In order not to get confused, please keep the following conventions:

STATUS, AUTHORS and REVIEWERS in documents

Indication at headings of status/authors of parts

- **[X!!] part to be done by X (A-AE-B-G-J-Z), or X+Y+…, first person as major editor**
- **[X?? …] question to X**
- **[X:v0.n] part done by X, version n (first version is 0.1, n gets incre ased by author(s) or editor)**
- **[Y:date.dd.mm] review/commenting/changes (with trace on) by Y on date dd.mm**

IF you work on a special subsection (as normally do), leave the other sections under headings empty (to keep automatic numbering OK and files small).
IF several people produce a chapter, the first author is asked to coordinate the writing, merge all input and produce a version.

FILE NAMING of .doc files:

- **Report_SecA.B-C.D_v0.n_X a version by author X of Section A.B – C.D**
- **Report_SecA.B-C.D_v0.n_X_RevY a review of a version by Y**
  Examples: Report_Sec1.1_v0.2_Z, Report_Sec1.1_v0.2_Z_RevAE

COMMENTING/REVIEWING

- **Use trace on.**
- **May rewrite/add text, also some points/keywords for other's parts**
- **Add suggestions/ideas/references in comment, as concrete as possible.**

TIME SCHEDULE:

12.05 All courses finalized
18.05 All report text + course forms finalized, sent to Zsofi (course forms uploaded),
20.05 Full report edited and made on-line available by Zsofi
21.05 To be commented by WG members + general feedback from Rob
22.05 Discussion of feedback from WG members during meeting
25.05 New version edited by Zsofi, incorporotaing input from others
31.05 FINAL PROOF READING/REVIEWING feedback from Bas and Job
+ preparation of final Appendices,
06.06 Report submitted

THIS DOCUMENT CONTAINS CONTRIBUTIONS of date 11.05

All textual + table part v0.1 by Z, prepared on 11.05.08 – could not do spelling check

Bachelor of Creative Technology

CreaTe

Information dossier in support of the application for the New Undergraduate Studies Test

Faculty of Electrical Engineering, Mathematics and Computer Science
University of Twente

Version: 0.1

May 11, 2008

Authors:
Dr. Z.S. Ruttkay e.a.

*

1 Introduction

1.1 General motivation [Zs:v0.1]

CreaTe is meant to be the first batchelor curriculum in the Netherlands, dedicated in content and in teaching paradigm to developing creativity of young people on an academic level to invent novel technological applications. The launching of such a new type of technological education is highly timely, has a good ground at Twente and is supported by favourable winds, nationally and internationally, see the material in Appendices XYZ.
Below, we give a closer look at five major motivations for the interdiscipinary Bachelor CreaTe, related to:

1. the development of ICT and its impact on the job market;
2. the national ICT strategy, in relation to the creative industry;
3. the continuity of the Faculty of EWI;
4. the characteristics of the profile of UT;
5. the geographical context.

Deleted: m

Deleted: .

1.1.1 Development of ICT and its impact on the job market [Zs:v0.1]

In our every-day life we are surrounded by latest achievements of electronics and informatics technology, like small chips, mobiles, GPS, different wireless connections (WiFi, RFID), the internet with a multitude of services and a huge load of information available in digital format, including video and sound. The current trend of development of the ICT technology and its applications may be characterised **[REF Humans08, IIPCREATE08], see Appendices XY,** as:

- steady increase in computational processing power, decrease in chip size, improvement in display technology (high-quality large displays, wearable displays as glasses);
- development of small, even wearable sensors, augmenting or replacing traditional input to computing systems;
- textual, visual and adio information stored in *digital format* is characteristic of all domains of applications, and in all stages (design-development –production-slale – maintenance);
- life is becoming on-line, information is available any time, everywhere via the web and local wireless networks, on diveces as PDAs and mobile phones;
- number of users and amount of usage is increasing because factors as:
    - dominance of a *new generation of teen-age users*, with new ways (examples: A??) of 'being on-line' for several hours every day;
    - *increasing cultural diversity*, as new populations enter as ICT users, particularly, from China, Japan and India;
    - many internet *users are authors* themselves (of user-created content) as individuals or as active mebers of different on-line communities.

Deleted: are

Deleted: Z?? AE

Deleted: ??

Deleted: ongoing

Nowadays the challenge is in keeping up with what the technology has to offer, in terms of 'harvesting' the technology and use it for novel services. Services which are witty and playful, original and attractive, are fascinating and easy to use, and last but not least, address real needs in every-day life. They contribute to our comfort at home and in town, while traveling or shopping, provide new ways to recreate or to study, to share experience with others – and even by mixing these functions. Ultimately, according to [Humans08], our relation to technoolgy wiil determine and is determined by our understanding of human values and aspirations.

In developing such applications, the major contribution is often *the very idea*, that is the concept or creative insight, as opposed to (the still needed) improvements of solutions to well-defined problems, such as increase in efficiency, quality or security of services, and the development of enabling technologies. For instance, new, dynamical scheduling algoriths may improve the punctual arrival and departure of trains. However, by offering multi-player games on stations, we may increase the satisfaction of the clients in a completely different way: by entertainment and meanwhile also creating social contacts and improving communal bonds. The choice here is between a traditional approach to a well articulated problem, the and a novel service, inspired by creativity and playfullness, with multiple, less sharp objectives, such as decreasing the subjective perception of idle waiting time and increasing communal bonds in society.

From a range of examples of creative applications we mention the Darfur is Dying game[1] invented by a team of students from University of Southern California to draw attention to the life in Sudan, which became a world success, and, the Exchange Cabinet[2] developed at the Waag Society in Amsterdam, based on the original idea of a Dutch student, to connect elderly, otherwise lonely people by means of an interactive digital 'cabinet' to share their stories and photos from their own life. See Appendix X for a more detailed description.

Typically, as illustrated by the xamples above and the examples given in [Humans08] as discussed in Appendix X, Creative Technology applications are built from technological components which are results of dedicated research by specialists in fields such as sensor technology, new media, different disciplines of computer science and applied mathematics and natural sciences, providing fast/safe data storage, access and communication; while the appealing and handy to use physical devices reflect the professionalism of industrial designers. However, the major role is attributed to a third type of expert, who came up with the creative idea of using the technological building blocks for the new services. Such applications require an open eye for how one could make life better in society, an understanding of what 'new is out there' in the technological world, a creative mind to invent an original application and last but not least, communicative, artistic and business skills to make sure that the invention does reach to the right people.

There seems to be a huge demand from industry for such type of people, as reflected in recent international manifestos **[REF MICROSOFT Z??]** and also by the informal interviews we conducted with leading people form Dutch ICT industry (Philips, Logica, IBM, TomTom) and other potential employers (NOB, Wageningen). The profile of the new type of technological expert can be characterized as a person capable of:

1. inventing new, successful applications for every-day life of people;
2. assuring the technological feasibility of the envisioned application;
3. thinking and acting in a business context.

These experts should not only ahev a creative and artistic mind, but also bear the signature of an academic education, with regard to their technological knowledge, the capability for abstract and analytical, global approach to problems, and a scientific methodology to frame and test the feasibility and social implications of proposed solutions.

1.1.2 The National ICT Strategy towards the Creative Industry [Zs:v0.1] [AE:v01]

In recent years we have seen in the Netherlands a number of responses to the the ICT developments depicted above, demonstrating the potential(s) of the Creative Industry in our country. On a national level, entertainment has been declared as a key long-term program for cultural and economical development in

[1] http://www.darfurisdying.com/
[2] http://www.waag.org/excgangecabinet

Formatted: Font: Italic
Deleted: punctuation
Deleted: On the other hand
Deleted: ,
Deleted: former is a
Deleted: latter is
Deleted: .
Deleted: T
Deleted: he above, and t
Deleted: r
Deleted: It is requested that t
Deleted: e
Deleted: as of
Deleted: s
Deleted: !!
Deleted: extend/check]
Deleted: the
Deleted: there have been
Deleted: responds
Deleted: above depicted shift in
Deleted: relying
Deleted: on
Deleted: c
Deleted: i

the Netherlands, based on a TNO study from 2005 investigating opportunities in this field [REF TNO 2005 report]. The most prominent and in the near future most influential action along this line is the formation of the ICT Innovation Platform Creative Industry (IIP CREATE) in Spring 2007. See Appendix X, where we recapitulate the most prominet insights offered in the Strategic Research Agenda. The Strategic Research Agenda, launced on 8 May 2008 at ICT Delta Congress, proposes a coordinated program, talking about different players and forces in creating (multiple) ecosystems of competitive creative industry initiatives. Not surprisingly, education has to play a prominent role. Creative research, moreover is envisioned to become more (creative) application-oriented – with adjusted assessment criteria for 'artistic and creative research'. As we argue in more detail in Appendix X, the Creative Technology bachelor education embedded in a technical university is a direct response to these needs.

In the Dutch educational scene, we see that most of the universities offer some study in New Media (UvA, University of Groningen, University of Leiden) or Game Design (new Master at University of Utrecht). We are witnessing of 'joining of expertise' at universities and art colleges, coining new frameworks for Master education where the artistic and design skills and an academic research agenda can be combined (PSAU as a result of collaboration between the Utrecht School of the Arts and the University of Utrecht, the 'Centre for Creative Content and Technology' to be formed at the UvA, together with CWI, HvA and Logica). In Tilburg a new research group on "Creative Computing" has just been launced. See Appendix X for a more detailed description.

In the public sector, we are witnessing how centers like the Waag Society, the Media Guild, mediamatic.net and the V2_ Institute of Unstable Media, launched years ago with the aim of exploring new media in an essentially multi-disciplinary fashion, have turned into intellectually and financially blossoming enterprises, and gained international fame. Both Waag Society and V2 have recently started programs to couple industrial and governmental partners with creative talents from educational institutions, indeed students, with different backgrounds in exploratory projects (Patchingzone). See Appendix X for a more detailed description.

These developments, provide on the one hand a suitable context for the CreaTe Bachelor education, and related to this, on the other hand, a continuous line with new kinds of research within ICT. However, we wish to emphasize that CreaTe is not just one of the many initiatives, but with regard to both content and approach unique and novel in the Dutch context, as it is the only bachelor curriculum in the Netherkands with that endorses as much as an educational paradigm-shift to train young people for a new type of role in applying (creative) technology.

1.1.3 Need to attract more students to EWI/EEMCS [Zs:v0.1]

From a local point of view, the motivation for the new type of education is to attract more students to the Electrical Engineering, Mathematics and Computer Science (EEMCS). The number of new students has been steadily decreasing in the past years, see Figure 1. [REF G??: Figure on new students at EWI in past years] It is clear, also from similar tendency at other Dutch and Western universities, that the traditional technological educations like electrical engineering and computer science are not attractive any more for youngsters of today. In the Netherlands, moreover, the usual admission profile to EEMCS excludes 80% of the VWO students, as maths and physics courses are non-pupular and not very successful, in spite of (or related to?) several revisions of secondary-school curricula.

Without going into further analysis of the possible causes, we can formulate that for the continuity of the education (and related to this, the existence of the academic staff and thus, scientific activity) at EEMCS, it is necessary:

1. to attract *more first-year students* to EEMCS;
2. to offer an education interesting and feasible for a broader group than those with N+T profile.

Deleted: of
Deleted: potentials
Deleted: eis
Deleted: s
Deleted: r
Deleted: a
Deleted: l
Deleted: an
Deleted: b
Deleted: (see Appendix ??). Among these the need for dedicated education,
Deleted: and the incorporation of
Deleted: n
Deleted: e
Deleted: work to the ICT research agenda
Deleted: the
Deleted: – are emphasized.
Deleted: T
Deleted: T
Deleted: tatition
Deleted: of
Deleted: borad sense
Deleted: u
Deleted: u
Deleted: [AE?? What else? In Amsterdam?]
Deleted: institutions
Deleted: recently
Deleted: (
Deleted:)
Deleted: on the one hand,
Deleted: good
Deleted: a
Deleted: line
Deleted: On the other
Deleted: hand,
Deleted: similar
Deleted: an

[FIG on student numbers]

1.1.4 Re-definition of the UT profile [Zs:v0.1] [G!! T!! check/extend this section]

It has been found that UT is not characteristic and well-known enough on the Dutch educational market [G?? T?? REF report]. This constatering has initiated a renewal process. Though the final conclusions are not yet made, it is clear that a shift from a pure technological university to one of technological applications to serve the people will happen. For such a reprofilisation, a novel, application-oriented and interdisciplinary education is a major contribution.

On the other hand, the UT – in a unique way amont the technical universities in the Netherlands – has already in house several non-technical disciplines at other faculties, which are essential, as source of knowledge and /or methodology, for the CreaTe education, including bachelors as:

1. Industrial Desing Engineering (at CTW);
2. Psychologie (at GW);
3. Toegepaste Communicatiewetenschap (at GW);
4. Business and IT (at SMG).

Particularly, CreaTe can be seen as an EWI pandam for IDE: in CreaTe, the topic is the design of ICT applications.

The established contacts with near-by art-related educational institutions AKI, ArtEZ and Saxion are benefitial when launching a new Bachelor with a relation to the arts. Also the QuaArtQuaScience Foundation of the University is looking forward to co-operate with CreaTe education in the future.

Finally, the campus location of the UT, and the excellent support for hosting international students, are also pros for an education like CreaTe, which is to attract students from abroad, and assumes much joint activity among students, resulting in ‘things to be shown’ in open-air too.

1.1.5 Geographical context [Zs:v0.1] [G!! check/extend this section]

Enschede as the geographical location has two major benefits for the CreaTe education. First, the proximity of Germany is also a justification for an English-language, broad Bachelor. This has been proven with the Psychology education, with about 50% German students, for whom, all the same, English (would be) an easier option as Dutch as the language of education.

In the Twente Region, Creative Industry has been put on the local agenda. There are bottom-up and top-down inititatives to nurture and stimulate a local creative industry, such as:

1. Stichting Fris
2. Creative Factory [G?? there was an article in UT News -]
3. Enschede as Creative City?

2 Objectives and learning outcome of the CreaTe course [Zs:v0.1]

In this chapter we discuss the skills and knowledge of a CreaTe bachelor. The objectives are reflecting the multi-faceted domain-specific needs formulated in 1.1.1, and the general academic norms of a Bachelor according to the Dublin requirements.

We emphasize that CreaTe Bachelor students, by the end of their studies, will probably have developed special intrest and skills in one or other aspects. Within the education it is encouradged to identify interest

(e.g. in the technological, design , or business domain) and develop and strengthen individual skills and competencies accordingly. However, the human-centered and creative attitude, the knowledge to ask for relevant complementary expertise and the capability to communicate with potential experts and (business) partners are common characteristics. [

Deleted: or in the

Deleted: in the

Deleted: AE!! have a look at this par – does nto this kill what comes below? We should make it as an advantage that not uniform end-products are educated.]

2.1 Domain-specific requirements [Zs:v0.1]

After completing the bachelor curriculum in Creative Technology, students will be able to identify human needs for which they can invent, design and prototype novel concepts within the general digital realm, thereby enriching daily life with attractive applications.

Deleted: course

Students will be trained in creativity to identify and combine technological, societal and artistic aspects. Students will be adequately equipped in new media, smart systems, design, computer science, electrical engineering and mathematics to be able to act as a leading insipirator or play a central, integrating role in dedicated teams of experts working on creative applications in the digital domain. Throughout the curriculum ample attention will be given to developing communicative and social competences which are essential for learning about potential users in multicultural societies, working with experts and conveying ideas for business purposes.

Deleted: play

Deleted: f

Deleted: ulfill

The unique potentials of a creative technologist is in bridging societal needs and technological possibilities: on the one hand in discovering societal and human needs in a multitude of contexts and on the other hand connecting this to directions for artistic, technological solutions built on state-of-the-art methods from the engineering sciences. The multidisciplinary Creative Technology education will endow students with knowledge, skills and competences in the following 6 dimensions:

- Technology, particularly, New Media or Smart Technology,
- Requirement analysis
- Design
- Creativity
- Human factors
- Business

Below we enumerate 12 end-term requirements with reference to the above dimensions. After having passed the Bachelor exam successfully the student:

1. *knows* the relevant electronic and computing technologies to be used, concerning both principles and functionality. (Technology)
2. is *skillful* in implementing algorithms and combining principles from physics and mathematics at the level required to demonstrate the application. (Technology)
3. *has competency* to analyze complex requirement contexts making abstract descriptions following mathematical and design principles. (Requirements)
4. is *skilled* in using latest tools for trying out ideas and implementing key prototypes. (Design)
5. is *competent* in recognizing and understanding technological trends at such a level that a critical evaluation of scenarios for future applications and developments can be made. (Design)
6. is competent in recognizing societal problems and human needs that can be solved with state of the art technology in the digital realm; with a clear eye for ethical issues. (Design)
7. skilled in in creative thinking and design, taking into account all complexities, requirements and interdependencies of the application areas and stakeholders. (Creativity)
8. possesses skills to design attractive solutions, where both aesthetics and function are combined. (Creativity)

Deleted: T

9. understands user acceptance and success criteria in a multi-cultural and globalized world. (Human factors)
10. has communicative skills and psychological knowledge, indispensable for dealing robustly and successfully with stakeholders and people benefitting from the new systems and services. (Human factors)

11. can place the novel applications in a business context, developing business plans, executing market research and translating innovations into profitable opportunities. (Business)
12. can assume a bridging role in a variety of multi-disciplinary teams, thereby translating and communicating requirements and knowledge from different fields of specialization. (Business)

Table 1: Domain-specific requirements overview

Categories	End-term requirements
1. Technology	1, 2
2. Requirement analysis	3,
3. Design	4,5, 6
4. Creativity	7,8,
5. Human factors	9,10,
6. Business	11,12

Formatted: Indent: Left: 0.39"

2.2 General and scientific requirements [Zs:v0.1] [G?? This is Dublin end-terms ?]

Below we justify the academic qualities of the CreaTe Bachelor education, with respect to the Joint Quality Initiative of the Bologna agreement (http://www.jointquality.org/). In Table ?? the original requirements are listed, with references to the aspects of the CreaTe education supporting the requirement. The broad scope, the analytical context, the scientific methodologies place CreaTe in a (technical) university, as opposed to more skill-related educations at high schools, or ones focusing on artistic creativity in art schools.

Table 2: General and scientific requirements overview

General end-terms for Bachelor Education	CreaTe curriculum support
Knowledge and understanding Have demonstrated knowledge and understanding in a field of study that builds upon and supersedes their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study;	[G!!]
Application of knowledge Can apply their knowledge and understanding in a manner that indicates a professional[3] approach to their work or vocation, and have competences[4] typically demonstrated through devising and sustaining arguments and solving problems within their field of study;	CreaTe students during their study in Creative Applications and at the end in the Bachelor project are challenged to design and demonstrate applications. In the project but also in the smaller assignments self-motivated work, argumentation and mutual peer-reviewing are practiced.
Judgement Have the ability to gather and interpret relevant data (usually within their field of study) to inform judgements that include reflection on relevant social, scientific or ethical issues;	In CreaTe education students are trained to be driven by societal needs and for devising applications with an eye on issues beyond technological feasibility or traditional business poitentials.
Communication Can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences;	In the CreaTe curriculum there os special training for visual and verbal communication. These are exercised and assessed in almost all courses. In projects, they are to communicate with expert, potential users and clients.
Learning skills Have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy.	Because of the speed of development in technology, in the CreaTe education students are taught to understand and use new technological facilities. They must be capable to follow trends, and aquire new knowledge and skills.

2.3 HBO/WO orientation [A!! + G!! - to be done]

[3] The word 'professional' is used in the descriptors in its broadest sense, relating to those attributes relevant to undertaking work or a vocation and that involves the application of some aspects of advanced learning. It is not used with regard to those specific requirements relating to regulated professions. The latter may be identified with the profile / specification

[4] The word 'competence' is used in the descriptors in its broadest sense, allowing for gradation of abilities or skills. It is not used in the narrower sense identified solely on the basis of a 'yes/no' assessment.

2.4 Teaching and learning approach [AE:v01]

The Creative Technology bachelor may be characterized as primarily an integrative curriculum. In comparison with the other curricula that are offered at EWI and CTW, the Creative Technolgy curriculum aims at attracting a wider range of students, that differ from students in the other curricula by possibly a non-technical profile and, more importantly, a high motivation to be creative with technology. To accommodate this type of students, consequently, a different approach to education is necessitated, in which there is sufficient tolerance for a wider range of talents and which offers projects that are sufficiently motivating for young students with creative aspirations.

In order to find a proper balance between academic skills and competences and creative opportunities, we offer three types of courses:

1. **disciplinary courses** -- traditional approach, with regular courses and assignments
2. **project-based work** -- lectures to support active exploration of topics by students
3. **creative applications** -- challenges, to produce viable solutions for real world applications

Formatted: Font: Bold

Formatted: Font: Bold

Formatted: Font: Bold

Both disciplinary courses and project-based work are akin to traditional computer science and engineering courses. Creative applications differ from these, in an essential way, by offering creative challenges that surpasses mere problem-solving or even problem-finding, allowing students to take initiative and gain experience in self-organisation in projects with an intrinsic element of public exposure, offering a real challenge for their creative capabilities.

In addition to the regular courses and creative applications, we find it important to offer space for

- **creative explorations** -- in art, science and technology

Formatted: Font: Bold

which allow for inspiration by and reflection on, among others, the role of mathematics in art, both from a historical perspective and in contemporary art and design.

Although the need to include creative training in academic curricula is widely recognized, see for example the IIP/CREATE report (Appendix), it is not immediately obvious how to do that! In close cooperation with CTW (Industrial Design) we offer a mix of explicit attention for creative processes, such as brain-storming and out-of-the-box thinking, and a more implicit approach which comes down to providing adequate challenges and support for self-organisation, initiative and a relative degree of autonomy, together with inspirations from pioneers in art, media and design, among others in the creative explorations. Moreover, for the creative applications, we seek active involvement with regional institutes (such as the Creative Factory) and representatives of the (local) creative industry (directly and through our contacts with syntens), to ensure both challenging projects and public exposure. Creative applications and projects are explicitly meant to allow students to develop themselves according to personal motivation and interest, and to assume a role in the group that best fit their individual talent(s). However, to guarantuee a sufficient degree of participation as well as individual (academic) qualification(s), additional mechanisms of supervision and control are necessary, among which gropu discussions and periodic peer-reviews, in which students assess the productivity, quality and creativity of of other students contributions, as well as the responsibility taken in the overall group process. This approach ensures that students learn, apart from the necessary skills and competences, how to communicate and function in a group, thus gaining experience which is critically needed for a successful career in the creative industry, which is simultaneously competitive as well as higly dependent on collaboration and group dynamics.

To the extent that we allow for a high degree of autonomy and encourage individual creativity, one may speak of a change of paradigm in educational approach, in relation to the other engineering and computer science curricula. In this respect, our curriculum more closely resembles the approach taken for Industrial Design. Yet, in comparison, our approach differs in an essential way from the just-in-time learning adopted for Industrial Design, since we

provide ample space for courses of a more disciplinary nature, that is courses in which the students gets familiar with the fundamentals of the technologies involved. In the creative applications, however, as well as in the bachelor projects, we encourage students to develop their individual talents, and, in cooperation with other students and possibly external experts, create applications in multi-disciplinary teams that merit public exposure!

Finally, to conclude the discussion of our educational approach, experience shows that it is not a trivial task to keep students motivated and involved with their study over a longer period of time. Our paradigm shift, as we called it, intents to deal with this problem, by addressing the student not in the usual way it is done in traditional computer and engineering sciences, but, taking the recommendation of the IIP/CREATE Report seriously, as we would like to say an ‘artist’, that is an autonomous individual who we support in his/her individual search for human values and expression. We also hope to achieve a high level of motivation and aspiration, by stimulating groupwork and communication between students, and by challenging the group to a high level of achievement and public exposure.

-

2.5 Benchmark bachelor's degree courses [G!! AE?? have no idea what this should be] -- AE:v01

In **Appendix X**, we give a short description of the following Dutch curricula, some of which actually represent a cluster of studies, as for example Game Studies in Utracht, which comprises a bachelor game Development and Design at HKU (the Utrecht School for Arts), minors game and media technology with computer science and information science, as well as a minor New media and Digital Culture at The Faculteit Letteren. Obviously, these curricula differ widely in scope and (technical) depth.

1) Industrial Design, Technische Universiteit, Eindhoven
2) Human Ambience, VU Amsterdam
3) Information, Multimedia and Management, VU Amsterdam
4) Media Technology, Leiden University
5) Game Studies, Utrecht
6) New Media (MA), Universiteit van Amsterdam
7) QANTM College Amsterdam: Education in 3D, Game Design and Game Development

Both 4) and 6) are master studies, and address respectively a technical and cultural domain.
Interesting about 4) is its close alliance with the Royal Art Academy in the Hague, and the participation of artists in the curriculum. New Media in Amsterdam (6) is intersting because of its close allience with the HogeSchool van Amsterdam, and the Institute for Network Cultures (http://networkcultures.org), which regulary organizes events, in which students of both the University of Amsterdam and Hogeschool van Amsterdam participate, under the well-chosen name: Masters of Media (http://mastersofmedia.hum.uva.nl/) .

The two bachelors degree studies in the list, 3) and 7) both in Amsterdam, differ widely.
The QUANTM College (7) offers primarily a technical curriculum at HBO level, whereas IMM at VU University is more geared towards socio-exonomic aspects of ICT, with a touch of multimedia.
In comparison with IMM at VU, Creative Technology aims at a far more creative and technical approach, where students learn the actual skills needed for design and development, and the competences, needed for autonomous creative entrepreneurship. A similar distinction may be observed with regard to Human Ambience (2), originating from Artficial Intelligence, which finds inspiration in both psychology and health care information systems.

Closely related to Creative technology, in particular because of the essential contribution of CTW in the curriculum, is the Industrial Design curriculum of Eindhoven (10. However, we may remark, that whereas Industrial Design in Eindhoven in to a significant extent driven by a HCI, and user-centered design approach, Creative Technolgy students will be stimulated to work, one may say, in a more artistic way, that is inspired by the potential of the technologies (the rethorics of the material, to borrow a phrase by Brancusi), and the exploration of the interaction of technolgy and human aspirations.

Finally, as we have already observed, Game Studies in Utrecht (5) offer a rather heterogenous collection of studies, differing in content and approach. We may observe here that, on the one hand Creative Technology is far less focussed on game technolgy and game development, but regards games as one of the possible metaphors for designing creative solutions, and on the other hand, that we explicitly strive for a coherent group of students, that is students that work together in close proximity, proceeding from a shared base of skills and competences.

To derive a standard set of skills and competences from the curricula discussed above seems to be sheer impossible, except for perhaps a shared academic level of verbal and written communication.

Foreign curricula:

In Appendix X, we also list a number of foreign curricula, including both bachelor and master-level curricula:

1) School of Creative Technologies, University of Portsmouth
2) Creative & Cultural Industries, Faculty of Arts, Humanites & Sicial Sciences, University of Lancashire
3) Culture Lab, Newcastle University
4) Digital Arts & Entertainment, HOWEST, Kortrijk, Belgie
5) School of Interactive Arts + Technologies, Simon Fraser University, Canada
6) KEIO Media Design, Keio University Japan
7) The Media Lab, MIT, Boston, USA

Common among these curricula is their multidisciplinary approach, ranging over the Humanities, Arts as well as technolgical disciplines.. In comparison, 1) and 4) offer a more skill-oriented curriculum, in the areas of respectively web-design and game development, whereas 2), 3) and 5) operate from a more societal, human-oriented perspective. Both 6), a newcomer in the field and 7), an institute with a long-standing reputation, have, in comparsion, the most strong orientation on business aspect and valorisation issues.

3 The bachelor's degree course

3.1 Overview of the bachelor's degree course

3.1.1 Entry level [G]

3.1.2 The general characteristics of the curriculum [Zs:v0.1]

The CreaTe education is based on the following principles:

1. The education is multidisciplinary, consisting of courses related to Technology, Design, Creativity and Business.
2. The education is application-oriented, both concerning real-life problems to be solved in the form of Creative Application projects (CAs) of different complexity and the acquisition of basic knowledge via 'learning by doing'.
3. Students from the 2nd year follow either New Media (NM) or Smart Technologies (ST) track, with special technological courses. In this way each student may gather sufficient competences of one of the two fields, as opposed to the danger of 'little of everything thus nothing really' of a too broad technological program squeezed into 3 years. In the first, common year each students gets the basics of both technologies, allowing them not only to make an informed decision about their further specialization, but also to be able 'to interface' to the other technologies in the future, if needed. This is encouradged in certain CA (group) projects and by means of elective courses which may be selected from the other track.
4. The education leaves space for individual specialization and development, in terms of broadly defined CA projects requiring different expertises; and the 3rd year's elective courses. This allows the student to deepen or broaden the scope of the study, assuring the possibility to go on with some Master, or enter the job market.

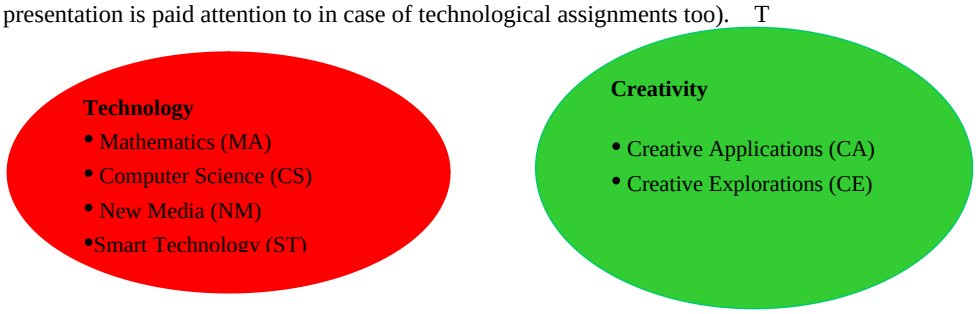
Special for CreaTe is the training for creativity. The creative, 'out of the box' problem solving is triggered, both by training mental and some artistic skills. While some practices are taught in more or less traditional Design courses, the main emphasis is on triggering the student's own creativity by putting them in charge of challenging tasks with a lot of freedom as of content, but well-defined structure and assessment mechanisms.

1. In the 5 **Creative Applications (CA)** project, spread in the first 2 years, students are faced with some broad tasks (e.g. make some game) or a broad choice of technological solutions (e.g. use displays of any kind). The CAs cover different application and technological domains, and are of increasing breadth, with respect to the life-cycle of a real application from analysis of requirements throught proptotyping to business plan, as well as if the 'client' is staff or a real-life partner, and the way of presenting the end-result, ranging from class demo to prototype deposited at a festival or in the real-life environment.
2. In the **Creative Explorations (CE)** students are involved in explorative activities, where the emphasis is on developing an attitude of openness and self-confidence, triggering creative thinking, extending the study with certain (e.g. historica) aspects or with actual news (like visit to exhibitions and reflecting on it) or by participating in occasional, small-scale projects of other nature than CAs (e.g. making an installation initiated by an artist in residence).

The Technological courses include supportive **Maths (MA)** and **Computer Science (CS)** courses,as well as the courses related to **New Media (NM)** or Smart Technology (ST). The **Design (DE)** courses cover a broad range of topics related to human-centered design, such as elements of perception psychology, evaluation methodology and traditional and computer-aided visual design, communication and some business-related issues too. In the **Business (BI)** courses, students identify potential market for applications, the costs associated with the application, in addition to practical aspects of business management. In their 2nd or 3rd year, students are encouradged and supported to start up an own company, not only to get practice with the formal process, but also to identify their area of interest and goals, feel (intellectual) 'ownership', and pursue their study in relation to these.

The distribution of the different kinds of courses along the years is indicated in Figure 2.

The curriculum is designed with exploiting overlap between the competencies and the courses, both concerning knowledge and skills in the technological courses (e.g. using examples to teach maths of programming from NM or ST domain), as well as in the non-technological ones (e.g. quality of presentation is paid attention to in case of technological assignments too). T



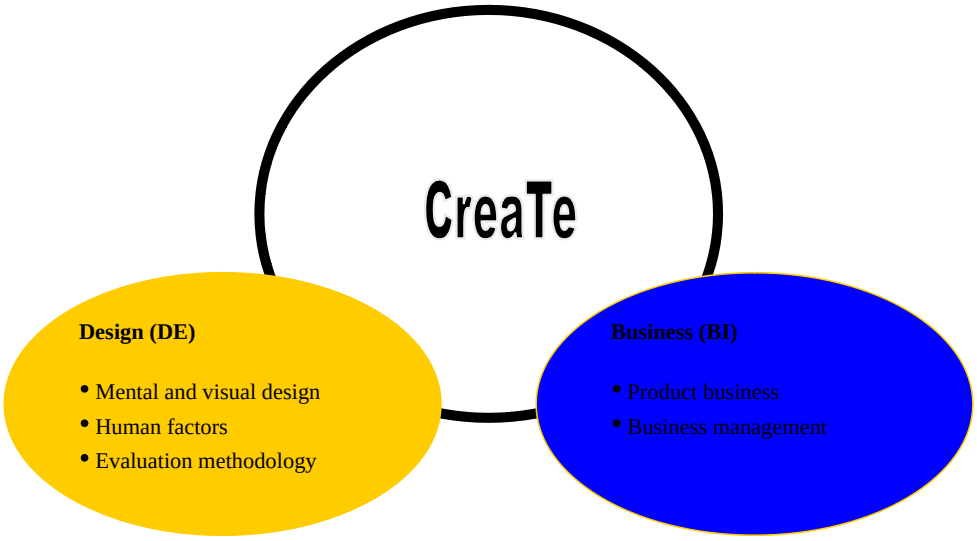
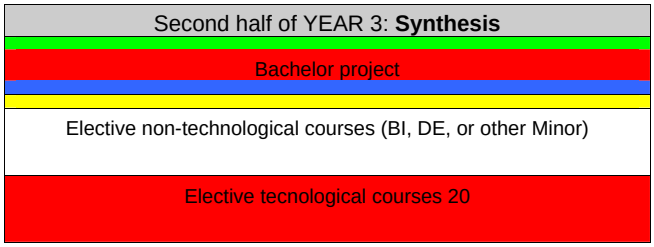


Figure 1: The four major components of the curriculum, with course types and their acronimes for Technology and Creativity, and some topics covered by the Design and Business courses.

The goals and characteristics of the 3 phases are shown in the Table 1.



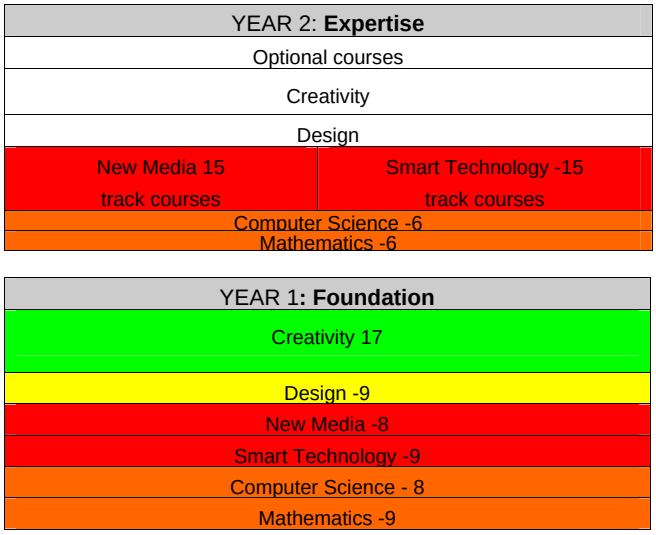


Figure 2: TBD [Z!!] Rough distribution of courses in the 3 years of the CreaTe education. The thicknes of the lines indicate proportion of study load (in terms of EC) of the specific course. The supportive technologcalcourses are indicated in orange. May be in table format like other tables.

3.1.3 Mandatory courses [Zs:v0.1]

The mandatory courses cover the entire capacity of the first 2 years, and ?? % of the 3rd year. The project-oriented courses, like CA, CE and the Bachelor Thesis are mandatory, but the student has quite some freedom in specifying the content. All mandatory courses are designed especially for the CreaTe curriculum. The particular courses are listed in Table 1-3.

Year 1	Mandatory courses				
Code	Title	Semester	EC	Author	Status
NM1	Web Technology	2	3	AE	OK
NM2	Interactive Visualization	3-4	5	AE	OK
ST1	Sensors	3	3	J/	F
ST2	Dynamical Systems	2-3	6	J	F
DE1	Hand drawing	1	2	W	F
DE2	Graphical design	2	2	W	F
DE3	Design in context	3	2	W	F
DE4	Ergonomics	4	3	W	F
MA1	Motion and Modeling	1	3	B	F
MA2	Signals and Systems	2	3	B	R
MA3	Statistics and probability	4	3	B	F
CS1	Introduction to Computer Science	1	3	A	OK
CS2	Introduction to Programming	1	3	A	OK
CE1	CEs in Art, Science and Technology I	1	2	Z	F
CA1	We create identity	1	3	AE	OK
CA2	Living and working tomorrow	2-3	6	M	OK
CA3	Have Fun and Play!	4	6	AE	OK

Year 2	Mandatory courses				
Code	Title	Semester	EC	Author	Status
NM3	Web2.0 Mashups	NM track	3	AE	OK
NM4	Virtual Environments	NM track	6	AE	R/VR?
NM5	Game Development	NM track	6	AE	OK
ST3	Control Systems	ST track	4	J	F
ST4	Wireless Communication Systems	ST track	4	J	F
ST5	Introduction to Electronics	ST track	4	J	F
ST6	Smart Environments	ST track	3	J/PH	F
DE6	3d modelling		2	W	F
DE7	Advanced graphic design		2	W	F
DE8	Digital content creation tools		2	W	
MA4	Protocols and Strategies		3	B	F
MA5	Queue and logistics		3	B	F
CS3	Complex data structures		5	A	F
CS4	Data-driven applications		3	A	R
BI1	Design marketing		3	W	
BI2	Business management		3	J/	
CE2	CEs in Art, Science and Technology I		2	Z	OK

CA4	Hybrid Worlds		6	AE/Z	OK
CA5	Ambient Screens		9	AE/Z	OK

Year 3 Mandatory courses					
Code	Title	Semester	EC	Author	Status
BP	Batchelor Project	2	15	AE/Z/J	OK

3.1.4 Elective courses [Zs:v0.1]

The elective courses cover roughly two-third of the 3rd year's study load. They assure that the student can gather special - technological or other – competences needed for his Bachelor Project, or suited to his further plans. Particularly, this contigent may be used to fulfiill prerequisites for some Master studies.
The electives are of two categories:

1. The non-technological elective courses (EN) can be chosen from a set of design, business, psychology, communication, ethics or philosophy courses, taught as regular courses at other educations, and a set of Minors. For at least 5 EC value Business and/or Human Factors related courses (BH) are to be chosen.
2. The technological elective courses (ET) may be chosen from the CreaTe technological courses taught in the 2nd year (in the 'other' track), as well as from regular courses taught in other Bachelor educations at EWI.

The list of possible electives corses is to be specified [G??] later, in coordination with follow-up Master Education needs. The BH courses may be specially designed for the CreaTe curriculum. The structure of the types of the elective courses is given in Table ??.

Year 3 Elective courses		
Code	Title	EC
EN	Non-technological (D, C, B) courses and/or Minor	20
BH	Budiness and/or Human Factors courses	5
ET	Technological (MA, CS, NM, ST) elective courses	20

3.1.5 Bachelor thesis [AE:v01]

The BSc project of 15 EC is the last component of the program. Students should demonstrate that

they are able to integrate the knowledge of other parts of the program in a creative design or application project.

Projects on **Smart Technologies** will be carried out in the labs of the EWI groups. These labs, mainly in Electrical Engineering, are well equipped with experimental facilities and computers. Whenever applicable, projects could also be done in industry under the common supervision of people from industry and from the UT, but also under the main supervision of one or more professors of the UT. In all cases we will strive to a situation that the student has to realize a design based on a demand from a 'customer'. This implies that business aspects, cost price and life - cycle issues are also important. Although emphasis in the project is on innovative designs, where ICT technology in a broad sense is applied into new devices, students must demonstrate that they are able to create generic solutions for the problem, based on a good understanding of the underlying principles. For students leaving the university with a BSc degree only, the project is the proof that they are ready for a career as a creative designer in industry, practically oriented, but on an academic level. For those who will continue their education in an MSc - program, the BSc project should also show the challenges of doing some more in depth research and stimulate them to deepen their knowledge further.

Projects on **New Media** are preferably done in cooperation with an external partner, and students will be encouraged to cooperate and assist eachother, in order to achieve, within the time constraints imposed by the project, an optimal result, both in terms of external visibility as well as individual development. To support such cooperation, students are encouraged to 'hire in' expertise' from 1-2 other students. This expertise may be technological (to make the prototype), human or business-related. Students that are hired-in, may thus earn maximal 5 credits for their elective courses, of which there are 20 available in the third year.
Such 'out-soucing' may be done to a limit of 10 credits, that is the work of two students, with 5 credits for each individual student. Typical New Media project may fall in either one of the following categories:

- creative industry -- *in new entrepeneurial activities*
- product design -- *in healthcare and entertainment*
- communication -- *regonial/global media campaign*s
- entertainment -- *new concepts in private and public settings*
- game development -- *serious games in education and corporate training*

that exemplify potential career options for creative technolgy students. In such projects, the student is expected to take up a role that suits his/her individual talents and capabilities, and that will contribute to his/her individual portfolio in the best possible way. Apart from the practical work, which preferably results in a prototype or proof-of-concept realization, students are expected to write a 20-30 page report, the bachelor thesis, and present their work for fellow-studnts, project stakeholders, and supervising staff.

The BSc project may be looked at as the most complete and challenging creative application. As such the BSc project should cover the complete cycle of a creative application, including initiation, project planning, design, development, and possibly even deployment and marketing. In practice, however, the actual project may only cover part of the entire cycle, and for reasons of planning and supervision, multiple students may take part in a longer running theme or project. However, to ensure sufficiently relevant projects, that is projects that prepare the students for either a career or a follow-up master, projects must be offered that that satify the criteria summarized by the following checklist:

- **domain** -- with *societal/personal* impact

- **elements** -- new media & smart technology
- **scope** -- *design & development* life-cycle
- **initiative** -- staff / student / organisation(s)
- **exposure** -- lab / UT / festival / *real life*

In reporting about the project, in the bachelor thesis, the student is expected to show the ability to be aware of each of these dimensions, and reflect on his/her work taking these dimensions in consideration. In conclusion we may add here that the student upon reaching graduation is expected to be able to demonstrate hish/her creativity, that is by, quoting Alan Kay, *connecting dots one would not look at normally*.

Relationships between courses and final qualifications [Zs:v0.1]

Table 3: Specification requirements matrix

	TECHNOLOGY	REQUIREMENT ANALYSIS	DESIGN	CREATIVITY	HUMAN FACTORS	BUSINESS
MA 1-5	X					
CS 1-4	X					
NM1	X			X		X
NM2	X					
NM3	X	X				X
NM4	X		X	X		
NM5	X	X		X		X
ST1	X			X	X	
ST2	X	X				
ST3	X	X				
ST4	X	X				
ST5	X					
ST6	X			X	X	
DE1			X	X		
DE2			X	X		
DE3		X	X	X		
DE4		X	X		X	
DE5	X		X	X		
DE6	X		X	X		
DE7	X					X
DE8						
BH					X	X
BI1						X
BI2						X
CE1	X	X	X	X		
CE2	X	X	X	X		
CA1	X			X		
CA2	X	X	X	X	X	
CA3	X		X	X	X	
CA4	X	X	X	X	X	
CA5	X		X	X	X	X
BP	X	X	X	X	X	X
ET	X	X				
EN			X	X	X	X

Table 4: General and scientific requirements matrix

	KNOWLEDGE	APPL. OF KNOWLEDGE	JUDGEMENT	COMMUNICATION	LEARNING SKILLS
MA 1-5	X				
CS 1-4	X				
NM1	X	X	X	X	X
NM2	X	X			
NM3	X	X			
NM4	X	X			
NM5	X	X		X	
ST1	X	X			
ST2	X	X			
ST3	X	X			
ST4	X	X			
ST5	X	X		X	
ST6	X	X			
DE1	X		X	X	
DE2	X		X		X
DE3	X	X	X	X	
DE4	X		X	X	
DE5	X		X	X	
DE6	X			X	X
DE7	X	X		x	
DE8	X	X	X	X	X
BH		X	X	X	
BI1		X		X	
BI2		X		X	
CE1			X	X	X
CE2			X	X	X
CA1	X	X	X	X	X
CA2	X	X	X	X	X
CA3	X	X	X	X	X
CA4	X	X	X	X	X
CA5	X	X	X	X	X
BP	X	X	X	X	X
ET	X				X
EN	X	X	X	X	X

3.2 Cohesion of the bachelor's degree course [Zs:v0.1]

The cohesion is an essential and complex issue in case of CreaTe, as it is highly interdisciplinary, and is designed to develop creativity and related skills thorught the entire curriculum. The programme cohesion is provided by the coordination of content and methodology of the different type of courses on five levels:

- **basic technological knowledge available on time**

The supportive technological courses (CS, MA) assure that the necessary mathematical knowledge and programming skills are available for the domain-specific technological courses (NM, ST). In MA and CS courses the illustrative examples and assignments, whenever applicable, come from NM and ST domains.

- **adequate levels in the ST, NM and DE disciplines assured**

In Year 2, a seris of NM or ST courses (depending on track chosen), plus a set of smaller DE courses assure that each CreaTe student reaches a sufficient level of expertise in one of the two technological disciplines and in Design. The courses are mostly complementary, thus giving a broad coverage of the related fields, but in some cases one technological course provides basis for the next one, or a design course extends/continues previous courses.

- **applications as vehicles of creativity and synthesis of disciplinatory knowledge**

The CA projects in the first 2 years, leading to the final Bachelor Project are designed in such a way that the basic disciplinary knowledge for them is taught before. These projects are to synthesis and apply the previously learnt competences. They show and increase in technological difficulty as well as complexity conserning users and potential business settings. These projects serve an intergrative function between the two technological tracks, as well as between individual competencies and interests of students.

- **developing communication and presentation skills**

The graphics design-related courses explicitely address (visual) communication and human perception and (design) argumentation issues. This knowledge is expected to be exploited in assignments and presentations in all other (technological) courses and CAs. Moreover, at all occasions of oral or written presentations the quality will be assessed. As of the mental qualities essential for successful communication with potential users and clients as well as experts, the (group) assignments with mutual peer-reviews in technological courses, the CE courses and particularly, the CA projects, provide the vehicles to leran these skills by ample of opportunities to exercise, also at occasions showing results in public events as well as in own portfolio.

- **minor and elective courses**

The minor and non-technological electives gives the student the opportunity to deepen their knowledge in business, design or human-related issues, and aquire extra technological knowledge needed for their Batchelor project and/or for further study, or just simply broaden their knowledge in topics for which the CreaTe Bachelor had simply no space (e.g. computer music, image or language processing)

Courses, though driven by a single person, are developed in close cooperation to assure this cohesion conserning content, illustrative examples, learning materials and teaching methodology. For CAs, multiple parties (staff with different background and/or external clients) may be involved to assure proper multidisciplinary support and assessment. Disciplinary teachers will be also available on a consultancy basis, whenever needed.

3.3 Study load of the bachelor's degree course [G!!]

3.4 Admissions [G!!]

3.5 Duration [G!!]

4 Human resources efforts [G!!]

4.1 WO requirements

4.2 Staff quantity

Table 5: Staff contributing to the Creative Technology courses

4.3 Staff quality

5 Facilities [J!! + AE:v01]

5.1 Teaching facilities

Facilities within the faculty

Other facilities on Campus

Computer, network and software support

AE:Computer and Software support for New Media:

Although we intend to supply each student with a notebook, for a number of assignments and projects, in particular in the area of game development and digital content creation, a small number of high-end PC, with hardware support for video, 3D and audio is essential, for example:

- 5 high-end PC's (Vista) / GeForce 8800 Ultra, SoundBlaster X-6

These workstation should minimally have the following software:

- Adobe Creative Suite 3 master (euro 999/seat) -- www.adobe.com/eeurope/products/creativesuite
- Adobe Premiere Pro CS3 (euro 800/seat) -- www.adobe.com/products/premiere

In addition, there need to be at least two server machines, with standard WAMP (Web, Apache, MySQL, PHP) support, and as additional software:

- flash media server 2 (euro 3800) -- www.adobe.com/products/flashmediaserver
- smartfox (euro 2000) -- www.smartfoxserver.com

For both workstations and servers, we intend to use Open Source solutions, whenever possible.

To support students and staff with the installation of such software, sufficient technical staff should be available!

5.2 Teaching Staff Offices

5.3 ICT facilities

ICT for learning and lecture support

ICT for teaching support

ICT for admission, for student registry and for student files

ICT for students

5.4 Library and learning resources [AE;v01]

AE:[These should be failrly standard, so I am not sure what to put here]

Over the last decade, me may observe a steady decrease of library usage among all levels of students, bachelor, master and even Ph-D level students. Also, printed sylllably become more and more an excpetion, are are commonly being replaced by online learning material, study guides and references. For the Creative Technology bachelor, this will be no different, and to stimulate effective usage of elecronically available material, we will invest in providing a well-documented overview of

- what material is available, and
- how it is to be used.

More in particular, we will stimulate from the beginning, starting with **CA1: We Create Identity**, that students gather their own material, and create argumented biographies and references in a shared wiki, analogous the the AVWIKI, http://avwiki.nl/ .

However, in the Working Labs, we will create a small dedicated library, that provides one or more copies from both technical and theoretical reference books, journals and proceedings, such as given in the References.

5.5 Study materials [AE:v01]

AE:[Again, this should be standard material]

For a number of the courses, and this includes most of the new media courses, there is plenty of material available, that may be used for self-study, and as a reference for more advanced projects.
As an example, for the course NM2: Interactive Visualization, which uses flex / actionscript technology, we distinguish between three types of material, as given below:

- **canonical example(s) –** selected by the creator of the course
- **(online) reference material(s) –** http://livedocs.adobe.com/flex
- **challenging target(s) –** examples of creative experiments with flash

For other courses, in particular the more traditional mathematics, computer science and engineering courses, learning materials are already available in a standard fashion. This also holds for courses in design, for which the material is borrowed from the Industrial Design Curriculum.

As indicated above, for the New Media courses, and even more so for the Creative Applications, we have to find suitable material that fits our needs, including inspiring examples, and technical references.

In the References, additional information is given on the availability of such materials. However, here we mention three sources of potentially relevent material:

- **New Media Consortium** -- http://www.nmc.org/publications
- **MIT Open Course Ware** -- http://ocw.mit.edu/OcwWeb
- **HCI Resources** -- http://www.hcibib.org

The material provided by these institutions ranges over technolgy overviews (New Media Consortium), complete courses on a variety of topics, including for example media Theory (MIT Open Course Ware), to annotated bibliographies dealing with elementary principles of human-computer interaction and itechnical nterface development (HCI Resources). The availability of all this material, obviously, does not mean that all work is done. To make effective use of it, still considerable effort is needed from both staff and students to select the material relevant for specific courses and projects.

5.6 Academic support facilities [J!! + G!!]

6 Quality management [G!!]

6.1 Internal quality assurance

6.2 System of quality control

6.2.1 Goals and objectives of the degree course

6.2.2 Programme of the degree course

6.2.3 Subjects and classes for Students of the degree course

6.2.4 Match between teaching Staff and teaching duties

6.2.5 Adequacy of support facilities

6.2.6 Results

6.2.7 Monitoring quality control

6.3 Stakeholder involvement

6.3.1 Employee involvement

6.3.2 Student involvement

6.3.3 Alumni involvement

6.3.4 Professional involvement

7 Conditions for continuity [G!!]

7.1 Guaranteed completion[5]

7.2 Financial Analysis

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Credits earned compensation						
Total revenues						
Variable costs						
Management & coordination costs						
Course development costs						
PR activities						
Total costs						
Net Profit/Loss						

[5] Subject to certain conditions, like for instance study performance.

The assumptions on which these calculations are based can be found below.
The scenario chosen is not a very optimistic one. The estimates for the intake of students each year is modest, reservations for management, coordination and course development are liberal, and we assume the annual revenue growth index to be 1 (i.e. no growth)

Numbers of students enrolled

Academic year	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	Year totals
year 1							
year 2							
year 3							
year 4							
year 5							
year 6:							

Total number of credits earned

year 1	
year 2	
year 3	
year 4	
year 5	
year 6	

Total number of degrees earned by the end of year:

	year 2	year 3	year 4	year 5	year 6
intake year 1					
intake year 2					
intake year 3					
intake year 4					
intake year 5					

Assumptions underlying the cost and revenue calculations:

New enrollments in year 1:
New enrollments in year 2:
New enrollments in year 3:
New enrollments in year 4:
New enrollments in year 5 and later
Annual costs growth index is:
In year 1 costs per hour is:
Total annual instruction time per student is:
Success rate after 3 years is:
Percentage of intake finishing in due time is:
In year 1 revenue per credit point is:
Annual revenues growth index is:
Nominal number of credits per year per student:
Effective number of credits per year per student:

8 Appendices

8.1 Examples of Creative Technology Applications [Z!!]

AE:[Taken from the list]

Darfur is Dying, developed by srudents of the University of Southern California

url: http://www.darfurisdying.com/aboutgame.html

from the website: In partnership with the Reebok Human Rights Foundation and the International Cris Group, mtvU launched the Darfur Digital Activist Contest, un unprecedented competetion bringing together student technology and activism to help stop the genocide in Darfur. Susana Ruiz, Ashley Yor, Mike Stein, Noah Keating and Kelle Santiago of the University of Southern California conceived the game and worked closely with humanitarian aid workers with extensive on the ground experience in Darfur to develop it.
Darfur is Dying is a naarative-based simulation where the user, from the perspective of the displaced Darfurian, negotiates forces that threaten the survival of his or her refugee camp. It offers a faint glimpse of what it's like for the more than 2.5 million who have been internally displaced by the crsis in Sudan.

Exchange Cabinet, Waag Society, Amsterdam

url: http://www.waag.org/project/wisselkabinet

from the website: Waag Society and Drents Audiovisual Archive (DAVA) have developed the DAVA Exchange Cabinet. The project is part of Waag Society's Shared Narratives Programme.
This piece of furniture will connect stories of elderly people with film
and photo material of the Archive and will be placed in care centre
Dekelhem in Gieten. Purpose of the cabinet is putting local history in a personal environment.

8.2 International educational examples [Z!!]

AE:[Taken from the list, left out courses, and added some own]

School of Creative Technologies, University of Portsmouth

url: http://www.port.ac.uk/departments/academic/ct

from the website: The sphere of activity of Creative Technologies is in those areas where new technology is impacting in the Arts, Leisure and Entertainment. It specialises in subjects like web design, graphics, animation, virtual reality, video, audio and music.

These are areas that will continue to grow and move forward at an alarming rate: Creative Technologies intends to be at the forefront of this wave!

Creative & Cultural Industries, Faculty of Arts, Humanites & Sicial Sciences, University of Lancashire

url: http://www.uclan.ac.uk/facs/class/humanities/creatind

from the website: Creative and Cultural Industries is an exciting new three year B.A. (Bachelor of Arts) degree programme to be offered by the University of Central Lancashire from September 2007, and is one of the first of its kind anywhere in the UK. Research at the national as well as international levels has shown that increasing numbers of graduates are opting to work in this sector, whether as employees of existent organisations or as entrepreneurs in their own right. This in turn has made this sector one of the fastest growing all over the country, particularly in the North West. However, among existing courses offered by different universities which address some of the industries in this area, many have been found to be less than adequate in creating for this sector the skilled, knowledgeable and well trained workforce that it needs to maximise its potential for growth.

Culture Lab, Newcastle University

url: http://www.ncl.ac.uk/culturelab

from the website: Culture Lab is a unique research infrastructure providing an environment for academics and practitioners working beyond traditional disciplinary boundaries.

We promote socially and economically valuable synergies with artists, creative industries, and cultural and scientific institutions, and the development of innovative research with digital tools.

Digital Arts & Entertainment, HOWEST, Kortrijk, Belgie

url: http://www.digitalartsandentertainment.com/#/nl/curriculum

The DAE curriculum is a three year bachelor, based on the requirements for creating interactive 3D environments. The curriculum offers a mix of artistic 3D skills and competences on the one hand, and programming technical skills and competences on the other hand.

School of Interactive Arts + Technologies, Simon Fraser University, Canada

url: http://www.siat.sfu.ca/core-ideas

from the website: "We're creating a new community based on designing better experiences."

The School of Interactive Arts + Technology (SIAT) is a future-focused school where technologists, artists, designers and theorists thrive in collaborative research, invention and theoretical thinking.

SIAT fosters dialogue and shared work around the core idea of creating better human experiences through design, interactivity, art and technology. Its program, faculty and facilities enable students to develop themselves as researchers; to learn new knowledge, expertise and skills; and to address critical issues of technology in society.

In SIAT, we are engaging in and transforming the world to a place where technology, design, art, and media serve people; A world where we better understand how interactive technologies transform the human experience in expected and unexpected ways; A world where we can design new technologies to support humans to think, feel, communicate, and connect.

KEIO Media Design, Keio University Japan

url: http://www.kmd.keio.ac.jp/en

from the website: Keio University Graduate School of Media Design is committed to fostering "Media Innovators" and creative global leaders who understand the core creative skills of design, technology, management, and policy in the field of media design. Education will take a practical, hands-on, and global approach to offering various projects grounded in practice by collaborating with international partner institutions and research facilities.

Keio University Graduate School of Media Design provides a premier graduate education to prepare students for leadership as "Media Innovators" in the modern creative society. A "Media Innovator" is a leader who understands the core values of creativity and innovation, who can implement and manage creative activities, and who is also capable of converting creative and innovative activities into economic and cultural value for society to the maximum extent. Therefore, the education program produces international professional leaders and scholars who can revolutionize industry and the bureaucracy, create and innovate new generations of digital media, who can produce innovative digital content and experience, and who can create, edit, and distribute "knowledge", which is the most valuable resource in our global society.

The Media Lab, MIT, Boston, USA

url: http://www.media.mit.edu/

At the Media Lab, the future is lived, not imagined. In a world where radical technology advances are taken for granted, we design technology for people to create a better future.

The Lab comprises rigorous research and graduate degree programs, where traditional disciplines get checked at the door. Future-obsessed product designers, nanotechnologists, data-visualization experts, industry researchers, and pioneers of computer interfaces work side by side to tirelessly invent–and reinvent–how humans experience, and can be aided by, technology.

8.3 Educational initiatives in the Netherlands [AE:v01 + Z!!]

AE:[??should we comment on these??, See 2.5 Benchmark degree courses]

Industrial Design, Technische Universiteit, Eindhoven

url: http://w3.id.tue.nl/en/information_and_recruitment_activities/

The Industrial Design course started in 2001 and counts a number of nationalities among its multidisciplinary staff. The emphasis is on ‘ambient intelligence’: the design of intelligent products, systems, and services. Over the next couple of years 'ambient care' will receive special attention because health and well-being are among the primary focal areas of both Industrial Design and the TU/e. Because of its broad range of contacts with companies and

institutions in Europe and beyond (Singapore, Australia, the United States), Industrial Design is well-equiped to respond to international developments in a pro-active manner.

The most noteworthy characteristics of Industrial Design at the TU/e are its unique educational system, the intensive coaching students receive, the focus on practice-oriented teaching and learning, and the close collaboration with local, national, and international companies and institutions. Self-supporting, responsible students who are creative and have an interest in people will find their way at Industrial Design. Motivation and involvement are important assets, as the Industrial Design Bachelor is a demanding program that often requires more than a day's work...

Human Ambience, VU Amsterdam

url: www.cs.vu.nl/~treur/HumanAmbience/HAtekst.htm

According to the website: Human Ambience is a new, mutli-disciplinary, problem-oriented curriculum with a strong focus on human function, in a physical, psychological as well as social context. ... Students are encouraged to analyse problems and find solutions making use of modern technologisch, with as an ultimate goal to create an understanding, more human environment. As examples of such solutions are mentioned: the caring wristband, for monitoring immediate healthproblems, and the attentive medicinbox, which alerts the user when it is time to take medicines.

Information, Multimedia and Management, VU Amsterdam

url: www.few.vu.nl/aanstaande_studenten/bachelors/Informatiekunde/page_ik_intro.html

According tio the website, the IMM curriculum (Information, Multimedia and Management) bridges the gap between information and communication-technology (ICT) and the application of these technologies in business and society. The IMM graduate will act as an intermediary between ICT-designers and the people that work with ICT. During the study the student will build an understanding of how non-technical users and organisation perceive information and computers, and they will learn how to deploy this knowledge to improve the way people work with current-day information systems.

Media Technology, Leiden University

url: http://mediatechnology.leiden.edu

from the website: The Media Technology MSc programme is a place where students are encouraged to formulate their own scientific questions, and to translate personal inspirations and curiosities into their own research projects. To answer these questions, students create actual products, because we are convinced that by doing and creating, new scientific insights into the underlying question are encountered.

Undergraduate course Creative Technology University of Twente

The programme is a joint initiative of Leiden University' s computer science institute (LIACS) and the Faculty of Creative and Performing Arts

Objectives

The programme recognizes creativity as an important factor in scientific innovation. It aims to be a place where students, artists and scientists do research by creating innovative solutions, inspired by results and principles of science. To achieve this, the curriculum focuses on creative exploration and on the understanding of science and technology. The programme encourages its students to draw from the knowledge available throughout Leiden University and the ArtScience programme of the Royal Academy of Arts in The Hague.

Game Studies, Utrecht

url: http://www.upgear.nl/?pid=16

In Utrecht there is a variety of studies offering courses in new media and game development, either as the core of the studies,or as a minor in a related field:

HKU: Game Design & Development

HKU: Design for Virtual Theatre & Games

HU: Bachelor Mediatechnology with endprofile Game Technology

UU: Informatica with minor game- and mediatechnology

UU: Information Sciencea with minor game- and mediatechnology

UU: Minor New Media & Digital Culture

where HKU stands for Hogeschool Kunsten Utrecht, HU for Hogeschool Utrecht and UU for University of Utrecht. Note that the last vaiant, Minor New Media & Digital Culture, is offered by the Faculteit Letteren.

New Media (MA), Universiteit van Amsterdam

url: http://www.studeren.uva.nl/ma_new_media

The international Master in New Media & Digital Culture is for students interested in contributing to timely discourse surrounding critical media theory. It builds upon the pioneering new media scene that Amsterdam is known for, with an emphasis on the study of Internet culture. Students gain an in-depth knowledge in new media theory, viewed from the perspectives of media archaeological, materialist and other critical traditions, and applied to such topics as blogging, locative media, networks and protocol. Additionally students may be trained in the areas of info-aesthetics and visualization, with its emphasis on how to read, understand and critique information graphics, interfaces as well as online interactivity. Among the expertise available to students is the emerging area of digital methods --Internet research approaches and techniques that are specific to the new medium and the study of natively digital objects.

QANTM College Amsterdam: Education in 3D, Game Design and Game Development

url: http://www.qantm.nl

The Quantum college offers:

- Bachelor of Science in Games Programming
- Bachelor of Arts in Interactive Animation

The website informs us that: As of 2008 we are validated by the Middlesex University in London to offer Bachelor Degrees (BA and BSc) for the education in game design and development.

8.4 National initiatives in the public sector [AE:v01 + Z!!]

Waag Society, Amsterdam

url: http://waag.org/pagina/waagsociety

from the website: Waag Society is the name of what started in 1994 as 'Society for old en new Media', Foundation de Waag. Founders were Caroline Nevejan and Marleen Stikker, who is still Waag Society's director. Before, Stikker was the mayor of the Digital City, the first internet community in the Netherlands.

The Society's -soon to be called 'Waag Society'- mission was to make new media available for groups of people that have little access to computers and internet, thus increasing their quality of living. After a complete restauration of the Waag building, a small group of enthousiastic idealists began their activities in 1996.

The medialab developed into an avant-gardistic thinktank whith a lot of freedom. But with an eye for commercial possibilities: attempts were made to bring Waag prototypes to the market. Waag Society grew into an institution that was active in the fields of networked art, healthcare, education and internet related issues like bandwidth and copyright.

The international network became increasingly important: Waag Society has a worldwide network with partners in countries like India, Canada and the UK.

Nowadays, Waag Society is an acknowledged institute where apart from R & D, there is room for experiment with new technologies, art and culture. Partners come from all parts of society: universities but also companies work together in our projects. Waag Society is a foundation and as such a non-profit organisation.

Media Guild, Amsterdam

url: http://mediaguild.com/organisation

from the website: Media Guild is a not for profit organization that fosters innovation and brings it to the market and to society. Media Guild has two important goals that follow naturally from each other.

- To support innovative starters in the creative industry
- To bring businesses and knowledge institutes in touch with the creative industry and innovation

Innovative starters:
Everybody who is talented and has a good (interactive media) idea can be considered for a place at Media Guild. All you need is an entrepreneurial character and an excellent innovative idea that can potentially reach the market.

V2, Rotterdam

url: http://www.v2.nl

from the website: V2_, Institute for the Unstable Media, is an interdisciplinary center for art and media technology in Rotterdam (the Netherlands).
In 25 years, V2_ has become an international organization for experimentation, research and development in art and media technology.
V2_'s activities include organizing presentations, exhibitions and workshops, research and development of artworks in its own media lab, publishing in the field of art and media technology, and developing an online archive.

Mediamatic.net, Amsterdam

url: http://www.mediamatic.net

from the website: New Media, Art, Society

Mediamatic is a cultural organization in Amsterdam. We do exhibitions, presentations, workshops and much more. This site combines an overview with news and theory. This site is also a social network of people interested and involved in our activities.

The Mediamatic organisation is closely related to the Mediamatic Lab, see below.

Mediamatic Lab, Amsterdam

Mediamatic Lab develops and builds intelligent, innovative media-applications. We have specialised in supporting networks of people and in knowledge exchange. We build websites and other new media applications. For our cultural activities visit Stichting Mediamatic our sister organisation.

Creative Cities Amsterdam Area

url: http://www.ccaa.nl/

Creative Cities Amsterdam Area (CCAA), is a consortium created to stimulate entrepreneurs in the respective cities of Amsterdam Utrecht Almere Haarlem Zaanstad Amersfoort Hilversum, and more in particular provides facilities to stimulate the growth of the creative industry in these cities.

The CCAA site also functions as an information portal announcing, for example, funding opportunities for **Digital Pioneers**, the foundation of a **Creative Campus** in Almere and a national **Creativity Contest**.

8.5 Being Human – Computer Interaction in the year 2020

In the following we present a summary as well as additional quotes with examples of the report:
BEING HUMAN HUMAN-COMPUTER INTERACTION IN THE YEAR 2020
Edited by Richard Harper, Tom Rodden, Yvonne Rogers and Abigail Sellen
is available from: http://research.microsoft.com/hci2020

A: Mission statement & summary

Computer technologies are not neutral, they are laden with human, cultural and social values. We need to define a new agenda for human-computer interaction in the 21st century, one that anticipates and shapes the impact of technology rather than simply reacts to it.

Our Changing World

Computers have played a massive role in changing the way we live over the last couple of decades. They are no longer possessions of the privileged but are rapidly becoming inexpensive, everyday commodities. They have evolved from being isolated machines to globally interconnected devices. Not only has access to computers vastly increased, but the ways we interact with them and materials used for computer devices have changed too. All of this means that computers can now be interwoven with almost every aspect of our lives. As we move towards 2020, so the extent of these changes will increase. By 2020, it may not be possible to realise all of our goals, ambitions and aspirations without using a computer or computing in one way or another. This binding of computing to our daily activities will in turn affect our values, goals and aspirations.

Transformations in Interaction

There are five main ways in which our interactions with computers will be transformed as we approach 2020. How we define and think about our relationships with computers is radically changing. How we use them and rely on them is also being transformed. At the same time, we are becoming hyperconnected and our actions, conversations and interactions are being increasingly etched into our digital landscapes. There is more scope than ever before to solve hard problems and allow new forms of engagement and creativity. We have begun to raise the issues and concerns that these transformations provoke. There

are many new kinds of questions we have not had to be concerned with before. Some will be within the remit of Human-Computer Interaction to address and others will not.

HCI: Looking Forward

HCI needs to move forward from concerns about the production and processing of information toward the design and evaluation of systems that enable human values to be achieved. Doing so requires HCI to shift its epistemological constraints away from their psychological roots towards other approaches, such as the philosophical, where conceptual sensitivity to meaning, purpose, and desire is possible. This suggests adding a fifth stage to HCI.s conventional design/research model: a stage of conceptual analysis where we consider the human values we are trying to support or research. This affects the whole cycle of research and design, including how we understand the user, how we do studies in the field and the laboratory, how we reflect on the values sought in design, how we build prototypes and how we evaluate our designs. Finally, HCI researchers need a larger assembly of skills and know-how if they are to succeed, which has implications for the concepts, frameworks and theories of HCI.

Recommendations

1. Revisit research and design methods in HCI
2. Be explicit about the remit of HCI
3. Develop disciplinary techniques that allow HCI to collaborate with other research communities
4. Teach HCI to the young
5. More advanced training for future HCI researchers
6. Engage with government, policy and society
7. Offer an inclusive future in 2020

B: Being Human Revisited – additional quotes with examples

> The question persists and indeed grows whether the computer will make it easier or harder for human beings to know who they really are, to identify their real problems, to respond more fully to beauty, to place adequate value on life, and to make their world safer than it now is. (p. 5)
> Norman Cousins . The Poet and the Computer, 1966

> The questions that result are far-reaching and profound. HCI can no longer be solely the **scientific** investigation of what role technology might have . it will need to be part of the empirical, **philosophical** and **moral investigation** of why technology has a role. (p. 8)

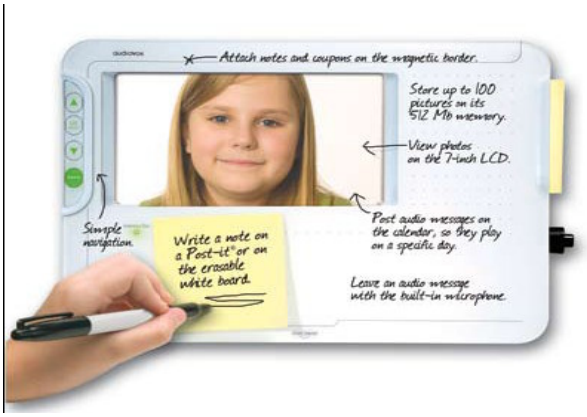
> The world we live in has become suffused with computer technologies. They have created change and continue to create change. It is not only on our desktops and in our hands that this is manifest; it is in virtually **all aspects of our lives**, in our communities, and in the wider society of which we are a part. (p. 10)

> What will our world be like in 2020? Digital technologies will continue to **proliferate**, enabling ever more ways of changing how we live. But will such developments improve the quality of life, **empower** us, and make us feel safer, happier and more connected? Or will living with technology make it more tiresome, frustrating, **angstridden**, and security-driven? What will it mean to be **human** when everything we do is

supported or **augmented by technology**? What role can researchers, designers and computer scientists have in helping to shape the future? (p. 10)

The **Reactable**: a multitouch interface for playing music. Performers can simultaneously interact with it by moving and rotating physical objects on its surface. Reactable was developed by Sergi Jordà and colleagues at the Universitat Pompeu Fabra, Barcelona. Icelandic songstress **Bjork** used one on her 2007 tour. (p. 16)

Animated Textiles developed by Studio subTela at the Hexagram Institute, Montreal, Canada. These two jackets .synch up. when the wearers hold hands, and the **message** scrolls from the back of one person to the other. (p. 18)



The **Rovio robotic webcam** is wirelessly connected to the Internet. It roams around the home providing an audio and video link to keep an eye on family or pets when you.re out. (p. 21)

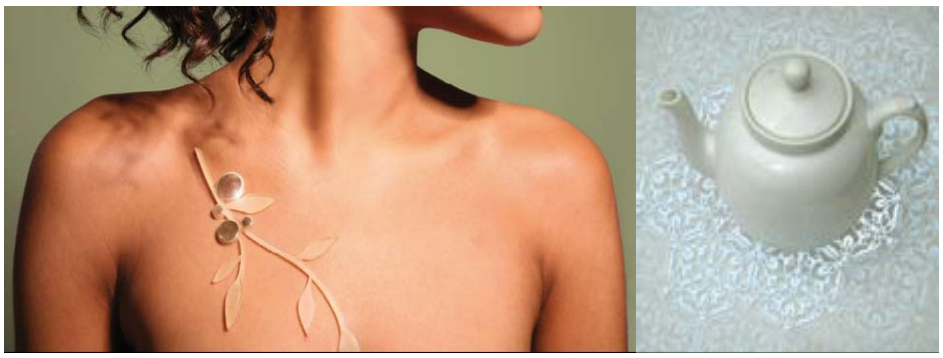
Audiovox.s Digital Message Center is designed to be attached to the refrigerator, letting families scribble digital notes and leave audio and video messages for each other. (p. 27)

New data sources are available to us all the time. We are all fast becoming **content producers**, publishers and developers as much as we are **consumers**. (p. 23)

By 2020, there will be very few people left on the planet who do not have access to a mobile phone. (p. 30)

ART+COM.s artistic installation called Duality, located at the exit of a metro station in Tokyo. Passers-by provoke virtual ripple effects with their footsteps, as if walking across a pond. (p. 32)

The characteristics that make us human will continue to be manifest in our relationship with technology. (p. 35)

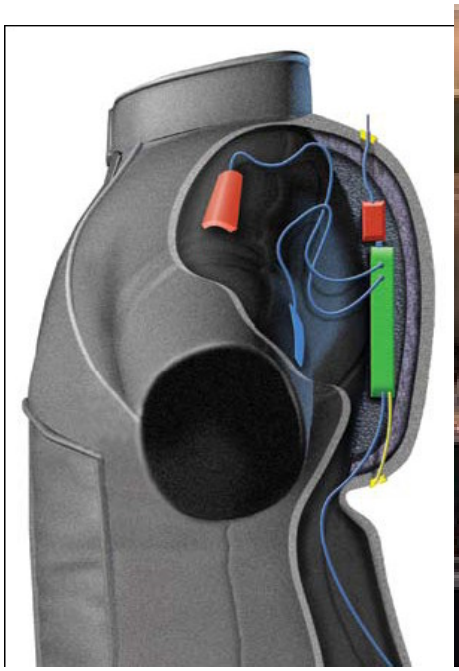


Electronic sensing jewelry (a concept from **Philips Design**) is based on stretchable, flexible electronic substrates that integrate energy supply, sensors, actuators, and display. By changing colour or even shape according to your mood, it explores how wearable technology can be playful, sensual, moodaffected, bio-activity stimulated. (p. 36)

Just as the interface between people and computers is radically altering, so, too, is the boundary between computational technology and the objects and surfaces in the everyday world. (p. 38)

Another playful piece of technology is the **History Tablecloth**, by the Interaction Research Studio (Goldsmiths College, University of London). It is designed to cover a kitchen or dining-room table. When objects are left on the table, the cloth starts to glow beneath them, creating a halo that expands very slowly. When items are removed, the glow fades quickly. (p. 38)

The more we depend on technologies to carry out or mediate our everyday activities, the more we will need to trust them to do so. (p. 41)



Garment is developing **full-bodied smart garments** . to be worn by fire-fighters and the like . that monitor and transmit the location and vital signals of its wearer (such as body temperature and heartbeat). (p. 40)

The digital crowd is likely to play a more influential role in shaping the human values of the future. (p. 45)

New forms of creative engagement : **Microsoft's Surface**. is an interactive tabletop allowing two-handed interaction with digital objects such as photos, music files, games and maps. These kinds of interactive surfaces encourage collaborative, creative engagement. (p. 50)

The **Kiss Communicator** is a concept prototype that allows you to blow a .kiss. to your beloved even when in another part of the world. Squeezing and blowing on the device wirelessly sends a sequence of lights to its corresponding Communicator. (p. 53)

The bottom line is that **computer technologies are not neutral**, they are laden with **human**, **cultural** and **social** values. (p. 57)

Extending the Research and Design Cycle: **Understand**, Study, Design, Build, **Evaluate**.

The delivery of one value will have **implications for other values**. (p. 63)

Design for values can and often will lead to **profound choices**. (p. 68)

Case Study: **Tracking versus surveillance in families**
Values such as reassurance, **togetherness** and enchantment call for different ways of thinking about how we design technology. (p. 70)

The **Whereabouts Clock**: the lefthand image shows the clock in its case; the middle image is a close-up of its interface; and the righthand image shows what happens when you touch on a text message. (p. 71)

Case Study: **The value of augmenting human memory**
In what situations might we want to remember and why? And is it sometimes better and more desirable to forget? (p. 73)

Different human values guide us in different directions, both in terms of the **literature** we need to look at, and the **work** that needs to be carried out. (p. 74)

The **Digital Shoebox**, by designer Richard Banks of Microsoft Research Cambridge UK, is an attempt to make the storage of digital photos more tangible. Photos can be sent wirelessly to the box, and users can browse through them by running their finger across the top of the box. (p. 75)

> In the future, more lightweight, **rapid prototyping** and **design iteration** processes will be required, ones that will allow complex ecosystem experiences to be investigated as well as simpler, human-machine relationships. (p. 81)
>
> Just as **computing has gone beyond the interface**, so, too, will HCI professionals need to move outside of the scientific community they have lived within and **find ways to engage with society as a whole**. (p. 92)

8.6 The IIP CREATE Scientific Research Agenda [AE;v01 + Z!!]

A: Press release

The IIP CREATE Scientific Research Agenda was announced on 8 May 2008 during the ICT Delta Congress. Below we quite the summary from the Waag Blog page[6]

This is the Strategic Research Agenda (SRA) of the ICT Innovation Platform CREATE. IIP/CREATE is the cooperation of the leading Dutch stakeholders in the creative sector from industry, non-profit institutes, SMEs, universities, HBOs and academies, sector platforms and intermediaries. It is supported by ICTRegie.The SRA addresses the growth potential of the creative sector for the Dutch economy, our society and our education and research. It identifies the barriers for further productivity growth and describes measures and instruments to remedy this.

The creative sector that is driven by ICT and Media

Economy growth relies on ideas, skills and quality to excel, on entrepreneurship, on the work force to make it happen and ultimately on society where all these aspects are rooted. We live in an era where the value system of society changes rapidly as a result of the rise of the 'creating' class. The 'creating' class forms a new economic sector where relative autonomy, creativity, a networked context, and (large-scale) production of small-scale expressions define its work ethos. At the core of the 'creating' class addressed in this SRA is Information&Communication Technology and Media. This definition – similar to the one of CPB – covers 30% of the workforce.

The potential of the creative sector is not employed

Dutch design rightfully acquires great fame, yet this results in limited impact in economic or social terms. The principal barrier is one of scaling. We do not employ the economic and societal benefit that this sector has to offer because small scale creatives do not know how to upscale their creative production in NL and large scale industry and the public sector do not know how to adopt creative products or ways of working.The SRA identifies two further barriers for increasing productivity:

- Coordination problems that occur when engineers and creatives do not find one another, and when knowledge and information are fragmented. Multidisciplinary projects are a way to remedy this.
- Barriers to entry that exist and are mostly due to a lack of real communications.

What is needed are complete ecosystems with science, inspiration, and production insight are combined. The IIP/CREATE is the start of such ecosystem at a national scale and aims to stimulate the economic growth of the sector in the Netherlands by 2 % annually. The potential of the sector is illustrated by

[6] http://iipcreate.waag.org/

experts throughout the SRA with scenarios for 2015 on games, shopping, cultural heritage, public health, hospitality, culture and education, and eGovernment.

Creating ecosystems in the Netherlands

Whereas the rise of the 'creating' class occurs world-wide, we focus on the changes in the Netherlands. We have identified trends, strengths, weaknesses, opportunities and threats that are important to create the winning ecosystem in the Netherlands. We must take advantage of innovation models and ways of working suiting the Dutch. Our excellent infrastructure provides an opportunity to invest in content, but at the same time also creates more information for the content providers abroad. Economic benefit of Dutch creativeness is often exploited elsewhere. Therefore, we must invest in Dutch ICM technology and experience labs. Current government instruments need improvement as they do not suit creative research well.

Creative entrepreneurship has been successful as the new way of life for SMEs and ZZPs. However, innovation here is stalling. To complicate matters, classic intellectual property rights are fading away on a global scale, putting pressure on creative business models. The first to experiment with the new IPR wins.

The Netherlands have a good potential advantage. It is our vision to create world-class ecosystems of the creative sector, by creating coherence between knowledge centers, industry and the non-profit leaders in regional contexts. Example ecosystems are presented in Amsterdam, Utrecht, Eindhoven, Rotterdam, and the NIRICT.

The Strategic Agenda

In workshops and interaction with the field, we have identified the most vital themes to develop. Themes with the highest potential of success and a sense of urgency have been coupled with tools for broad support in the field. The five themes are:

- searching & finding
- context exploration
- virtual and real worlds
- collaboration as a way of life and
- interactive and tangible environments.

To stimulate progress in these development themes, nine tools are discussed. These are instruments for interaction, location-based infrastructures, tools for data worlds and tools for building real & virtual worlds. Furthermore, the SRA proposes to extend the role of creative sector laboratories such as world experience labs and living labs. Equally important measures such as policies for property rights, entrepreneurship of the creatives, and research of the creatives are described.For each theme and each tool we argue why the Netherlands is an excellent place to endorse its development. Per theme and tool also, we indicate immediate stakeholders in the Netherlands.

Creating a winning ecosystemThe SRA proposes a mix of long-term research with short term demonstrations and high-profile applications, consequently to form new chains of knowledge for an enduring advantage. The two cornerstones for getting there are:

- Creating champions: by implementing a focus, by building new chains, and by investing in multi-disciplinarity
- Providing Instruments and Incentives: Financial, Organzational, Facilities, room for R&D, dedicated education and coordination.

We focus on the 'hottest' spots supporting local initiatives, wherever they originate. We aim to introduce vouchers for the production of creative ideas, for creative pionees, and vouchers for the production industry and coaching. For the restoration of chains, we aim to build large-scale programs and new reward systems. For community building, we suggest public awareness programs, registration of best practices, and the maintenance of open-source technological sources. We suggest a few programs on

education. We suggest a PhD on the basis of a work of art and on the basis of a start-up company. And, we aim to develop a program for stipends to artists, and for public broadcasting to be a lead customer.

The SRA instruments and tools are geared to exploit the EU ambitions, which proposes 2009 as the Year of Creativity and Innovation.

B The Strategic Agenda Revisited – implicatations for Creative Technology

We have chosen, in addition to the text of the press release, to represent the main tenets of this excellent, and extremely timely report, not because we could not think of the wording ourselves, but because we feel that a verbatim paraphrase allows us to find support in an authorative voice, expressing opinions that have far wider resonance than the working group for the *creative technology* bachelor would ever be able to obtain. Nevertheless, we have included our opinions so as to emphasize our point of view and indicate our particular strengths, where we aim to create a, as it is called in the report, **local eco-system** for **creative technology**, at a university that carries both **convergence of technologies** with societal impact and **creative entrepeneurship** as their mission towards the dutch and local society.

From the **managements summary** we may read as a characterization of the **creative sector**:

> The creative sector: Economic growth relies on **ideas**, **skills**, and quality to excell, on the **work force** to make it happen, and ultimately on **society** where all these aspects are rooted. (p. 6)

With respect to the **economic potential** the report is careful:

> The potential: Estimation of the **economic perspective** in standard ways is hard as data about this new sector lag behind. Nevertheless, there is ample evidence of a considerable impact in times where technology becomes invisible, hardware is cheap and **content** becomes invaluable.

Nevertheless, it leaves no doubt about the impact of these developments, especially in a **social context**:

> Socially, the rise of the ***creating* class** has an enormous impact on the participation in (virtual) communities, to restore coherence, narrowing the digital divide, and introducing new ways of living in the city.

And to emphasize, as later also more explicitly indicated in the report, the **creative industry** is regarded a necessary factor to remedy the potential dangers of the rapid technical developments to our society:

> The impact of the ***creating* industry** is inevitable, desperately needed to balance the excitement of internet and games at home.

And this holds, not surprisingly also for the Dutch situation:

> In the Netherlands: The life style of consumers will be creative and personalized, supplied with mass produced individual expression.

In particular, as observed in the report, broadband is widely available, nevertheless there is a tendency for the creatitive industry to gather in particular centers of our country, since:

> Where broadband introduces the whole world in the living room, **proximity** will paradoxically gain in importance.

The committee writing the report has set itself as a goal:

> In science and technology there is an apparent lack of a coherent agenda, as opposed to foreign countries which invest heavily in this field.

> It is our vision to create world-class **eco-systems** of the **creative sector**, by creating coherence between knowledge centers, industry and non-profit leaders in regional contexts.

It is instructive, from our point of view to read what the report mentions as examples of areas which acts as **centers of creative industry**:

> Examples: Amsterdam, Utrecht, Eindhoven and Rotterdam. (p. 7)

And indeed, why not Twente, you may ask. Here we may state, not needing any further argumentation, that Twente should make effort to be also in the list, since it satisfies many of the necessary conditions, that is the occurrence of (education in) science, arts and a lively entrepeneurial climate. Our proposal for a bachelor **creative technolgy** as explained fully in the main body of our accreditation eport, fits seamlessly here, and may acts as a necessary impetus to put Twente on the **creative map** of the Netherlands.

The **strategic agenda** of the report mentions five themes:

> The five themes are: **search & find**, **contextivity** about the context of context exploration, **virtual and real worlds**, **collaboration** as a way of life, and **interactive** and tangible **environments**. (p. 7)

In each of these themes our curriculum has to a greater or lesser extent an offer. And here we emphasize that, as much as possible, we would like to approach these themes from a unified vision, that is find suitable interactions between these themes, whenever possible.

The report spends ample deliberation on what it considers conditions for **creating a winning eco-system**:

> This agenda proposes a mix of long-term research with short-term demonstrators and high-profile applications, consequently to form new **chains of knowledge** for an enduring advantage.
>
> We focus on the hottest spots, supporting local iniatives, whereever they originate.

In other words, local context and iniative are determining success factors, and as such it from our point of view more a matter of whether the UTwente has the courage to take this initiative, than whether the necessay conditions are satisfied, which to our mind leaves no room for doubt.

Despite the **visionary rethorics** used in the report, as some may regard it, the report gives in our opinion a very accurate description of the current cultural and academic landscape, as it concerns the **creative industry**. It is worth emphasizing that a large, representative group of people have been involved in the writing of it:

> IIP/CREATE: The **Strategic Agenda** was produced by the program board of IIP/Create and created in discussion with industry, non-profit institutions, SMEs, universities, HBOs and academies, platforms and intermediaries, and supported by ICTRegie.

Apart from the grand overview given in the *managements summary*, it is worthwhile to look in some more detail at the observations made in the report, in particular as they pertain to education and our target audience, that is essentially members of what the report calls the **creative class**:

> Living the creative way: Millions of people are beginning to work and live **the creative way**, as artists, consultants and scientists always have done. (p. 10)
>
> The creating class: Our definition of the ***creating*** **class** covers the creation and recreation of products, it contains **experience** and **information**, it contains **media** and their **impact**. In short, it contains all who are creating in **relative autonomy**, operate in a **social network**, live in a **local eco-system** and deliver their goods wherever they are in the world.

It is interesting to note that the report has a wider definition of the creative class, which includes for example also scientists (!), than the CPB, which puts stronger emphasis on the relation with the **arts** and **human experience**:

> Cf. definition of CPB, which is more narrow: The creative industry is a specific form of industry, which produces **products** and **services** which are the result of individual or collaborative behavior and entrepreneurship. **Content** and **symbolism** are the most important elements of these products and services. They are purchased by consumers because they evoke **meaning**. On this basis **experience** is created.

Irrespective of what definition is adhered to, both research and education for the **creative industry** is inherently **multi-disciplinary**:

> Essential parties: Our target lies at the crossroads of three parties. We need **inspiration** and **content** from the **arts**, from **cultural heritage**, from **design**. And we need **industry** to **make** and **sell** it. And we need **science** and **innovative ways** of thinking to make the product or service ... (p. 11)

In other words,

> we need **content** designed with a touch of **excellence** and empowered by **science**.

As **critical success factors**, the report mentions:

> Technology, talent and tolerance: Extensive research shows that **successful eco-systems**, with respect to **innovation** and growth, have three factord in common: **technology**, **talent** and **tolerance**.

Especially, while positioning our curriculum **creative technology** in an academic/engineering environment it is worthwhile to keep in mind, as the report phrases it:

> A tolerant environment attracts top creative and top creating talents. (p. 11)

There should be no need to divulge into the **potential** of investing in (education for) the **creative industry**:

> The potential: Dutch creativity is world famous, but does not (sufficiently) payoff economically. (p. 18)

> Cultural potential: New technology is first applied in the old idions, later it is employed in line with its own capabilities. As a consequence, the many ways in which ICT technology will innovate the arts are still to be discovered.

And let's be clear, there is not only cultural potential, but **economic potential** as well, simple because **learning** becomes essential for our total workforce:

> Potential in learning: **learning at school** and **life long learning**. (p. 31)

The report, moreover, clearly states what **education for the creative industry** entails:

> Education for the creative industry: It is **essential** that education at schools, **universities**, and in programs aimed at people in the **creative industry** adjust to the developments we have sketched ...

And, again no need to emphasize, our curriculum **creative technology** must be seen as instrumental in conveying both **skills** and **competences** in an appropriate way:

> The new possiblities, technologies and applications must find their way to the **(future) creative work force**.

> Current arts programs at academies should include more **training of technical skills** and technical schools should give more attention to the development of people with **creative skills**.

The report makes some interesting observations about **creative entrepreneurship**, and how **media artists** might be looked at as **role models**:

> The role of the media artist: The rise of the media has only just begun. Today's and tomorrow's **interactive media applications** represent a significant part if the creative industry, where **co-creation** and **meaning** become crucial. Interactive art and design have created a valuable **expertise** and a rich **practice** in relevant fields of **human** or **user-centered** and **participatory** design. (p. 44)

Equally interesting is the importance the report attaches to **regionality** or **regional eco-systems**:

> Open or collaborative accross-discipline innovation in a **local eco-system** is a **winner**. (p. 44)

> The vision: We need the **creatives** for their contributions to realize the necessary **transitions** in **society** and **education**. (p. 46)

> It is our vision to create a world-class eco-system of the **creative sector**, by creating **coherence** between **knowledge centers** and the non-profit leaders in **regional contexts**.

And, again creating education for the creative industry is not something that should be done in isolation. Also for our curriculum **creative technology** in addition to the great variety of expertise in-house, we essentially need to cooperate with the partners in the local context, including saxion, syntens, and *de creatieve fabriek*:

> Collaboration is a way of life: **Cooperation** improves **creativity**, breeds industrial and cultural **innovation** and trancends fixed **patterns and structures**. (p. 47)

Evidently, from an educational perspective, we need the courage to look beyond the traditional boundaries of engineering and computer science.

The report makes also in very clear wording explicit how **creative research** differs from traditional academic research:

> Research of the creatives: Creative research is totally different from academic research, the techniques, the process, the results and the way these are appreciated. (p. 61)

And, again, the reports refers to the **media artist** as a **role model**:

> The contemporary **media artist** is a **researcher**, **designer** and **mediator** who is positioned in the **center of disciplines** and patches together knowledge fields and methods.

The **message** is simple and clear:

> Academic and creative research is destined to go hand-in-hand to **learn** and **benefit**.

In the local situation, that is the Netherlands, the report observes:

> In the Netherlands,..., we have many yet isolated **examples** of successful cooperation between **creative** and **scientific** research ...

We should keep in mind, according to the report:

> Creating **coherence** is key. (p. 63)

This directly points to the **relevance of (proper) education**:

> Cornerstones: education for a world-class knowledge and creativity to feed into the eco-systems. (p. 67)

The timeliness of the report, as well we hasten to add, the proposal for our bachelor **creative technology** is testified by the (in itself incidental) occurrence of the fact that the UE has announced:

> EU 2009: The year of Creativity and Innovation

The report concludes on that basis that:

> We are to develop outstanding **education programs**, combining **technolgy**, **research**, **business** and **design & art**. (p. 69)

Since, as the report states:

> Only if **young people** see career opportunities the **knowledge chain** can be closed again.

More in detail, the report proposes:

> Education and permanent learning (p. 71):

- Master programs will be developed allowing students to enhance their knowledge and experience in other directions, like a master for creative service design.
- In addition, we endorse collaboration between ICT and art colleges in the form of exchange of staff and students.

We wish to go a step further and start with a **bachelor**, to prime young people, with **fresh minds**. If not integrated from the start, the Dutch bureaucratic university and school systems might prevent such exchange to happen, even if only due to the perception of students that just come from high school, and still need to find orientation in their lives.

In conclusion, in the **iip/create** report, we find, so to speak, the **evidence** that our initiative to create a bachelor **creative technology** is not only timely, but also well-focussed, both in terms of **content**, as it deals with many of the issues relevant for the future owrkforce off the **creative industry**, and in **regional approach** where it is meant to strengthen the creative industry in the eastern part of the country, in close cooperation with a wide range of potential partners, supported, where needed, with what in Dutch may be called some *grootstedelijk elan*.

8.7 Initiatives in the Twente region [AE!! + G!! + Z!!]

AE:[not sure what is meant here??]

planetart, Enschede, Amsterdam

url: http://www.planetart.nl/

contacts: Kees de Groot (creative director), Viola van Alphen (managing director)

PlanetÀrt organizes festivals and events, also in the local twente context, often in cooperation with students from universities, as for example in the recent KunstVlaai, http://www.planetart.nl/kunstvlaai.htm

Initial contacts have been established for possible cooperation in the future.

de creative fabriek, Hengelo

url: http://www.creatievefabriek.nl/

contact(s): Sonja Warbroek (festivals en jeugd), Kees de Groot (Art Director en Ateliergroepen)

from the website: The Creative Factory aims on the one hand at a creative and sustainable re-development of (Twente) industrial heritage, and on the other hand to activate and stimulate the creative economy of Twente, by clustering mutually reinforcing companies, knowledge institutes, cultural organisations, artists, craftsmen and innovative entrepreneurs.

Initial contacts have been established for possible cooperation in the future.

syntens, Twente

url: http://www.syntens.nl/SYNTENS/Projecten/Innovatieprojecten

contact(s): Marco Strijks, Harry Bosch

from the website: Syntens, Innovation Network supports both regional and national innovatipn projects, by

- acting as a mediator between companies and organisations,
- organising workshops about hot topics,
- transferring knowledge from universities and higher education
- financial support for research and development

Syntens (Twente) is also involved in the TOP-arrangement, which helps students to become entrepreneurs, and contacts have been established for possible cooperation in the future

8.8 Professional Scenario(s) -- Creative Technology / New Media [AE:v0-new]

[This may be omitted, but I tought it useful to add them, when kept a reference in 3.5 BSC thesis, to this appendix should be included AE]

As an indication of possible professional roles, after obtaining the bachelor creative technology, we will briefly sketch the following scenarios:

- creative industry -- *in new entrepeneurial activities*
- product design -- *in healthcare and entertainment*
- communication -- *regonial/global media campaign*
- entertainment -- *new concepts in private and public settings*
- game development -- *serious games in education and corporate training*

***scenario* -- creative industry**

The *creative industry* is a somewhat wide notion, originally introduced by the Blair government to re-vitalise dormant industrial areas. After the success of Silicon Valley, and New York's Silican Alley, the model was adopted by among others Amsterdam and Berlin. In the *creative industries*, our students might take any of the following roles:

- *entrepreneur* -- creating business
- *creative genius* -- generating idea(s)
- *content author* -- to produce material(s)
- *technical developer* -- to write script(s) & program(s)

Despite the wide range of possible roles, whatever role is taken, however, our graduates will distinguish themselves by their level of technical expertise.

***scenario* -- product design**

In an evergrowing cosumer market, *product design* will be an area of active development. Dependent on the context of deployment, healthcare, entertainment, or home or office furniture, our students may be active in any of the following roles:

- *visual design* -- to give aesthetic appeal
- *concept development* -- to accomodate human needs
- *usability & deployment* -- making it fit for it's role
- *evangelist* -- to promote the (benefits of the) idea

Despite the wide range of possible roles, whatever role is taken, however, our graduates will distinguish themselves by their level of technical expertise.

***scenario* -- communication**

Tradional communication models, in broadcasting and advertisemt, are gradually being replaced by multimedia strategies, involving the internet and crossmedia in an essential way. In such media endeavors we may find our students active in one of the following roles or departments:

- *web developer* -- setting up portal(s)
- *crossmedia architect* -- relating all media
- *production agency* -- to coordinate delivery
- *strategic planning* -- defining targets and goals

Despite the wide range of possible roles, whatever role is taken, however, our graduates will distinguish themselves by their level of technical expertise.

***scenario* -- entertainment**

Entertainment is an everlasting source of revenue for innovative enterprises. In our society the technical opportunities for entertainment are abundant, both in an urban and private setting. Our students may work in the area of entertainment in one of the following roles or fields:

- *concept design* -- defining new artefacts
- *technical infrastructure* -- for realization
- *business plan* -- to coordinate the enterprise
- *production manager* -- mediating between parties

Despite the wide range of possible roles, whatever role is taken, however, our graduates will distinguish themselves by their level of technical expertise.

***scenario* -- game development**

Games are increasingly beong recognized as valuable tools in an educational environment, and coprporate learning. With the growing attention for *serious games*, it becomes likely that we will find our students active in *game development*, in either one of the following roles or activities:

- theme(s) & storyline(s) -- *setting the context*
- style & visual(s) -- *creating the appeal*
- asset development -- *to embody the game*
- interaction & experience design -- *to promote involvement*

Despite the wide range of possible roles, whatever role is taken, however, our graduates will distinguish themselves by their level of technical expertise.

8.9 Description of the CreaTe Bachelor Courses [all]

8.10 Key figures in CreaTe Education [all]

9 References [AE:v01 + Z!! +J!!]

Background material

[Human08] -- BEING HUMAN HUMAN-COMPUTER INTERACTION IN THE YEAR 2020
Edited by Richard Harper, Tom Rodden, Yvonne Rogers and Abigail Sellen
is available from: http://research.microsoft.com/hci2020 (see **Appendix X**)

[IIPCREATE08] -- ICT Innovation pPatform -- Creative Industry, presented at ICTDelta, 8 may 2008, Utrecht, available from: http://iipcreate.nl , pressrelease at http://iipcreate.waag.org , (see **Appendix X**)

[Facets06] -- FACETS OF FUN -- On the Design of Computer Augmented Entertainment Artifacts, Sus Lundgren, Department of Computer Science and Engineering, Chalmers University of Technology and Göteborg University, 2006, available at:http://www.cs.chalmers.se/%7Elundsus/lundgren_facets_of_fun.pdf

Technical books

[Web20] -- Professional Web 2.0 Programming, Eric van der Vlist, Danny Ayers, Erik Bruchez, Joe Fawcett, Alessandro Vernet, Wrox Professesional 2007

[Animation] -- Foundation Actionscript 3.0 Animation: Making Things Move, Keith Peters, FriendsOfED, 2007

[VisualComputing] Nielsen F. (2005),
Visual Computing: Geometry, Graphics, And Vision, Charles River Media

Theoretical books

[DeepTime] Zielinski S. (2006),
Deep Time of the Media -- Towards an archaeology of Hearing and Seeing by Technical Means, The MIT Press
[Remediation] Bolter J.D and Grusin R. (2000),
Remediation -- Understanding New Media, MIT Press
[Semiotics] Kress G. and van Leeuwen T. (1996),
Reading Images: The Grammar of Visual Design, Routledge
[InformationArts] Wilson S. (2002),
Information Arts -- Intersections of Art, Science and Technology, The MIT Press

Selected papers

[WebDossier]
Eliëns A., Wang Y. van Riel C. and Scholte T. (2007), 3D Digital Dossiers -- a new way of presenting cultural heritage on the Web, In Proc. Web3D 2007, ACM SIGGRAPH, pp. 157-160

[Serious]
Eliëns A. & Chang T., Let's be serious -- ICT is not a (simple) game, FUBUTEC 07, Eurosis, Delft, April 2007

[SecondLife]
Eliëns A. Feldberg F., Konijn E., Compter E., VU @ Second Life -- creating a (virtual) community of learners, In Proc. EUROMEDIA 2007, L. Rothkrantz and Ch. van der Mast (eds), pp. 45-52, Eurosis-Eti Publication

[Mashups]
Eliëns A. Feldberg F., Konijn E., Compter E., Mashups in Second Life @ VU, In Proc. GAME-ON 07, Nov 20-22, University of Bologna, Marco Roccetti (ed.), pp. 130-134, EUROSIS-ETI Publication

{Climate]
Eliëns A., van de Watering M., Huurdeman H., Bhikharie S.V., Lemmers H., Vellinga P. , Clima Futura @ VU -- communicating (unconvenient) science, In Proc. GAME-ON 07, Nov 20-22, University of Bologna, Marco Roccetti (ed.), pp. 125-129, EUROSIS-ETI Publication

[Aesthetics]
Eliëns A. and Vyas D., Panorama -- explorations in the aesthetics of social awareness, In Proc. GAME-ON 07, Nov 20-22, University of Bologna, Marco Roccetti (ed.), p. 71-75, EUROSIS-ETI Publication

Online references

learning material and tutorials:
There is a great number of tutorials and information sources online, a small (non-representative) selection is given here, merely to illustrate the variety of these resources:

- lindenmayer systems -- http://www.biologie.uni-hamburg.de/b-online/e28_3/lsys.html
- web technology -- http://www.w3schools.com
- google labs -- http://labs.google.com
- media theory -- http://networkcultures.org/wpmu/krant

inspiring examples of media art:
There are too many examples that may provide an inspiration, one way or another, to mention or even categorize. Again, a non-representative selection is given:

- early web art -- http://wwwwwwwww.jodi.org
- digital art -- http://www.digt-paint.nl/digital_view
- local festival(s) -- http://www.planetart.nl/
- information art -- http://www.wefeelfine.org

resources for smart systems technology:
There are ample resources describing technology and projects that somehow mix smart technology and new media. These include:

- sensor technology -- http://www.phidgets.com
- magic lenses -- http://www.deutsche-telekom-laboratories.de/~rohs/wikeye
- interacive spaces -- http://roomwareproject.org
- intelligent displays -- http://idisplays.info

events – creative business, research and technology:
Here we list some examples of (past and upcoming) events that are, one way or another, related to creative technolgy.

- Gaming & New Literacy 2008 -- http://www.ugame-ulearn.com/nl
- ICTDelta 2008 -- http://www.ictdelta.nu/programma
- CTIT 2008 (UTwente) -- http://www.ctit.utwente.nl/ctit_symposium_2008
- PICNIC 2008 (Westergasfabriek, Amsterdam) -- http://www.picnicnetwork.org