - in the sense of one person carrying out several tasks simultaneously - is as common to the electronic arts scene as to any field in the media world these days. In multidisciplinary collaboration projects the role generally played by artists, besides being the conceptual motor and director, is often the one of (co-) producer and (co-) organiser, sometimes also audio or visual designer.

Below, Cãlin Dan describes the project *Happy Doomsday!*, developed when he was an artist in residence at the V2_Lab in 1998. Besides being an artist, Dan currently works as an art director for a multimedia production company in the Netherlands.

> *Happy Doomsday! by Cãlin Dan*[5]
>
> HD! is an art project that reflects on the culture of war by using the conventions of computer gaming. HD! starts from the premise that war and interactivity have common patterns, a view that lies beyond enthusiasm and critique, somewhere in the limbo of entertainment itself.
>
> The visitors access HD! via an installation that consists of two fitness machines connected to a media system (computer, data projector, sound). By working out on the fitness machine, the user can navigate through and act in a virtual multi-user environment that is essentially a simulator of European history. Depending on preliminary options and the physical performance, a database can be accessed containing information about military history and cultural history in still images, documentary and feature films, newsreels, etc. A mix of war, cultural, political and other human generated sounds are shaping a mood setting ambiance where the narrative channel interferes, inserting short dialogues between various supporting characters. Defined also at the level of graphics, these characters are giving guidance to the players, keeping alive the quotational character of Happy Doomsday! as ‘a game about game playing’.

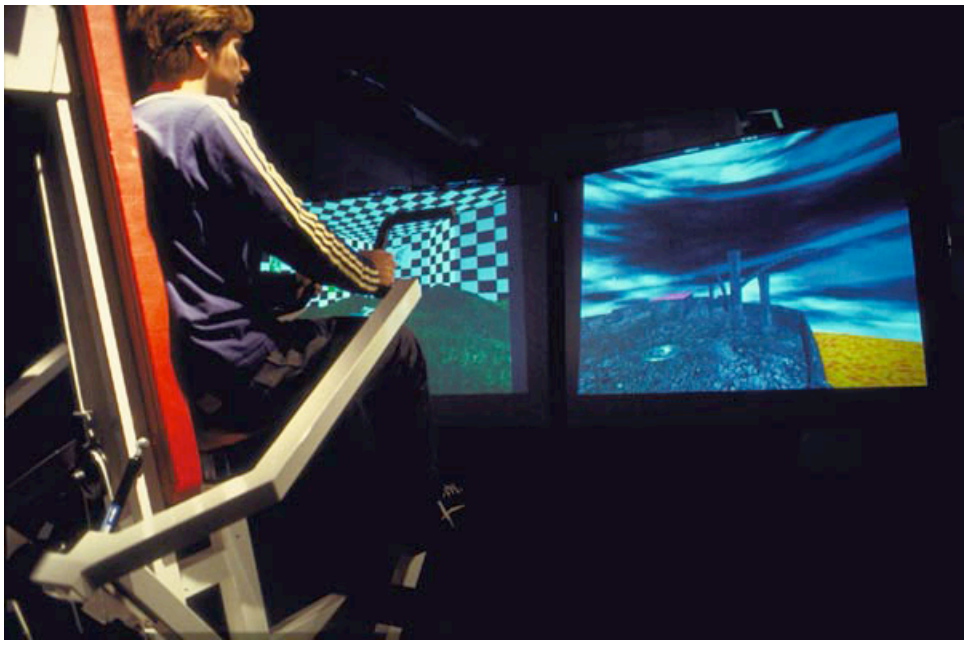


Photo © Jan Sprij

The fitness machines are instruments through which two competing users can influence the political developments represented in the virtual environment and change history into a personal fiction.

The audience testing of *HD!* took place during the Ars Electronica Festival[6] in Linz (2000), where a single fitness machine was installed with the work in progress. The second presentation, with two machines, took place during the Dutch Electronic Arts Festival[7] in Rotterdam. Besides a lot of impressive visualisations of cultural importance, the *HD!* installation also provided a set of insights into ways of encouraging audience participation. This drew partly on lessons learned from gaming, but without the competitive element.

The team working on *Happy Doomsday!* consisted of soft- and hardware developers, an interaction designer, 2D and 3D visual designers, a sound designer, graffiti artists and a production manager.

Dan had the role of director, and designed the overall concept. He also pre-designed all the visuals and prepared all action scripts in collaboration with the interaction designer. His presence during the process was important, ensuring feedback and the reinforcement of the concept throughout the whole process. As happens in a lot of experimental art pieces, some of his visions turned out to be based on future technology, some of which was realised by smart, small innovations by the team, and some had to be left out.

My observations in the V2_Lab over the past few years indicate that artists involved in a multidisciplinary work process fit into an (updated) profile matching single or multi-discipline oriented engineers and scientists. All the team members bring in their specialist expertise, which often results in re-purposing existing software and/or hardware and the creation of other functionality for soft-/hardware. This work often creates a new context for research or soft-/hardware, which includes a critical reflection on the daily use of technology, mentioned above. This usually involves an exchange on the conceptual level in terms of ideas, expertise and aesthetics. This exchange seems to be a key factor in these works, and is often the main contribution of an artist. It could be argued that in multidisciplinary collaborations the artistic

concept functions as a connection machine, combining ideas and work from different fields in a new context and raising awareness or stimulating reflection.

Further more, a general observation is that a multidisciplinary approach often uses existing software tools and pre-developed software, as well as audiovisual productions (with or without interactive elements) embedded in the artwork. The various elements are usually combined and connected as a total entity. The way most multidisciplinary projects are constructed is comparable to a combination of finished research, whether this is created by third parties or by project sub teams. In *Science in Action*, Bruno Latour[8] refers to this within a scientific research trajectory as "black boxed", or ready-made science.

Interdisciplinary Approach

Over the last few decades an increasing number of artists have taken the step of learning (formally or informally) programming skills, in order to avoid the tedious aspects of multidisciplinary collaboration, such as misunderstandings and dependency. This often results in an entirely different form of collaboration, which could be classified as interdisciplinary. A truly interdisciplinary approach involves the artists not only working with a team, but also participating in a collective process. The artist-director's role here is different from the one in multidisciplinary collaborations. As well as being a conceptual supervisor, the artist involved in interdisciplinary projects wants to participate "hands-on" in the creation process. The feel of the material, the personal touch of the programmed parts, or the need to understand the technological matter can be crucial elements. A desire to explore or understand contemporary or future technology is often just as important as the conceptualisation process.

The jargon used by artists working in interdisciplinary collaborations is often a mixture of art and technological vocabulary. The collective creation process often includes input and collaborative problem-solving or creative innovation by the team. Usually the artistic concept and the code are intertwined; the technique becomes an important element of the concept and the concept is the drive to develop or adjust the technology. Software- or hardware-based artworks are usually developed as a team effort where the artist works together with the technicians, designers and researchers. This requires a more prominent conceptual role on the part of the team members: not only do they bring in expertise, they become actively involved in the conceptual design and development.

The professions represented in these teams vary according to the work and most people have several tasks, e.g. project management, visual/audio design and programming, hard-/software design and programming, interaction design, research etc. This results in a shift in the profile of the artist as well as the profile of the engineers and scientists. All the team members must be able to speak different languages or jargons; they have to be open to the need to understand the others, and be motivated to work according to unfamiliar methods derived from another discipline(s). This also requires the willingness and patience to invest time in something from which the outcome is not entirely predictable, and the openness to deal with unexpected "accidents" because the team is co-constructing crucial conceptual elements throughout the work process.

Below, Thecla Schiphorst (Canada) describes the whisper project which she is developing with Susan Kozel, Kristina Anderson, Julie Tolmie, Norm Jaffe, Sang Mah, Jan Erkke, Andruid Kerne, Stock, V2_Lab and others). I use this to illustrate the interdisciplinary work method as a case study. Schiphorst is a Vancouver-based media artist and Associate Professor in the Computer Arts and Design Sciences Programme at Simon Fraser University. Her formal education and training in computing science and dance form the interdisciplinary basis of her work, which integrates models of scientific representation with experiential physical practices and methodologies.

whisper by Thecla Schiphorst[9]

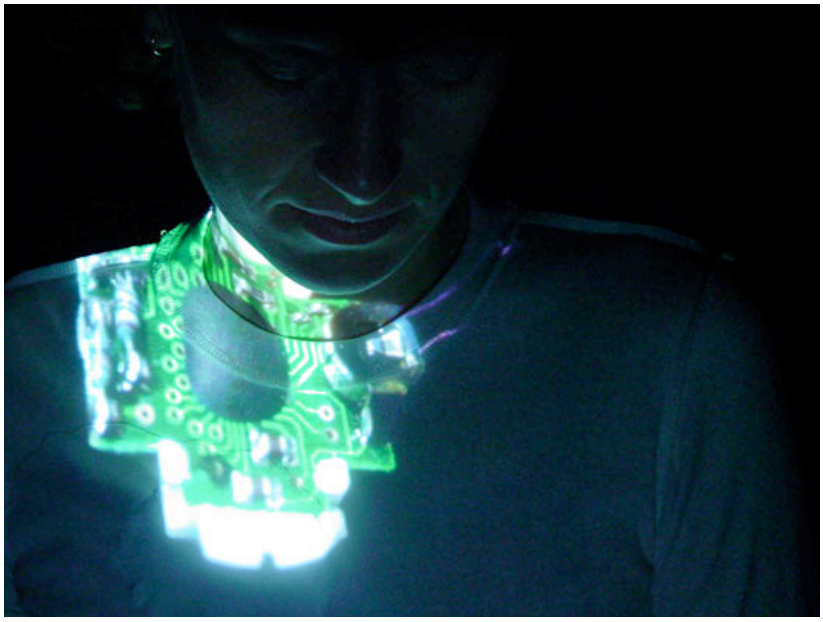
whisper is an interdisciplinary project that will result in a participatory installation exhibited at DEAF03 in Rotterdam. *whispers* are wearable body architectures. *whisper* is an acronym meaning wearable | handheld | intimate | sensory | personal | responsive | system. *whisper* devices construct networked messages based on inferred states of carrier bodies the hosts for small wearable devices. *whisper* is based on creative and collaborative processes that include collective first person methodologies, and our version of the "sewing circle", the phenomenon of participatory installation as an emergent, non-hierarchical performative form; the aesthetic that emerges directly from the materials (sensors, circuits, electronics embedded in latex, silicon, rubber, and the body) in a play across the opaque, translucent, transparent; and the reconfiguration of attitudes toward the body that allows for our corporealities to be seen as fluid, networked and dynamic systems that unearth information concealed beneath our skin, mapping them to linked and networked devices.

As an interdisciplinary project, *whisper* brings together researchers with a range of backgrounds in human computer interaction, mathematical visualisation, industrial design, haptics, real-time distributed systems, media theory, electrical engineering, visual arts and performance, digital image and audio processing, and music. An important research goal is to create new collaborative research techniques and processes. This involves innovative strategies for sharing design and development methodologies between the sciences, technologies and the arts. In addition to shaping and building technologies according to engineering processes, we include a rigorous and inherently social and collective design process, to inform and to iterate known engineering and computing science methods.

An example involves designing and prototyping the wearable devices in collaboration with user-centred iterative development processes. In our case, experiential physical disciplines, such as those used in performance, theatre, and dance, will inform the methodologies and techniques that are employed in designing, engineering, and testing the development of the system. For example, users (performers) will develop interactive strategies by directly experimenting, manipulating, fabricating, wearing and moving with the devices during early stages of the design and construction process. How these users /participants interact with the data affects the behaviour of the devices and the patterns of data, and will shape the operations selected for data visualisation and data representation, which in turn will affect next stage physical properties of the devices.

We introduce the interdependencies between the user, the users' experience, and the system behaviour into the process. The study of user/participant response is a basis for design iteration. The inter-dependent elements function as modifiers of experimental outcomes. The key to the proposed work is that it integrates the participants' knowledge of the space with the mathematical/statistical mappings. These maps or visual/sonic cues are linguistic elements invented for the purpose of evolving the *whisper* space in a directed (rather than *ad hoc*) way. The models that form the structure of the space are ongoing and classifiable and can be taught.

whisper constructs the development of a "formalised physiological virtual environment language" - it is not test-based. It is an experimental environment where the role of words and textual symbols has been explicitly removed with the intention of reassigning their roles to complex interacting systems. This rationale necessitates an integrated interdisciplinary approach, in order to produce scientifically, technically and artistically innovative outcomes.



As reflected in her text, Schiphorst's multi-tasking role is rooted in different areas of expertise all brought together in the project. She is the conceptual motor, assembling different research areas, while simultaneously she is involved in the technical development, and she brings in her own research trajectory.

In comparison with multidisciplinary collaborations, the development of interdisciplinary works tends to be more process-based and less predefined. Interdisciplinary collaborations often have the need to use parts, or adjust software to create a new work rather then to re-purpose software or combine existing software. The use of non- "black boxed" software is preferable in these situations. "Open source" and "free" software should, in this context, be considered as "open box" software and are especially interesting for interdisciplinary collaborations. Not only can one delve back into the history of existing open source software to better understand it, but the developed software also provides possibilities for new software development directions, maybe even ending in a hybrid area between art, engineering, and computer science. In addition, open source- or free software - as well as other open concepts - brings about interesting intersections showing the added value of the combined effort created by artist involvement in the field of creative technological development. The dis-functionality or other insights provided by interdisciplinary projects could in this way enter the technological field and technical science could impinge upon the art world.

'Bridge Builders'

Once informed about the different ways people operate in multidisciplinary and interdisciplinary collaborations, there is an awareness of the confusion and misunderstandings that might arise. Most commonly these obstacles are overcome by means of human "bridge builders". Here I refer to people, working in mixed research and development teams, who are able and willing to put effort in the communication using different vocabularies, or who are motivated to establish fruitful exchange and collaboration between people from different domains. It turns out that a key person (usually the project manager or the coordinator) performs this role in multidisciplinary collaborations, such as Robert Schroter[10], professor of the department of Bioengineering at the Imperial College of Science, Technology and Medicine in London (UK). Schroter is involved in the research and development of zero gravity experiments[11] with the French choreographer Kitsou Dubois[12]. He acknowledges the importance of art as one of the "fuzzy areas" that contextualise scientific research through offering it more unexpected angles. For him, the process of making art

matches his way of working, which appears unconventional. The effort he puts into the art-science projects in which he is involved reflects his belief in the value art can bring to science and vice versa.

Besides project managers and bridge builders such as Schroter, I have observed another group of bridge builders in the field of art, engineering and science who often perform this role in interdisciplinary collaborations. Earlier I briefly mentioned the changing profile of the artists, engineers, and computer scientists involved in interdisciplinary collaboration to create artworks. A growing number of artists are working in a mixed field combining art, engineering and/or computer science. This significant shift seems obvious in a technology-driven age. It is manifested in an artist profile different from those we are familiar with from regular or traditional (fine) arts.

There are several questions attached to this shift: is it caused by the high profile or status of science, or is it the lack of interest from the scientific community in collaborating with media artists (or a lack of interest on the part of artists in widening their scope), or the lack of direct commercial value? I would argue that all of these factors are relevant and that it is difficult to pinpoint a single underlying cause. Looking into the (short) history of media art, several artist-engineers-scientists have performed dual roles in the technology field, such as Dick Raaijmakers[13] (the Netherlands), Dan Sandin[14] (United States), David Rokeby[15] (Canada) and Nell Tenhaaf (Canada). I have worked with a number of artists who have shown an impressive combined profile as artist-researcher, artist-scientist or artist-engineer, if not several of these embodied in one person.

These combined professions are becoming an important bridge between art, engineering and science. Peter Weibel has phrased this in *art@science*[16] as: "The question how much art and science are approaching each other must therefore be answered on the level of methodology. If we could imagine an individuum, intelligent enough and comprehensively educated, this individuum could move in both universes freely." It is important to note that he takes the view that art and science are methods. Although I'm not sure whether (all) the artists, researchers and engineers I refer to in this text are the *Star Trek* characters Weibel is hoping for, it is worth paying attention to these multi-taskers, both in practice and in the art and science theoretical discourses.

These artists-researchers-engineers seem to be able to function in at least two different disciplines, not only by reflecting on the fields they are involved in, but also by contributing to the interdisciplinary art, engineering and technical science theory and practice. This should not only be considered of (future) interest for artistic research and development; these people also work as mediators for (computer) science in artistic developments and visa versa. This task should not be underestimated in the light of the increasingly dominant role of technology in our daily lives. The art and cultural experience will be more and more mediated and this requires insight into other fields and working methods, other goals and other target groups than those with which most technical researchers are currently familiar.

Anne Nigten
Anne@v2.nl

Special thanks to all contributors, my V2_ colleagues, Cathy Brickwood[17] and Prof. dr. Lynda Hardman[18]

---

[1] More details on this can be found in the essay 'Code based art' I wrote for the publication 'Transmediale
[2] V2_Lab, international lab for the unstable media is the aRt&D department of V2_ in Rotterdam, the Netherlands www.v2.nl www.v2.nl/V2_Lab
[3] Most project descriptions can be found at our website www.v2.nl
[4] Source: Oxford handy

[5] Section of the text by Cãlin Dan published in 'The art of the accident' V2_Organization, editor in chief: Joke Brouwer, published by Nai Publishers. Happy Doomsday by Cãlin Dan, is produced in 1998 in the V2_Lab, in co-operation with Ars Electronica Centre, Linz, Austria. Info on the project can be found at: www.v2.nl/projects/hd
[6] The Ars Electronica Festival is organized by the Ars Electronica Centre in Linz, Austria www.aec.at
[7] The Dutch Electronic Art Festival is organized by V2_Organization in Rotterdam, the Netherlands www.v2.nl
[8] Bruno Latour, Science in action, published by Harvard University press, Cambridge Massachusetts
[9] Information on the work of Thecla Schiphorst can be found at http://www.techbc.ca/a-people-people-facultylist-schiphorst.phtml
[10] http://www.bg.ic.ac.uk/staff/rcschroter/
[11] http://www.ic.ac.uk/templates/text_3.asp?P=2521
[12] Information on Kitsou Dubois' work can be found at http://www.artscatalyst.org/htm/grav0.htm
[13] Several texts and publications by Dick Raaijmakers can be found at http://publications.v2.nl/publications/index.jsp
[14] Information on work by Dan Sandin can be found at http://www.evl.uic.edu/dan/
[15] Software developed by David Rokeby Very Nervous System http://www.interlog.com/~drokeby/softVNS.html
[16] Art@science edited by Christa Sommerer and Laurent Mignonneau, published by Springer Verlag Wien
[17] Thanks to Cathy Brickwood for grammar and English checks
[18] Prof. dr. Lynda Hardman, Group head Multimedia and Human-Computer Interaction, CWI, Member of the Information Systems group at the Technical University of Eindhoven, The Netherlands http://www.cwi.nl/~lynda