INTO THE FUTURE OF NETWORKED EDUCATION

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Abstract

Modern communication and information technologies have offered educators a range of new and exciting possibilities to design their instruction. On the upside, Cybereducation holds many promises for the student: more freedom, more and more readily available resources, more diversity, and more flexibility. On the downside we note that education may become dehumanized and students may drown in a sea of information. This chapter discusses our view of the future of Cybereducation.

The first part describes and discusses a recent experiment in Cybereducation: the *Virtual Learning Company,* a distributed, virtual learning environment, which aims to bridge the gap between education and professional working. Although it makes extensive use of advanced information and communication technologies, the true innovative power of the *Virtual Learning Company* lies in the underlying, new educational framework.

The second part of this chapter is far more speculative. Starting from a number of presumed technological innovations we reflect upon the future of Cybereducation at large. We surmise that the decisive factor is the kind of impact we allow technology to have on the fabric of our society.

Keywords
Cybereducation, education, Cyberspace, virtual reality, Virtual Learning Company, virtual business teams, knowledge society, knowledge worker

1 Knowledge, knowledge, knowledge!

Education and the rest of society are highly interdependent. Clearly, as society changes the educational system has to change accordingly. The most striking challenge facing educators in the 21st century is to meet the demands of the information society that we're building right now.

In the 1970s the term *information society* was introduced (Toffler 1980) to describe the transition to a new era following the agricultural and the industrial eras of the past. Similar concepts are *knowledge-driven economy*, *knowledge-centered economy* or, briefly, *knowledge economy*. The term 'information society' and its cognates refer to the ever-growing importance of knowledge as a production factor: to deliver some product or service requires an increasing amount of knowledge. For example, from a purely material perspective, a modern automobile hardly differs from an ancient wagon. But while wagons are easily put together out of relatively simple components, for its production a modern car relies on a variety of advanced parts, such as hydraulic systems, electronic circuitry with embedded computer software, etc. In the production of these parts went a lot of knowledge, adding costs. Through this 'added value', the prices of modern products reflect the required knowledge rather than the cost of raw materials.

Now, new information technologies but amplify the impact of the immaterial, knowledge-rich components. Increasingly, people can be labeled *knowledge workers*, applying their expertise without any direct material impact. The impact of knowledge on society is reflected in contemporary terms like the *learning organization*, *knowledge-centered business*, *smart products, expertise centers*, *lifelong learning* etc. Educators cannot afford to wait and see. They should rather try to anticipate changes and develop new ways of

teaching to fulfill the new demands and conditions. This paper will be our contribution to reaching that objective.

In the first part of the chapter, we will describe an innovative educational model called the *Virtual Learning Company*. This model we developed and implemented at the Open University of the Netherlands in an attempt to answer to future challenges (sections 2 and 3). Briefly, the *Virtual Learning Company* is a distributed, virtual learning environment that embodies the functional structures of veracious companies; it offers students a rich and meaningful context that resembles the context of professional working in many respects; it aims to bridge the gap between education and professional working, between theory and practice, between knowledge and skills. We consider the *Virtual Learning Company* as a state of the art example of Cybereducation.

In the second part of the chapter we will identify and discuss a number of trends that affect the society of the future (section 4), and subsequently attempt to evaluate their impact on education. We'll do this mainly by extrapolating from our experiences with the *Virtual Learning Company* (section 5). Finally, by way of wrapping up our story, we'll formulate our main conclusions and the considerations that prompted these conclusions in an epilogue (section 6).

2 Higher education and the knowledge economy

One of the most striking problems in current (higher) education is its poor match with professional practices. Both employers and graduates publicly question the appropriateness of higher education programs. Apparently, graduates acquire an overdose of theoretical knowledge which does not match well with the demands of workplace practice (Barnett 1994). Also, the large numbers of student drop-outs reflect the inadequacy of many current pedagogical models. Lecture-halls, bulging with hundreds of students, can hardly be considered a testimony of a sophisticated pedagogy.

In our post-industrial era, the lasting flow of technological innovations has given rise to profound and continuously changing demands upon employees. Today, employees can no longer be considered ignorant laborers who perform routine jobs. Modern employees represent the business' human capital (Walton 1985), a terminological shift that aptly illustrates their altered role. They are expected to be pro-active, enterprising, responsible and self-reliant professionals. Society needs competent and flexible team players who are able to apply and share their expertise in service of shared goals (Barnett 1994, Walton 1985) and to adapt their expertise and competencies continually to new insights and developments. Clearly, learning cannot stop at the phase of initial education any longer.

Such developments call for a rethinking of the objectives education should pursue, indeed of its entire design. Yet, one should realize that the introduction of new technologies *per se* hardly qualifies as fundamental pedagogical change. If anything, the altered outward appearances of education are likely to obscure the traditional pedagogical patterns that still underpin the educational system (Kaufman 1998). A true educational innovation should start with pedagogy, technology being a mere, admittedly important, enabling factor. This has been the premise underlying the innovative educational model of the *Virtual Learning Company*, which we'll describe below.

3 The *Virtual Learning Company*

The *Virtual Learning Company* offers an Internet-based, networked learning environment that closely reflects the functional structures of real companies. Students in the *Virtual Learning Company* take up professional roles and run the business, that is, they deliver

knowledge-centered products and services to authentic, external customers. The approach essentially differs from regular role-playing games, practicals, simulations and various forms of apprenticeship learning in that its processes do not reflect predefined scenario's and outcomes. In the *Virtual Learning Company* students are in charge of a business system that freely interacts with the outside world. The educator's role reflects that of an in-company training coordinator: it is restricted to facilitating, monitoring and supporting the competence growth of the 'employees'. The *Virtual Learning Company* strives to bring together the contexts of education and work. It attempts to offer a concrete and meaningful environment that closely resembles the students' future workplaces.

Figure 1 The logo of the *Virtual Learning Company*

The *Virtual Learning Company* is built on two entirely different but strongly interdependent processes. First, in the educational process novice students are transformed into competent students; second, in the business process the students act on orders of external customers and turn them into knowledge-centered products and services. This duality is not unique to the *Virtual Learning Company*, it strongly matches modern ideas on knowledge-centered businesses (Nonaka et al. 1995), the importance of human capital, human resource management, performance improvement and personnel development, and work organized through virtual business teams (Coleclough no date). The difference between a regular business run along the lines of these ideas and the *Virtual Learning Company* is one of goals and means: whereas in the *Virtual Learning Company* orders (student assignments) and products are a means towards the goal of learning, in the real world the situation is reversed.

When setting up a virtual learning company in any domain, the starting point always is the construction of a *competence map*: an exhaustive inventory of relevant competences, their interrelationships, contributing parts and performance criteria. Such competence maps are obviously domain specific. Table 1 shows part of the competence map for a consultant who works in an environmental consultancy firm. Generally, the competence map is the linking pin between the educational and business processes. It provides a language by means of which the entry level, the progress and the exit level of students may be assessed; it also provides a language by means of which orders (assignments) may be characterized.

Element	*Performance criteria*
Stay on top of new developments in the content field, particularly those that concern the firm's core competencies.	Report (for instance to the firm's knowledge management system) new developments in the environemental field, particularly those in his own area of expertise.
	Report to the management team in what new directions the firm should evolve, if at all.
Stay informed about the competition's strength and weakenesses, and policy changes.	Report to the firm's management the strengths and weaknesses, and policy changes of the firm's principal competitors.

	Formulate an opinion on how to keep a competitive edge in the face of changing competition.
	Justify an opinion on how to keep a competitive edge in the face of changing competition.
Stay informed about those shifts in the political and socio-economical arena that determine the type of problems customers will commission.	Formulate an opinion on how to keep a competitive edge in the face of emerging socio-political and economical trends.
	Justify an opinion on how to keep a competitive edge in the face of emerging socio-political and economical trends.
Strike a balance between a client's and the firm's interests.	Accept those and only those projects that generate both a profit to the firm and customer satisfaction.

Tabel 1 Excerpt from a competence map (regarding the competence unit Acquisition) for an environmental consultant

The intake of a new student ('employee') results in the student's initial competence profile, showing performance levels and competence gaps; next, for each individual student a long-term 'career plan' is put together, formulated in terms of competences to be acquired; it forms the basis for future task assignments. Similarly, for each order the intake produces a competence profile that serves as an identifier for the competences involved. Business tasks are then allocated between tasks and students by matching for the completion of the assignment required competences with competences pursued by students (Westera, Sloep & Gerrissen 2000). The competence-based performance monitoring and assessment include methods for self- and peer-assessment as well as traditional tutor-controlled evaluation procedures. Eventually, relevant information for each student is collected in a personal portfolio that is used for establishing and formalizing attained performance levels.

Being essentially a learning environment, the *Virtual Learning Company* has at its disposition outstanding competence-related facilities to improve individual performances. These facilities include relevant sources of information, instructional materials, individual coaching and extensive training facilities, all of which are available just-in-time.

The actual design of a virtual learning company is extensively described in Westera, Sloep & Gerrissen (2000). So far, we've run a number of pilots with the *Virtual Learning Company* in the areas of environmental consultancy (Sloep et al. in prep) and information technology. More instantiations are projected for serving not just academic curricula but also vocational training.

3.2 The pedagogy underlying the *Virtual Learning Company*

However much the *Virtual Learning Company* may make use of computer networks and other technological innovations, its true innovative power lies in its underlying pedagogy. What are those pedagogical principles? Our discussion here will necessarily be limited. For a more extensive description of the philosophy and educational design principles underpinning the *Virtual Learning Company* we refer to Westera and Sloep (1998).

Competence learning rather than reproduction of codified knowledge
Traditionally, knowledge is seen as a distinct cultural asset, at a remove from the every-day real world. It is represented by explicit, codified, formal and often strongly hierarchical

structures, preferably stored in written texts. This tradition perceives education as the mere transfer of such knowledge.

As important as codified knowledge may be, crucially, it forms only part of the knowledge that is needed to cope with complex, authentic situations. To achieve that, another kind of knowledge comes into play that cannot be separated from its operational context. Such informal, ill-articulated, implicit or tacit knowledge cannot be expressed precisely in texts or in any other (formal) symbol system (DiSessa 1977); it is only attainable by profound experiences (Kolb 1982). The *Virtual Learning Company* facilitates the acquisition of such informal knowledge by immersing students in an environment with a natural complexity that they are asked to explore, taking full responsibility for their own doings. They work closely together in teams, continually testing their own experiences against those of others. Such a learning environment ensures valuable learning experiences, supporting the acquisition of informal, implicit knowledge associated with practical situations. Naturally, a large variety of codified resources is also available, via the *Virtual Learning Company's* knowledge management system.

Custom-made education rather than boring uniformity
Most educational programs are developed to serve cohorts of students that share a number of characteristics (age, place of residence, interest, prior knowledge, etc.). Usually, form and content of these programs are chosen to serve some average student showing the average of the characteristics mentioned. In practice, however, all students are different, showing different capabilities, attitudes, learning needs, learning styles, motives, etc., few matching the average student's profile. What can a student do in such a rigid, uniform system but slavishly attend the pre-arranged program? We should not be too surprised about the high numbers of drop-outs.

The *Virtual Learning Company* offers flexible, custom-made educational programs that address individual needs, capabilities and ambitions. Students are encouraged to develop their talents via individualized task assignments. The very heterogeneity of student groups is used to create a complex social environment that allows students to get acquainted with multidisciplinarity, cognitive adaptation and changes of perspective.

Student-control instead of teacher-control
Traditionally, educational processes are fully controlled by the teacher. In contrast, the *Virtual Learning Company* fosters a relationship between educators and students that differs significantly from common patterns. The openness and authenticity causes the teacher's control on what, how and when students learn to become much reduced. Students are assumed to be self-reliant and independent agents responsible for running the virtual business (*cf* Table 1, item 5 in VanderVert, this volume). The teacher's controlling role has been replaced by the role of a coach who coordinates the intake and monitoring processes, and assesses student progress. The educators' efforts to improve the effectiveness and quality of the learning processes is as much as possible directed towards improving the support structure and only very rarely takes the form of direct interventions.

Closing the gap between *learning and working*
Though education aims to prepare individuals for their working life, most educational contexts are self-contained, closed systems, literally shielded from the rest of society by walls and fences. It looks as if students are deliberately kept in quarantine until they manage to pass their exams, in order to avoid premature contamination with the real, outside world. In the *Virtual Learning Company*, this artificial barrier is removed in two ways. First, reality is imported by modeling the learning environment after the structure of modern, real companies (Van Petegem et al. 1999). Second, students are incited to interact with external customers, external resources and external experts, as a part of performing their learning tasks. This way the *Virtual Learning Company* bridges the traditional

demarcation between education and society at large. It also undergirds the ambitions of life-long learning, in that it facilitates the integration of learning and working environments (Walton 1985).

In summary, we consider the *Virtual Learning Company* a state-of-the-art model of innovative education at the start of the new millennium. From our various pilot studies we conclude that virtual learning companies are a powerful and promising tool to meet today's educational needs, anticipating a worldwide shift to Cybereducation. Naturally, future developments in technology and society will make new demands on education and force us to redesign the *Virtual Learning Company*, or perhaps even force us to abandon it entirely in favor of more powerful and suitable educational models. In the next sections we'll try to anticipate those changes.

4 Identification and evaluation of future trends

Whoever attempts to predict the future, almost by definition skates on thin ice. Any visionary statement about our future society may easily be associated with crystal-glazing, blank guessing or hobbyhorse riding, be it the prediction of stock market quotations, the apocalyptic end of times or the characterization of future education. An occasional success may readily be overrated by the public and the lucky prophet may quickly gain the status of cherished guru who's article of faiths are blindly mistaken by utter truths. Our moral? It would be naive to advocate the benefits of Cyberspace and the knowledge economy unconditionally. No one can tell how these will develop over the next decades nor what its impact will be. The only certainty at hand seems to be that both will develop along unforeseen lines.

Yet, we have to look ahead and so we will. In the remainder of this paper we'll try to identify and evaluate some major trends and, subsequently, discuss its impact on the models of education. Though speculative, this evaluation is critical and substantiated. Our starting point will be a number of solid trends in information and communication technologies.

4.1 Technological change

During the last centuries, technological innovations have proven to be one of the most prominent driving forces of a changing society (*cf*. Toffler 1980). Recent examples are the broad range of information and communication technologies that have become available during the last decades. Around the turn of the century, computers and computer networks have acquired a prominent position in many areas of the economy. Decreasing prices of personal computers and the development of various kinds of productivity software have accomplished high penetration factors in the domestic markets. Faster processing chips and further miniaturization of memory allowed user-friendly graphical screen interfaces that leveled out existing barriers for users. Finally, the boom of the Internet, connecting people via world-wide networks of computers, seems to mark a new era of human communication.

Using the present state of the art as our benchmark, it isn't all that risky to predict the following *technological* developments:

Full accessibility
Though large parts of the world are still excluded from access to the Internet, in the near future communication will be possible with anyone all over the world, at any time, at any place. Mobile communication will be globally covered and an immense amount of information will be instantly retrievable from any database. Note that we leave out here the

social equity question of who will be able to afford full access, which is a major issue not only for the developing world but also for the new poor in the developed world.

Large bandwidths
Constraints to the transfer of data will gradually be removed. In almost all countries of the world projects are underway to increase bandwidth, both within nations as between them. Therefore, truncated ways of mediated communication like chat, news (NNTP) or even (Internet) telephony may soon become obsolete remnants of immature technologies. Full-color live video may become a baseline standard for networked communication, thus better meeting the requirements for natural, human interaction with both verbal and (be it always limited) nonverbal cues.

Embedded software
Increasingly, objects - be it buildings, consumer goods or live stock - will be equipped with embedded software (ubiquitous computing) and will be assigned an IP-address (the now famous Trojan Room Coffee Pot at Cambridge University's computer lab, which went on line as early as 1994, may count as a first instance: *<http://www.cl.cam.ac.uk/coffee/coffee.html>*) so as to make them uniquely identifiable. The actual status and associated data of such objects can be called at will, making them available for direct interaction. Such a trend marks the shift from a central database approach to a local data approach: it implies a shift from the idea of centralized control and coordination to that of distributed, autonomic agents in a network. In fact, it is the technological counterpart of the pedagogical notion of the student's autonomy.

Intelligent agents
In the 1980s, the accomplishments of artificial intelligence have been disappointing (Russell and Norwig 1995). By no means, the high hopes for knowledge systems and expert systems one then entertained, were fulfilled. However, at present, a modest revival of the artificial intelligence field can be observed. As an extension of the use of embedded software, many objects will be equipped with *intelligent agents*, software 'objects' that reside in networks or pieces of software and autonomically fulfill various functions: self-diagnosis, communication and coordination with other objects, data processing, screening, decision support, *et cetera*. Shortly, any individual will experience the support of many personal agents in everyday life.

Virtual reality
More and more, multi-sensorial interfaces will become available to represent Cyberspace. Full 3-dimensional graphic environments equipped with 'surround-sound' systems, olfactory devices producing the right odors, and electromechanical devices simulating touch and force feedbacks will provide users with breath-taking experiences measuring up to or even surpassing the experiences of real life. Virtual reality not only presents sweeping experiences over distance and time, but also holds the promise of supplanting our present reality[1].

Using these technological trends as our starting point, we will elaborate on their supposed implications for society. For our purposes we address four major issues:
- The dematerialization of human activity
- The dehumanization of communication
- The inescapable information chaos
- The ideals of Cyberspace under attack

4.2 The dematerialization of human activity

An increasing number of processes and operations are becoming software-driven. Hence physical reality is gradually being replaced and controlled by its software-counterparts. One may call this the dematerialization of human activity. It is not only the traditional card-trays that have been replaced by computer files and databases, also an increasing number of

manufacturing and maintenance processes are largely controlled and carried out now without any physical exertion whatsoever. Maintenance and repair of products like cars and TV-sets (do we still need these?) will primarily become a matter of reprogramming the systems; smart software for self-diagnosis of such products may even autonomously decide to download and install relevant updates without any interference of humans; faulty hardware will simple be replaced, rather than repaired, reflecting the relative costs of the hardware and the software ('knowledge-ware').

Cyberspace will also add to reality, by complementing it with various virtual realities. Cyberspace thus has the capacity to greatly enhance our mental horizons, opening up an infinite and unprecedented reservoir of individuals, knowledge, experiences, services and chances. This virtualization of reality will deeply influence our society and the way it functions (Benschop 1997; Smith and Kollock 1999). So far, technology has been applied to support many primary functions (food, shelter, health, even sex), but now technology will force a radical change of the human habitat by overcoming the restrictions of time and space.

This extended reality that Cyberspace offers us, generally reduces the importance of physical performances in favor of mental functioning. In Cyberspace, performances of the mind, including expertise, cleverness, communication skills, persuasiveness, reasoning and the like are the dominant determinants of human functioning. Ever more, genuine physical powers are becoming trivial. In Cyberspace, our physical powers may bear no relation to physical powers in the real world, only to the powers of our imagination, as the motion picture the Matrix shows (Wachowski and Wachowski 1999).[2]

Perhaps, the great public interest in sports - that is, watching sports, not practising – is a mere powerless convolution of our reduced physical ambitions. Watching sports offers a collective excuse for our physical clumsiness. Sports resemble a dying-out circus act that implicitly reconfirms the latent but unreachable possibilities of our own bodies. It represents a projected and over-romantic desire to bygone days, when our physical capabilities were decisive to survive. If our analysis is true, the advent of Internet sport is only a technological innovation's length away. To some extent, we do already witness such events in networked games. In such games survival is no longer a matter of physical power, the human body loses value.

Cyberspace thus offers outstanding possibilities to transcend the human body, while entering a world that is completely controlled by the mind. One could say that Cyberspace matches quite well the human striving for immortality – the everlasting mind leaving the deteriorating body. This brings Cyberspace on a par with spirituality, religion and superstition. Have we found here a clue to why surfing the Internet is so popular and addictive? Altogether, this makes the virtualization of reality and the associated dematerialization of human activity a self-fulfilling prophecy.

4.3 The dehumanization of communication

Cyber-adepts make much of the democratic or even anarchistic nature of the Internet, the inexhaustible source of information and the unlimited possibilities to meet people from all over the world. Yet, as in many other situations, quantity may easily go at the expense of quality. It is hardly thinkable that any inhabitant of Cyberspace will be able to handle the enormous flow of messages in a sensible way. But more importantly, the dehuminization of Cyberspace communication will very likely affect its very function.

Consider the role intelligent software agents may play. In communication, they fulfill the role of reliable and servile personal assistants who filter out important messages and information, arrange appointments, draw attention to pending and upcoming events, send appropriate replies to standard questions. Many software applications already show intelligent or semi-intelligent behavior in the tasks they perform. Think of webbots, text correction routines, installation wizards, handling routines, mail filtering software, et cetera. Within a few years it will be common practice that individuals are permanently assisted by

various intelligent agents. Though initially, such agents have to be adjusted to match the desired personal profiles, they will gradually learn in practice to improve their functioning. Ultimately, personal agents may become an inseparable part of someone's personality. Their filtering or shielding role will drastically affect communication in Cyberspace. It is quite conceivable that in the end we largely communicate by proxy, through the intervention of our personal intelligent agents. Communication thus has become severed from the communicator.

To some extent, entering a new community offers the possibilities of brushing up one's personal characteristics: people may pretend to be smarter, handsomer, wealthier than they really are. This is not an uncommon pattern in ordinary life, but in Cyberspace such metamorphoses will be easier, and probably more frequent and more radical: using e-mail, no one can tell whether you are a women, a man, a doctor, a millionaire or a murderer. This kind of deception is not something to be taken lightly, particularly since pretense is such a fundamental side of human nature. Communication in Cyberspace may degenerate into a mere exchange of figments of imagination, more seriously, people might fall victim to deception.

New supportive software for speech processing will widen the possibilities for deception. The advent of text-to-speech convertors and speech–to-text convertors divorce the content from the modality of a message: the days you may mail a message by speaking it into your digital cellphone are almost there already (*cf* Dorner in Engst 2000). Combined with real time translation software, one day we may even adopt a different cultural identity. Yet, according to Heydt, (1980) citing Cassirer, and McLuhan (1964), conversion from one symbol system to another inevitably results in distortion of the message. To avoid such conversion losses, senders of messages will reduce their texts to pointed, rational and unambiguous statements that avoid any layers of connotative meaning. Rich and embellished communication as well as informal and spontaneous communication will gradually disappear from Cyberspace, because any message, be it spoken or written, may be logged. Mistrust, caution and distance will dominate the cyber-relationships. Clearly, these factors will severely impoverish our communication and our language .Communication, one may argue, has always run the risk of going awry. However, in natural, non-mediated communication systems there's always the non-verbal component that give's away the sender's true intentions. In mediated communication the non-verbal is much less prominent, if not lacking at all. In an e-mail message, for instance, emotional constitutions can only be communicated through deliberate actions, be they texts ('O, I am so happy', 'hahaha') or emoticons: ;-). But this way, the emotion that is implicit in our ordinary communication only gets communicated by first making it explicit. Consequently, the receiver has to be on guard when accepting the emotion, as there is virtually no means to check the sincerity of the sender. Conversely, a simple factual statement like 'You're wrong' may easily be mistaken for 'flaming' by the receiver, as diplomacy and prudence heavily also rest on nonverbal and connotative cues.

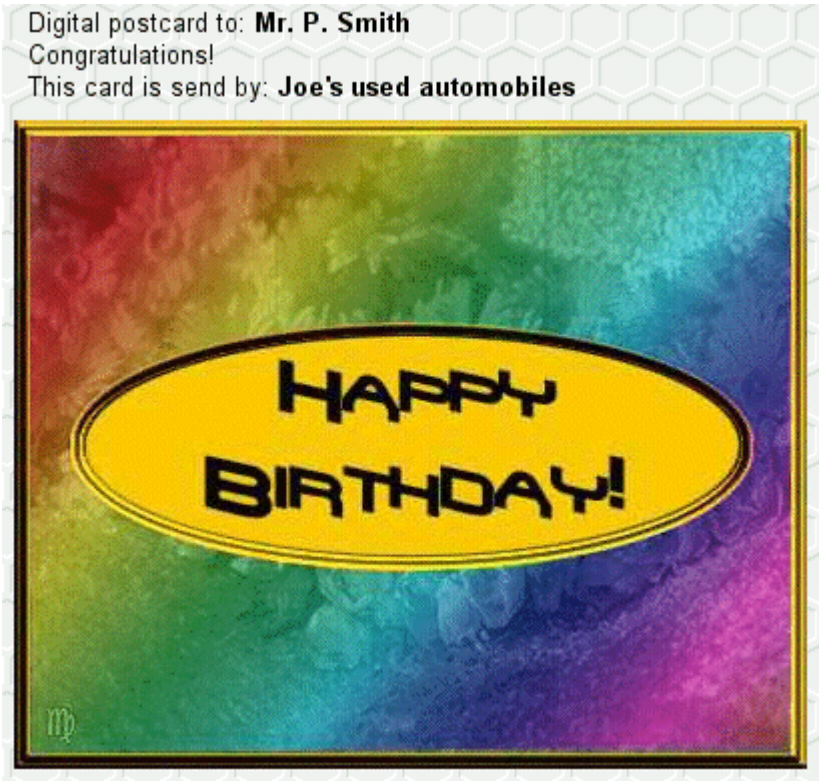

Figure 2 Automated thoughtfulness

So communication in Cyberspace is severely curtailed by the lack of authentic emotional stimuli. This opens the door to all kinds of deception. Consequently, all communication, even if it is restricted to the factual, lacks the qualities that allow one to easily check its reliabilty. The only exception to this would be communication between people who already know each other; they will judge messages on the basis of prior knowledge. Although this severly restricts the size of the community in which one may reliably communicate, Cyberspace does allow for more intense and frequent bouts of communication within this restricted community.

Hence, interestingly, the quantitative increase in communication possibilities the Internet affords seems to be offset by the diminished quality of human communication. If true, this would be one of the major paradoxes of Cyberspace.

4.4. The inescapable information chaos

In Cyberspace, all means of production are democratized. This is one Cyberspace's most fundamental and commended characteristics. While information is the key product in Cyberspace, any individual can be consumer and supplier at the same time. Today, the building and publishing of a web-site that makes information available world-wide, is a piece of cake. Consequently, Cyberspace is inherently multi-faceted, showing a wide variety of information suppliers, from respected institutions to smart swindlers, from recognized professionals to well-intending amateurs. Yet, the more information becomes available, the harder it gets to access the right information. Finding the right catchwords for search robots can be tricky, and by the associative hyperlink structure of Cyberspace people may easily arrive at answers to questions they did not ask. And even when, in the end, suitable information has been found, it is hard to verify its correctness or reliability.

Negative effects of this information explosion have been observed before, in the last century, when the advent of radio and television brought about a radical change of society.

In their need to achieve high viewing ratings, the networks anxiously avoid any profundity: entertainment is the key issue. Consequently, traditional achievements in the realms of literature, theatre, science, and history have become lost in a flood of superficial and manipulated facts that are being emptied out over the people (Baudrillard 1995; Postman 1986). It is the chaotic presentation of the one triviality after another that fosters the construction of a primitive and fragmented view of the world. Individuals get highly disoriented and confused in this complicated and obscure world that seems to lack any structure. Now, the cyber-revolution amplifies these effects. Not only the amount of information has for all practical purposes become infinite, the computer-mediated observation of the world is so drastically clipped and distorted that it can only produce a further truncated, extremely abstract and detached world view. The reality of the world may thus easily become mixed with the virtuality of playing a computer game, and people become hopelessly confused in a mix of reality, virtuality and fantasy. As a consequence, people will no longer be intrinsically affected and connected deep-down by their experiences, nor will they be able to form critical opinions. Individuals will indiscriminately use new, isolated facts without being able to position and consider these facts within a larger frame of reference. For these reasons, Cyberspace may be regarded the next step in people's alienation from everyday's reality.

We might invoke help to master the information flow. As discussed before, personal intelligent agents will be happy to assist us and promptly search for relevant facts when needed: the capital of France? Paris! Britain? London! Why should anyone be obliged to learn these facts by heart so painfully? It is evident that the classical ideal of erudition or scholarship would better be replaced by a system that values higher order insights (What is a country? What is a capital?) as well as skills and competences to categorize, handle, and understand information. Perhaps, the scholar itself will gradually become a relic of ancient times, just destined to perform its tricks in a television show. Indeed, intelligent agents may compensate our factual ignorance and thus reduce the need for reproductive knowledge. Yet, from an ethical and ideological point of view, it may well be undesirable that we hand over the search, selection and evaluation of information to automated, preprogrammed devices. In the end, it is us who remain responsible.

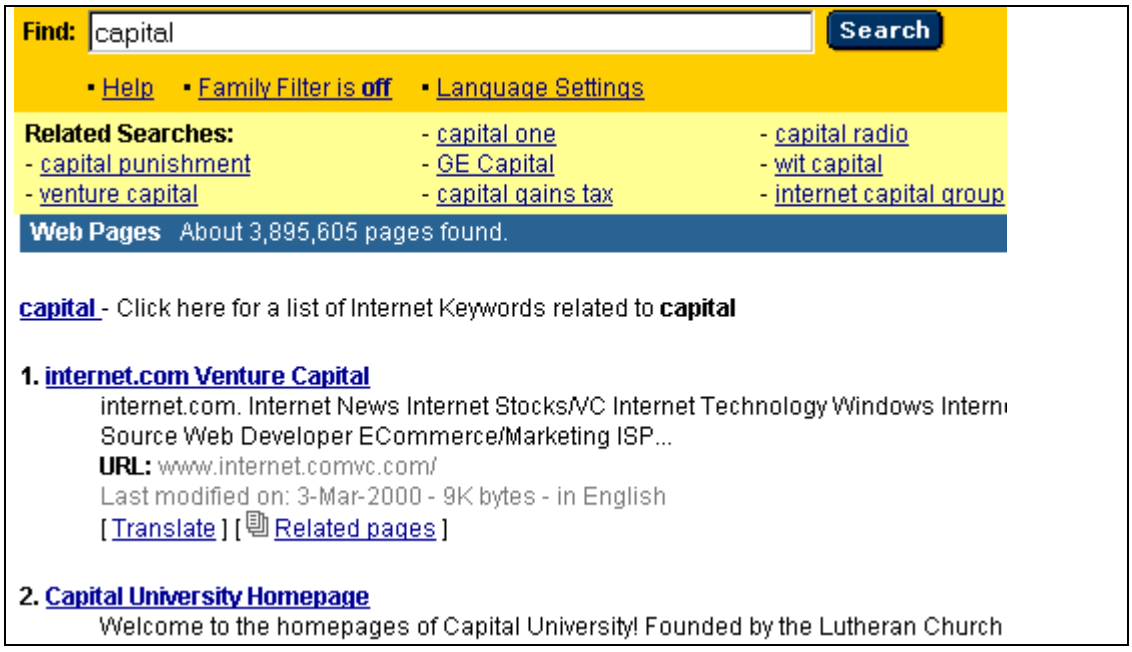

Figure 3 A tidal wave of information

One could propose a role for knowledge institutions here, be it schools, universities or research laboratories. These could act as managers of certified knowledge by maintaining

and building knowledge databases. Applying such a system of certification would help to guarantee the quality of the knowledge to the users. Yet, one can hardly imagine that such a centralized, almost totalitarian mechanism would flourish within such a decentralized and anarchistic community like Cyberspace. More seriously, it would eliminate the individual's need to think independently and critically in favor of the rash acceptation of knowledge on the mere basis of authority. Knowledge itself would become a matter of belief and indoctrination rather than a matter of insight and understanding. Such authority-based patterns would be a severe threat to democratic values and it would conflict with many of Cyberspace's other fundaments.

Curiously, the main problem of the information society seems to be the information itself. Though information is the key asset of the cyberworld, it becomes increasingly difficult for individuals to handle it in a sensible way.

4.5 The ideals of Cyberspace under attack

Initially, the Internet advocated the idea of a better world by absolute anarchy (North 1994). Equality, unlimited freedom of speech, thought and choice were the key concepts of this new transnational community; a utopia where power and control, if needed at all, would be distributed among all its inhabitants. These premises fit quite well into the 1990s' spirit of responsible, independent and mature individuals in egalitarian communities. Indeed, many of these ideals have been realized. The cyber-community is highly autonomic and self-regulative, and offers its inhabitants boundless possibilities for individual exploration and mutual exchange of ideas (Berners-Lee 1999)[3]. Yet, this idea of a better world is rapidly being undermined.

Social alliance in Cyberspace is not to be compared with social alliance in real life. We don't want to claim that enduring, solid relationships are at all impossible in Cyberspace, but the majority of contacts are relatively brief and superficial. Cyber-communities have relative short life cycles and show rapidly changing compositions (*cf* Smith and Kollock 1999). Entering and leaving such communities is about as easy as 'zapping' from one TV-channel to another. This indeed increases the individual mobility, self-reliance and independence, but it also hampers the construction of enduring associations that truly offer collectivity and safety.

One may argue that this only is a reflection of the immaturity of the Internet. However, superficiality seems to be a wider trend in society. It is for instance evidenced in the trend that life-long employment is gradually being replaced by flexible, short-lived engagements. In addition, companies in the knowledge economy are increasingly forced to subcontract external experts temporarily when needed. A similar pattern can also be observed when companies setup temporary consortia to realize project development. It seems that Cyberspace closely resembles a new housing estate: the more people to meet, the less interesting or enduring the contacts are. It is questionable whether Cyberspace really substantiates the ideal of collectivity. Instead, it seems to promote human individuality, while flexibly fulfilling individual needs.

The commercialization of Cyberspace only adds to this character. Without arguing that businesses should be excluded, it is clear that the boom of electronic commerce has radically affected the Internet's premises. Cyberspace has become a giant marketplace with knowledge and information as its main products. Paid access to information, because of sought licensing profits, is a case in point (see Noble 1998 for a rather pessimistic view on the consequences for education). The initial openness and the egalitarian ideals are fading away and the lack of a central authority is swiftly being superseded by the traditional authority of money. This need not necessarily be a drawback, because now the quality of information will be reflected in its price. One could even label such developments in Cyberspace a proof of its self-regulative power.

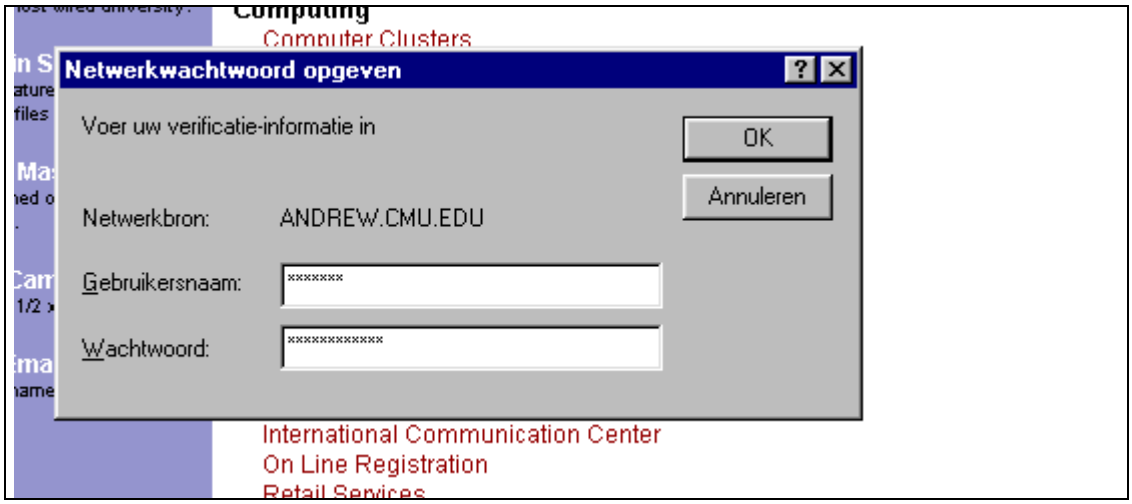

Figure 4 A Web of secrets

Yet, clearly, such developments promote pragmatic, transactional communication patterns, along the line of 'you scratch my back and I'll scratch yours'. In such an atmosphere, we shouldn't be surprised that, in the end, our dearest friends want to get paid for their information. What initially was meant to stimulate and broaden the exchange of ideas, may now prove to become a world of secrets.

5 The future of Cybereducation

All of the trends described above redefine human functioning and human communication in a radical way. What will be the consequences for future education? How should educators procure changes? And how does the *Virtual Learning Company* fit into this picture? Without depreciating the vast opportunities of Cybereducation, we will now identify the major problems of Cybereducation and formulate possible answers to overcome these.

5.1 Clipped human functioning

Taking up a censorious position, we could claim the richness and complexity of Cyberspace is a matter of quantity rather than quality: the impoverishment of human communication and the distorted perception of reality will increasingly reduce the richness of human functioning. Consequently, a broad range of human functioning will be literally eliminated. Focusing on education, such clipped behaviors will inevitably affect the intake, monitoring and competence assessment, the validities of which are essential. Furthermore, the assistance of software (agents) will obscure the emotional integrity of messages and reduce communication to mechanistic transactions featuring more standardized, routine-like interaction patterns. Consequently, mutual reservedness and mistrust will dominate any form of cybercommunication. All the millions people on the Internet do not guarantee the forming of profound relationships, true friendships, a fabric of social alliances, meaningful and informal communication, a sense of security. Cyberspace represents a new, important extension of reality. By creating this new virtuality we've mixed up reality and fantasy, making reality-testing in Cyberspace extremely difficult. Growing up we all learned eventually how to distinguish fantasy from reality. Now, through our own doings we seem to have lost this faculty again. Consequently, important ethical, social and cultural values, which are closely connected to reality-testing, will be difficult to maintain.

In our view Cyberspace can only be a suitable environment to address the educational needs of the knowledge society if its virtual reality is regularly combined with the real reality of the material world. To avoid alienation, educators should not deny but rather emphasize the essential differences between the virtuality of Cyberspace and the reality of the material world. To achieve competence learning and a broad development of personalities it is important to cover the full range of human functioning and to promote social engagement and the stability of individual identities. Educators should strive for a conservation of conversation (discourse) by finding alternative ways of preserving rich and meaningful communication. The only way to broaden human communication and functioning is to strive for a hybrid system that allows for the full range and richness of human behaviors, a system in which non-mediated communication has a significant place. Hence our conviction that the unconditional transfer of all learning activities to Cyberspace doesn't make sense.

5.2 The overwhelming abundance of facts

The abundancy and instant accessibility of information in Cyberspace certainly reduce the educational need for focusing on knowledge reproduction. Why bother to learn capitals by heart? Indeed, educators tend to shift their focus from reproductive knowledge and scholarship to skills and competences. This trend is further amplified by the abundant availability of facts and the sympathetic helpfulness of intelligent agents. Yet, factual ignorance is a severe threat to an individual's competence growth. Competent performance presupposes a sufficient body of knowledge. How would you search for the capital of France if the only capital you know is a typographical one?

We certainly don't want to claim that one should revert to the traditional focus on knowledge reproduction, but we do emphasize the importance to have at one's disposal a sufficient body of such knowledge that can act as a conceptual frame of reference. Such a frame of reference would encompass a continually growing and adapting set of beliefs and understandings and their associated vocabularies, necessary to interprete all kinds of stimuli in a meaningful way. Indeed, expert behavior is known to be very effective because of the experts' extended neural networks carrying a framework of mental representations. So, rather than addressing the mere facts itself, education should strive for true and deeper understanding; learning in Cyberspace should not just be equated with the collection of these facts, but should be provoked by offering valuable opportunities that allow for the identification and transfer of knowledge. The need for reflection and understanding is even amplified by the transactional characteristics of Cyberspace as embodied by e-commerce, the extensive exchange of superficial facts and the increasing, pragmatic urge of today's individuals to arrive at solutions as fast as possible. Thus, for educators to resort to explorative and student-controlled ways of learning involving rich and open environments (i.e. the web) and complex communications, the students' needs for substantial knowledge will increase. Also, learning tasks should sufficiently specify the utmost boundaries of learning activities to avoid disorientation and unnecessary drifting. For example, the confines and aims of the *Virtual Learning Company* may be assumed to provide a contextual and operational frame of reference that supports the acquisition of meaningful knowledge. It thus is assumed to support competence learning (*cf* Lévy 1998).

5.3 Freedom against quality

In Cybereducation student-control is greatly enhanced: students are free to study at any place (home or at work) and at any time of their choosing. They are also free to wander around in a world-wide reservoir of knowledge and people. Yet, we should realize that these degrees of freedom primarily serve student-controlled logistics and not necessarily innovative pedagogy. The plea for open learning environments and student-control, as demonstrated in the *Virtual Learning Company*, doesn't mean that educators are free to sit and watch the students' ploddings.

To a certain extent, learners have to be shielded from irrelevant stimuli, to warrant the quality and effectivity of learning and to avoid disorientation within an inconceivable sea of facts. Unfortunately, educators are easily tempted to take up their archetypal roles of controlling the learning environment or, alternatively, they are up to claim roles as managers of certified knowledge selling their expertise as the one and only truth. However, it is the educator's task to find the right balance between shielding the learners from the outside world and handing over control to them, as was done in the *Virtual Learning Company*. There the educational design specificies a playing field for students to control their own learning behaviors, given the roles they are to play and the tasks they are to carry out. Student control by no means implies that educators are out of control.

5.4 Affordability of tailor-made education

The days of the *homo universalis* who combines the mastering of a broad range of human expertises with a variety of specialisms (cf. Leonardo Da Vinci) are far-off. The ever-increasing amount of knowledge inevitaby leads to more specialisation and differentiation of professional workers. Consequently, education should respond to these developments by differentiating its educational services: tailor-made education will more and more replace the standard curricula. Unfortunately, tailor-made education readily becomes unaffordable. Here, educators should distinguish tailor-made content from tailor-made education. While the former is relatively cheap and can be achieved via simple filtering procedures, the latter is more expensive and more laborious to realize: it takes account of individual characteristics of learners, i.e. ambition, preferred learning styles, acquired expertise, intellectual capacities, etc. and requires reduced students-tutor ratios.

For tailor-made education to stay reasonably priced, educators must find ways to apply methods for self-study and peer assessment, to generate automated feedback and support, and to recycle learning materials in various situations. Also, educators should not hesitate to arrange good old attendance sessions with students.

5.5 Addressing diverging demands

In the knowledge society with its ever-growing amount of human knowledge, educational institutes will have difficulties in responding to diverging students' requests. It may be problematic to find and contract the domain experts needed to develop and support a particular tailor-made educational program. In addition, comparison of different learning routes of different students will become troublesome, as will be the granting of legally recognized credit points.

To preserve credibility and comparability, educational institutes should not abandon their certifying role. They should withstand the tendency to broaden their range of tailor-made programs unconditionally; it would be wise for them to specialize in a restricted number of well-chosen domains or to form educational alliances with other institutes. After all, Cybereducation surpasses the restrictions of fixed locations.

6 Epilogue

Most succinct conclusion of our analysis is that a total transfer of education to Cyberspace doesn't seem to make much sense. We argued that the Cyberspace channel in itself will never be able to cover the whole range of human performances: it strongly distorts human communication and, in important ways, restricts rather than extends our natural habitat. It is important to notice that these drawbacks are not temporary in nature. We should realize that the more sophisticated Cyberspace will be, the more unreliable and truncated its

messages will become. In fact, as the main weakness of Cyberspace is its artificiality, new technologies will amplify their own failures. In the end, Cybereducation seems to become trapped in self-referential loop that will never converge to desired outcomes.

Still, we 're convinced of the great possibilities of Cybereducation, provided that it is extended with other modalities of social interaction. Indeed, the evaluation of our *Virtual Learning Company* pilots confirmed the importance of additional face-to-face meetings (Sloep et al. in prep). But one may ask, are they perhaps a relic of the modes of communication the participants have grown accustomed to? To put things differently, our student were socialized in a system that used and valued traditional model of communication. What if we were to repeat the very same experiment with today's- kids that use chat, e-mail and other 'distanced' modes of communication with great confidence? One can only speculate about its outcomes. But it also indicated that learning and working in such networked environments open up a whole range of new opportunities to improve the quality of learning.

Having said that we hope that the reader appreciates our speculative synthesis of the future and take advantage of our conclusions. Needless to say that we advise the reader not to accept our conclusions as unquestioned facts, but to use these as agents for further discussion, reasoning and reflection.

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Footnotes

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[1] Examples abound. A well-known one can be found in Michael Crichton's *Disclosure* - book and motion picture: 'There's no corridor. Everything you see is just a bunch of numbers. It's the DigiCom company database, exactly the same database that people access everyday through their computer terminals. Except it's being represented for us as a place.' (p. 395) A point similar to ours is made in Chapter 2 of this volume where Shavinina speaks about High Intellectual and Creative Multimedia Technologies (HICEMTs).

[2] The Matrix is the very personification of Cyberspace, a virtual reality apart from everyday reality, but quite like it. For the enlighted few who can tell virtual and physical reality apart, the limits to their physical prowess is set by their imagination. Thus jumps of tenths of meters, lightning fast karate moves, and dodging bullets become feasible.

[3] See also LivingInternet.Com <*http://www.livinginternet.com*>, particularly the section The Internet, How it Works.