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## The Productive Information Society: A Basis for Sustainability

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**Keywords:** Integration of blue and white collar work. Mediation of technologies. Resolving alienation of work. Interaction of work and information. Free information. Resolving trade and market. Social evolution. Long term development.

**Abstract:** We present a scenario for free associations of people who are organizing life and work by means of technical networks and information. The usage of the web mediates in a new way the acquisition of emerging technologies. We enter a world where people are at the same time white and blue collar workers and consumers of their collaboratively produced goods. The process of developing and acquiring the web tends to a new form of collaboration in production and of "commerce". This social process yields the basis for sustainability. It will end in a society with "socialists". We present the main issues in technical and societal respect.

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**Schlüsselwörter:** Integration von Hand- und Kopfarbeit. Vermittlung neuer Technologien. Aufhebung entfremdeter Arbeit. Zusammenspiel von Arbeit und Information. Freie Information. Aufhebung von Markt und Handel. Soziale Evolution. Langfristige Entwicklung.

**Zusammenfassung:** Wir stellen ein Szenario mit freien Assoziationen von Menschen vor, die Leben und Arbeit mittels technischer Netze und Information organisieren. Der Gebrauch des Web vermittelt in einer neuartigen Weise die Aneignung entstehender Technologien. Wir betreten eine Welt, in der die Menschen zugleich die Kopf- und Handarbeiter und die Konsumenten ihrer gemeinsam hergestellten Güter sind. Die Entwicklung und Aneignung des Web führt zu einer neuen Form von Zusammenarbeit und „Handel“. Dieser soziale Prozeß liefert die Grundlage für Nachhaltigkeit. Er wird in einer Gesellschaft mit „Sozialisten“ enden und stellt wichtige Herausforderungen in technischer und gesellschaftlicher Hinsicht, die hier skizziert werden.

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An abstract (2 pages) of this paper appears in the "Proceedings of the 5th International ERCIM Workshop" on 'User Interfaces for All', held at Dagstuhl (Germany) from November 28 to December 1, 1999. There, this paper is presented as a poster. The poster is printed here in the appendix.

# THE PRODUCTIVE INFORMATION SOCIETY: A BASIS FOR SUSTAINABILITY

## CONTENT TABLE

1. INTERNET FOR ALL: A REVOLUTION STARTS
    - 1.1 *Entering a scenario*
    - 1.2 *Generalizations of the scenario*
  2. SUSTAINABILITY THROUGH FREE INFORMATION AND FREE COMMUNICATION
  3. ISSUES IN COMPUTER SCIENCE
    - 3.1 *Collisions between plan and reality*
    - 3.2 *The growing jungle of information*
    - 3.3 *The dialectic of marrying and divorcing people, components and worlds*
  4. SOCIETAL ISSUES
    - 4.1 *The web integrates blue and white collar work and education: A new universality arises*
    - 4.2 *Goods instead of stocks*
    - 4.3 *A legal framework for the productive information society*
  5. FINAL REMARKS AND CONCLUSION
- APPENDIX: POSTER

## **1. *Internet for all: a revolution starts***

Computer supported collaborative work will grow. But where will this process go? We describe a scenario in order to develop and to illustrate an unconventional answer and some main issues in technical and societal respect. In the scenario people use the full power of information and communication technology shortly named "Internet" or "web". People construct and produce cooperatively with their own mind and hands virtual *and* real things and systems for their own use. People overcome the traditional division of labor, especially the taylorism. The web mediates in a new way the acquisition of existing or emerging technologies and the generation of new ones giving a basis for a sustainable evolution around the networked world.

### **1.1 Entering a scenario**

Imagine you are an owner of a house and you would like to install yourself a solar thermic system. You would search for information on such systems, you would discuss the layout with some skilled and experienced people, you would visit running systems in reality and on the web. You would plan the work to be done, you would buy the material and finally you would install the system with the help of some friends and craftsmen. In our scenario now, we see people (figure 1) combining in full freedom industrial, artisanal and private work and the respective consumption. People do not only do virtual paperwork at a display or simply buy a manufactured system but they also produce it by themselves as far as it is possible. They mix routine and automation, professional and dilettantic experiments with modern optimizations and innovations as the result of qualified research and development.

Planning, simulating, constructing, running, maintaining, repairing and demolishing a system with computer support simply means that one views some aspects of the system at a display or on print-outs and that one handles this information. Entering all this information into the web the treated system is "mobile" from its beginning: One can view "life" presentations with stored as well as with current operation data. One "works" with it from anywhere: in a bureau for planning and simulation, but also at the construction site, during installation, maintenance, repair, reconstruction or demolition. One makes comparisons of different running systems and with further information from the web one finds better answers to technical and cost questions. Today, workmen and craftsmen, small and medium sized enterprises interface between the consumers and customers at one side and the distributors and manufacturers on the other side. They also interface to the public educational and advisory sector. In the scenario the web augments the traditional means of communication and cooperation of these social actors. With web support they use technical data, data of running systems and planning tools. Via I/O-sharing they communicate on-line and in real time with remote partners discussing technical details. Schools and universities use this new access to the productive world. During the education of consultants, planners, craftsmen, workmen, trainees, and students for retraining their teachers consider "virtual" systems, vary their configurations, compare them with real ones they have found in the web, and they plan new ones using web tools. The web supports action groups of unemployed people as well as people coming from local exchange trading systems (LETS) to participate in productive discussions about concrete, technical themes.



Figure 1

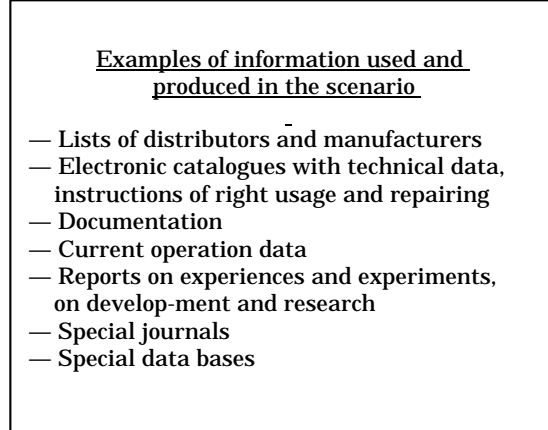


Figure 2

## 1.2 Generalizations of the scenario

With web support those in the scenario will publicly plan, produce, run, maintain, repair, and take systems out of service in a *collaborative* way that goes far beyond today's possibilities.

With web support they will also *link up* planning, production, running, maintenance, repair and demolition, they create *networked* products and systems and they show the *combined effects* of their labor on nature, society and individuals (figure 3).

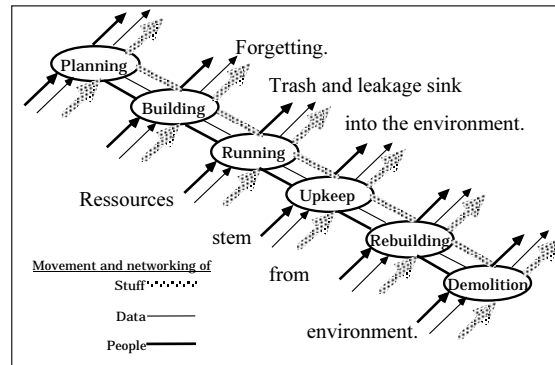


Figure 3

In all these stages people come closer to each other since they are able to communicate data and dynamical behavior of the underlying object of their concern. Traditional breaks within each stage and between them are overcome. The web support establishes new feedback loops. The following spatial, temporal, functional, and dynamical dimensions span the scenario:

- Spatial: People of different skills, qualifications and positions and coming from different regions collaborate closer on the basis of technically networked information, communication, and systems. They perceive better the effects of their labor on to nature and onto themselves.
- Temporal: The extraction of raw materials may leave traces in the nature for decades or for ever. Also decades may pass from the planning until the demolition of a system. The ordering of parts, their production and delivery take days, weeks, or months. Components running in a network may communicate within seconds or milliseconds.
- Functional: The access to the appropriate data and methods as well to the data and documentation of the various systems makes it possible to take care of resources and to elaborate innovative things efficiently. These products contain components of

different functions which are connected mechanically and supported electrically, and which cooperate in an electronic network.

- Dynamical: The world of products, their data and their environment are subject to permanent change. Existing systems are rebuilt, spare parts will be provided for a long time, new systems will contain new components. A system will be recycled when it is taken out of service.

## **2. Sustainability through free information and free communication**

The social actors in the scenario form a *productive* information society far away from crumbling into but singles with their television set. In the essence people are forming their world *consciously*: Free use of information reflects the free use of machinery and resources and vice versa, and the free production of information reflects the free production of goods and vice versa.

Negotiating and processing a thing or a system people talk about intended and produced changes which they remember in their mind or write and draw on paper in order to facilitate a consistent work<sup>1</sup>. They change the chiseled things as well as the electronic descriptions of it. New information is generated by men if the information is written down by someone and sent to the web opening *systematically* the individual or regional experience for all. New information is also produced automatically by technical processes opening the processes for redesign. Thus computer supported information and communication complete what is passed by word and described or drawn on paper. *Labor is reflected in products and in information.*

The web enables and makes to store more data about work and its objects in computers, to communicate these data by means of computers and to use them by computers connected with other machinery. But we are far away from having a complete and totally consistent database. It is more like a growing "information jungle."<sup>2</sup> Nevertheless, the information helps to treat thoroughly and to balance the substantial dimension of man's life, to evaluate not only intended effects or those that lie nearby but also a lot of non-intended side-effects. People will find better answers to the standard question "Do we want this or something else?" *Using freely* and efficiently the *information* in the web as the very best database people discuss *all* aspects of their life and organize *all* activities needed to live. This gives the basis for a sustainable usage of resources, for a recycling of old products, for the application and invention of technological innovations. In this *productive* process people produce the needed things *using freely* the existing *machinery* and natural resources. *Information is reflected in labor and in products.*

The social actors in the scenario reflect their world in information through collective labor in order to react collectively on the world of their objects and on nature. The scenario will not have been realized even tomorrow. It will take a long time during which we will be confronted with technical, social, economical and political issues. In the following we sketch some of them.

## **3. Issues in computer science**

In the same period in which computer power is doubling the growth of industrial productivity is far less than 10%. Most of this growth is due to organizational changes in the enterprises and to innovations in classical engineering areas and *not* to progress in

<sup>1</sup> ARCHIMEDES has drawn his plans into the sand.

<sup>2</sup> WOLF GÖHRING: Informationsurwald. In: Marxistische Blätter 37 (1999), 6/99, 61—67

computer science.<sup>3</sup> Imagining to realize the scenario we feel and see immediately the short comings of today's computer applications. The scenario should serve as a touch stone for the quality of the *technical* solutions that have to be found in the coming stage of computer applications such that they will become a real computer *support for everybody*. In the future the main challenges in computer science which have to be mastered may be:

- the permanent collisions between plan and reality,
- the growing jungle of information and
- the marrying and divorcing of people, things and worlds

These tasks meet with usability, with ergonomic requirements and construction principles of computer systems<sup>4</sup> but they also aim at a solution of some deeper problems.

### 3.1 Collisions between plan and reality

Concurrent activities and diverging interests generate unforeseen differences between plan and reality which are reflected in the resulting data. Information should be realistic and complete with respect to the purpose for which one wants to use it. But only the irreal LAPLACIAN demon could describe facts without any lack. Information will never be applicable without unexpected side-effects thus always having an element of des-information. The dynamic solution lies in the reciprocal aptitude in using *and* in the reciprocal dependence on using (strange) information. An objective idea of the quality of the virtual world is only found if it is combined with reality: The description of a component proves to be true if a technical system together with the built-in component operates as expected.

- We need technical support to contact programmers, data suppliers and other people or to go into the details of a program or the history of data if programming errors occur or if data seem to be obscure.
- We need tools *usable by everybody* with suitable graphical user interfaces for modeling, planning and documentation of plans *and* of reality. The models have to accept descriptions of algorithmic relations between the components and to facilitate corresponding simulations. We need to get an (virtual) idea of the quality of the used data, information, and programs.
- (Distributed) Data have to reflect reliably their objects for decades during their life cycles. The data have to migrate reliably over generations of hard- and software.
- The growing vast number of data, though remaining incomplete, and the complexity of planning force to use heuristics whose quality has to be founded theoretically. This problem is aggravated if NP-completeness occurs.<sup>5</sup>

Briefly: A plan and the reality which the plan reflects should be verified each against the other. Existing contradictions have to become tractable.

### 3.2 The growing jungle of information

The number of people whose labor is reflected in mechanized information is growing considerably. In the future we will have much more mechanized information and informationalized means to manage the information as they are available today. This results

<sup>3</sup> This and the consequences are discussed by: PETER BRÖDNER: Der überlistete Odysseus. Über das zerrüttete Verhältnis von Menschen und Maschinen. In: edition sigma rainer bohne verlag, Berlin 1997

<sup>4</sup> In German this may be characterized by "Gebrauchstauglichkeit", see "Memorandum zur Entwicklung eines zentralen Zukunftsthemas im deutschsprachigen Raum", see Mensch & Computer, Information, Interaktion, Kooperation. In: Informatik Spektrum 3/22, June 1999, 212—214

<sup>5</sup> More details: DAVID HAREL: Algorithmics: The Spirit of Computing, 2. ed.. Addison Wesley Publishing Company: Reading 1993



in a kind of an information jungle which hardly seems to be used rationally though more and better information is a prerequisite for a rational behavior. For the following aspects we need *efficient* solutions:

- One has to be able to combine the lot of pieces of information, among them the environmental systems in the enterprises, in order to view the effects of work on nature and to make the information useful for individual behavior.
- Intelligent autonomous agents have to enrich existing information with new one. They have to structure and maintain the information and to delete old one. They have to exploit the wealth of information in showing essentials and in extracting new information from correlated data.
- In the information jungle people have to find the needed fixed points, measures and methods in order to recognize the essentials of the information and in order to work accurately, productively, cooperatively, fairly and well protected from losses and errors.

Briefly: He who hammers a 2 1/2 inch nail with three hits he wants to work in a similarly smart manner with the intelligent agent in the laptop positioned beside his hammer drill.

### **3.3 The dialectic of marrying and divorcing people, components and worlds**

In order to handle something people bring together their competences using the technique of synchronous I/O-sharing, for example. Work finished they search for other partners in order to handle something else. The computer supported collaborative work on a temporarily common object changes the basis of information continuously. For the sake of technical documentation and the recycling of materials it has to be continued and to be archived. If data have no more meaning for existing things they have to be recognized as obsolete, and they have to be given up. Generally, partners, projects, information and technical conditions change and are situated in different and changing places giving raise to the questions for synchrony, concurrency, conflict and confusion.

We need *efficient* solutions for the following aspects of this problem:

- Intelligent agents have to handle installation and deinstallation of software on existing hardware, they have to handle the migration of existing software and data to new hardware and operating systems. A general infrastructure has to make available systems for planning, documentation, verification, information retrieval, I/O-sharing during teleworking and cooperation.
- The different aspects and the concurrency of the work of the different partners have to become transparent such that the partners can secure the desired consistency and synchrony within the treated virtual and real worlds.
- One has to be able to make visible or to fade out aspects of a virtual object which are of different interest.
- Synchronous I/O-sharing should enable remote partners to communicate on-line and in real time on the details of their common (virtual) object thus enriching the traditional process of asking, answering and demonstrating of work steps.

Briefly: The web tools have to be designed such that people may come together for a passing common work on virtual and real objects minimizing conflict and confusion.

## **4. Societal issues**

„The 21st century has to be the age of a new integration of labour and living, ecology and economy, technology and culture. Architecture and urban planning are key factors

in this scheme.<sup>6</sup> In the scenario we show how this re-integration of design and work, production and consumption, education and daily life could look like giving raise to societal issues in social, economical and political respect intertwined with each other.

#### 4.1 The web integrates blue and white collar work and education: A new universality arises

Above all, blue collar workers are viewed as an object of computer supported planning especially if one allocates "human resources" to the production process. Workmen that behave on their own are seldom admitted in the models. The same is true for the political ideas of the information society where productive labor nearly never occurs. The scenario is neither imaginable nor realizable without an active and independent participation of blue collar workers no more dependent on a foreman. In the scenario, the usage of the web mediates in a new way the acquisition of existing or emerging technologies and the generation of new ones.

Here, people plan their work in cooperation with others, they notate their experiences, and present it in the web thus heavily influencing the way products are designed and manufactured. The new opportunities of the web will be taken up in education and training. People want to train and to qualify themselves and they will formulate their requirements. The computer supported collaboration requires a collaborative computer support. The computer tools have to be developed in collaboration with the persons who use these tools in order to collaborate in producing real, not only virtual, things. Clearly, at the beginning one will use the available tools, may be as free- or shareware. With the course of time users become able — by qualification, by cost aspects, and by regulation — to hold their acquired competence against the computer specialists.

The free *and* productive usage of the web at really every point of the society as sketched in the scenario could to advance the development of each individual. Here, the psychological moment of alienated work tends to be dissolved since there is no need that people act under predefined orders. Though our technical world becomes ever more complex it is reflected in the web at its best. The web may become the externalized knowledge of mankind retrievable by everybody and communicable to everybody. In the future the *universality of an individual* may consist in the ability to retrieve suitable information, to combine it with existing machinery and to cooperate with other people in order to get needed things. "The laws of his own social action, hitherto standing face to face with man as laws of nature foreign to, and dominating him, will then be used with full understanding, and so mastered by him. Man's own social organisation, hitherto confronting him as a necessity imposed by nature and history, now becomes the result of his own free action."<sup>7</sup>

We need experiments, studies and more detailed models for our understanding and support of this possible development that has been started with the web:

- What is an adequate concept of information society that comprises and combines the labor of blue and white collar workers as well as the consumers?
- What are obstacles hindering the engagement of blue collar workers (lack of education, knowledge and training, too much time consuming, too much stress, no or too less permission by the boss, bad tools etc.) and what are the guidelines for suitable conditions supporting blue collar workers in this emancipation?

<sup>6</sup> HERMANN SCHEER: Chairman's Address. In: 5th European Conference on Solar Energy in Architecture and Urban Planning, May 27—30, 1998, Bonn, Book of Abstracts, p. iii

<sup>7</sup> FREDERICK ENGELS: Anti-DÜHRING. In K. MARX, F. ENGELS: Collected Works, vol 25, Progress Publishers Moscow, 1987, p. 270 (German: MARX ENGELS Werke (MEW), vol. 20, p. 264)

- Study the education of young people in enterprises and the training of more or less skilled people with more or less practice as craftsmen and workmen and also the retraining of unemployed persons using some elements of the scenario.
- Develop curriculae for schools, technical colleges and retraining programs and develop (software) tools for the connection of schools and practical work.
- Realize some technical systems in a computer supported collaborative environment as a training task and study this process.

#### 4.2 Goods instead of stocks<sup>8 9</sup>

Due to the web support in our scenario producers and consumers come to closer agreements about the features of a thing and the work to produce it as they would only face each other as seller and buyer of a finished product. The social actors in the scenario work toward a production *after* having agreed on it. With web support they deliver the promised thing or service and contribute to the result thus getting things and services they need within the agreed span of time and quality.

Extrapolating this development into the future we see people determining the utility value of goods by the savings of time and the growth of possibilities. The utility value will be considered not only for a moment or for a small range but also globally and in long terms and in relation to nature. The activities that the involved persons pursue including the descendants bothered with clear-up operations consume life time and natural resources. These activities have to be economical for everybody involved.

The sole value known in traditional economy is the value of stocks. First of all stocks are private products that become stocks by being produced not for self-consumption but for consumption by others, thus being produced for the social consumption. Only after exchange the other can consume the acquired stock. Exchanging a fixed and finished product one disregards the real work which contributed to its production. Traditionally only the value of exchange interests which is the expression of the labor that in society would be needed to produce the desired thing. This social labor may be distinct from the private labor used to generate the product.<sup>10 11 12</sup> In competition the difference

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<sup>8</sup> In this chapter we follow the analysis of the capitalist production as given by MARX and ENGELS. One of the central points is the difference of "worth" (use value) and "value" (exchange value) of a product that is brought onto the market in order to be sold, bought, and consumed. Now, we use "stock" if we mainly consider a product as having an exchange value, we use "good" if we consider the product as having a worth or use value. In avoiding the word "commodity" we think that this expresses better the difference of the German words "Güter" and "Waren".

<sup>9</sup> For more details on the underlying process and its dialectics see: WOLF GÖHRING: Mittels Informations- und Kommunikationstechnik die Warenproduktion dialektisch aufheben? In: JÖRG BECKER and WOLF GÖHRING (eds.): Kommunikation statt Markt — Zu einer alternativen Theorie der Informationsgesellschaft, GMD-Report 61, Oktober 1999

<sup>10</sup> "Trade in general being nothing else but the exchange of labour for labour, the value of things is ... most justly measured in labour." BENJAMIN FRANKLIN: The works of B. FRANKLIN, ed. by Sparks, Boston 1836, vol. II, p. 267

<sup>11</sup> "As a general rule, articles of utility become commodities, only because they are products of the labour of private individuals or groups of individuals who carry on their work independently of each other. The sum total of the labour of all these private individuals forms the aggregate labour of society. Since the producers do not come into social contact with each other until they exchange their products, the specific social character of each producer's labour does not show itself except in the act of exchange. ... To the latter (the producers, W. G.), therefore, the relations connecting the labour of one individual with that of the rest appear, not as direct social relations between individuals at work, but as what they really are, material relations between persons and social relations between things." KARL MARX: Capital, Book I. Capitalist Production, Part I. Commodities and Money, Chapter I. Commodities. Rev. acc. to 4th German ed.. Charles H. Kerr & Company: Chicago 1919, pp. 83, 84. And: "There, the existence of the things *quâ*

between the adequate social labor and the realized private labor is determined — more or less accurately, expressed in varying prices.<sup>13</sup> The seller has to sell the product against the competitors arguing his product would be best suited for the buyer and withholding bad features. The seller promotes the product, not with the real utility value that only could be defined by the consumer but with a fictitious one. The buyer finds out the direct features of a product nearly only from his own experience, on demand, from operating instructions or from a mostly lengthy study of documents. The indirect features resulting above all from the effects on nature and the clear-up operations to be done in the future persistently are disregarded during the purchase.

In the scenario people consider the above mentioned "social labor" based on the information they find in the web. In relation to accessible machinery, resources and needs they become able to determine the concrete labor each of them *will* do. People define thus their *concrete equivalent* product, service and contribution. After production there is no need to exchange the product on the basis of its value and to determine this value *ex post*. Thus, money in whatever form as an *abstract equivalent* to regulate the interchange of products and services becomes inapplicable. The economical moment of alienated work tends to be dissolved.<sup>14</sup>

Clearly, the actual economical structures, i. e. the production of stocks that have to be sold on a market contradict fully to the economical aspects of the scenario. First of all, classical trade and planning are heavily influenced. There might be reservations about the sketched web support of production: it costs money, competitors don't like to participate, employees should not be allowed to participate, classical structures of economy would be totally revolutionized, goods have forever to be produced, to be sold and to be bought as stocks as if other forms would be unimaginable. Yet we think that the scenario illustrates main aspects of an evolution that has begun in our days. But for a better understanding we need studies concerning the following aspects:

- Obstacles due to competition and means to overcome them.
- Sustainability in a production after agreement.
- Exchange of products and services based on a abstract equivalent versus an agreed and concrete equivalent product, service or contribution in producing something common.
- The new ways of life and work and the realized utility values.

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commodities, and the value relation between the products of labour which stamps them as commodities, have absolutely no connection with their physical properties and with the material relations arising therefrom. There it is a definite social relation between men, that assumes, in their eyes, the fantastic form of a relation between things. ... This I call the fetishism which attaches itself to the products of labour, as soon as they are produced as commodities, and which is therefore inseparable from the production of commodities." p. 83 (German: MEW vol. 23, p. 87 and p. 86)

<sup>12</sup> "While, therefore with reference to use-value, the labour contained in a commodity counts only qualitatively, with reference to value it counts quantitatively, and must first be reduced to human labour pure and simple. In the former case, it is a question of How and What, in the latter of How much? How long a time?" KARL MARX: op. cit., pp. 52, 53 (German: MEW vol. 23, p. 60)

<sup>13</sup> With the German waste separation and recycling system "Grüner Punkt", with the obligation to prove a secure disposal of radioactive materials if one wants to run a nuclear power station, and with the obligation of the manufacturer to take back old cars we get elements of *future* labor in the price.

<sup>14</sup> "Society would then know how much labor each object of use required for its creation. It would have to direct the plan of production in accordance with the means of production to which labor-force also belongs. The advantageous effects of the different objects of use and their relations to each other and the creation of the necessary means of labor would be the sole determinants of the plan of production. People make things very easily without any interference on the part of the much discussed 'value'". FREDERICK ENGELS: Landmarks of Scientific Socialism. Trl. and ed. by AUSTIN LEWIS. Charles H. Kerr & Company, Chicago 1907, pp. 254, 255 (German: "Anti-DÜHRING", MEW vol. 20, p. 288)

### 4.3 A legal framework for the productive information society

In the scenario people are acting in organized relationships and structures: traditional ones like family, schools, friendships, clubs, local community, modern ones like production and web oriented structures. From an individual's point of view these structures have a "hard core" giving some security. But there will also exist quite flexible structures which are used if needed. In developing the scenario everybody has to be allowed to act freely not only in the mentioned traditional structures but also in the web and production oriented ones. Using the web and other technical systems the only regulative should be that one has to contribute an agreed service in return. The social actors are not restricted to an elite. People that had been excluded from society may find new contacts, and exclusion may be avoided. In the fully developed scenario people use technical networking, information and communication as well as the machinery in order to produce physical objects *without any formal bound*. Everybody may intervene to work and to argue without any hindrance. People develop computer supported collaborative work *for all*. Clearly they remain dependable on each other but they can organize this dependency as a balanced one since each one has access to all information and to the productive inventory of the society. The inevitable alienation of work through usual contracts of employment will lose its significance. Now, determining the "good life" one will go beyond the narrow limits within which Aristotle viewed this matter, and which have been accepted for more than 2000 years: "In order to maintain society nature decided that there are leaders and retinue. He who is able to foresee wisely, whom made nature to be leader and ruler, he who is able to execute commands with his hands' work, whom decided nature to obey and to be servant."<sup>15</sup> This old opinion contradicts to the 1st article of the Universal Declaration of Human Rights: "All human beings are born free and equal in dignity and rights. They are endorsed with reason and conscience and should act towards one another in a spirit of brotherhood."<sup>16 17</sup>

We need a political and legal framework such that people don't lose the equality of their rights during their life, a framework that supports and legalizes the described free use of information, that adopts and enhances the new possibilities of the web as outlined in this paper, and that stabilizes social security. We need a new freedom of use and a mediation and conflict solving process for the developing productive information society. We need studies and discussions to better understand this development.

## 5. Final remarks and conclusion

Labor in the society is reflected socially by the work steps that fit together, technically by the parts forming an object and informationally by the technically supported descriptions of things and the accompanying communication. These three sides of labor in the society, namely the social, technical and informational sides are closely interrelated, though not without contradictions. We have shown some long term aspects of a coming productive information society. There, the "web" will mediate the acquisition of technology and it will reduce the known alienation of work. The division of labor into white and blue collar work tends to be removed. People become able to organize collaborati-

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<sup>15</sup> ARISTOTELES: Politik, Buch I, 1252a. Die Lehrschriften, herausgegeben, übertragen und in ihrer Entstehung erläutert von Dr. PAUL GOHLKE. Ferdinand Schöningh: Paderborn 1959 (Here translated by W. G.)

<sup>16</sup> The Universal Declaration of Human Rights, 10th December 1948, Article 1

<sup>17</sup> "You make me confused. Thus freedom would be nothing else than the power to do what I want to do necessarily." VOLTAIRE: Freiheit des Willens. In: Philosophische Aufsätze, Übs. AXEL WINCKLER, Bibliographisches Institut, Leipzig Wien, w. y., p. 38 (Here translated by W. G.)

vely their own productive labor through the web resulting into more freedom and equality: They will behave as "socialists".

Somebody may say that all this lies far in the future, and mankind has other grave problems: The growing consumption of energy, the greenhouse effect resulting from the emission of CO<sub>2</sub> and other gases, the consumption of raw material for industrial products, the consumption of agricultural areas for towns and industries, the devastation of immense areas, the elimination of traditional social relations, and the mechanical and informational rationalization of labor for example. All this will have a decisive influence on the coming technical, social and political development on this globe. Mastering these enormous challenges men will alter considerably technical production and social relations which are founded in the way how men determine what is needed and how they acquire the needed things. With the scenario we gave an outline of how this development could look like.

Now let us have a quick look at the past. 150 years ago KARL MARX wrote: "Social relations are closely bound up with productive forces. In acquiring new productive forces men change their mode of production, and in changing their mode of production, in changing the way of earning their living, they change all their social relations." Besides his abstract words MARX hung a picture: "The hand-mill gives you society with the feudal lord, the steam-mill, society with the industrial capitalist."<sup>18</sup>

We complete MARX' picture: In networking the mills we enter a society with socialists.

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<sup>18</sup> KARL MARX: Poverty of Philosophy. In: Marxist Library, v. xxvi, New York International Publishers, p. 92. (German: Das Elend der Philosophie, MEW vol. 4, Dietz Verlag, Berlin 1983, p. 130. Original in French, Paris, Bruxelles 1847: Les rapports sociaux sont intimement liés aux forces productives. En acquérant de nouvelles forces productives, les hommes changent leur mode de production, et en changeant le mode de production, la manière de gagner leur vie, ils changent tous leurs rapports sociaux. Le moulin à bras donnera la société avec le suzerain; le moulin à vapeur, la société avec le capitaliste industriel. pp. 99, 100)

Appendix:

The Productive Information Society:  
A Basis for Sustainability

Poster

# The Productive Information Society: A Basis for Sustainability

## ***The 21C Problem of the Global Society***

The central problem of 21st century — the 21C problem — consists in

- the growing consumption of fossil fuel, of energy, of raw material, and of agricultural areas,
- the devastation of immense areas,
- the greenhouse effect ,
- the elimination of traditional social relations,
- the mechanical and informational rationalization of labor.

All this leads to a radical change of technical production, of social relations, of the way to determine what is needed, and of the way to acquire the needed things.

**Computer supported collaborative work helps to solve the 21C problem.  
But how?**

## ***The Intertwining of Information and Labor***

Labor is reflected

- *socially* by the work steps that fit together,
- *technically* by the parts forming an object, and
- *informationally* by the technically supported descriptions of things and the accompanying communication.

**Information is reflected in labor and products.  
Labor is reflected in products and information.**

## ***The Web as the Central Tool for a Freely Organized Labor***

The web facilitates the communication of data and behavior of underlying systems. It reflects the technical world at its best becoming the externalized knowledge of mankind retrievable by and communicable to everybody.

The *universal access to data and methods* makes it possible to take care of resources and to elaborate things efficiently. The web mediates the acquisition and generation of technologies. It enables a sustainable evolution.

**The web yields the technical basis for a coming productive information society.**

## ***The Collaboration of Individuals in the Productive Information Society***

In relation to machinery, resources and needs individuals determine collaboratively the concrete labor each of them will do. People of different skills and from different regions collaborate closer. They overcome the traditional division of labor, especially the division into white and blue collar work and the taylorism. They don't act under predefined orders.

The *universality of each individual* consists in retrieving suitable information from every point of the global society and to organize collaboratively his productive labor and to enrich the web with information. With web support each one "is able to foresee wisely" (ARISTOTLE) and, with support of other people and of suitable machinery, to execute the needed labor.

**The individuals abolish ARISTOTLE's principle "that there are leaders and retinue".**



## ***Alienation of Work Vanishes***

In a negotiation process and as sketched out people define their *concrete equivalent* contribution to labor done socially. There is no need to exchange produced things on the basis of their value and to determine the value in competition at random and *ex post*. "The laws of his own social action, hitherto standing face to face with man as laws of nature foreign to, and dominating him, will then be used with full understanding, and so mastered by him. Man's own social organisation, hitherto confronting him as a necessity imposed by nature and history, now becomes the result of his own free action." (FREDERICK ENGELS, Anti-DÜHRING)

**Men organize a global „builder's yard“ where the psychological, economic, and legal alienation of work vanishes.**

## ***Issues***

**We find great deficits in computer science, social relations, economy, and legislation.**

### **Issues in Computer Science**

When computer power is doubling industrial productivity grows far less than 10%! In spite of this gap one has to be able to

- operate more efficiently in the *growing jungle of information*,
- handle better the permanent *collisions between plan and reality*, and to
- "marry and divorce" people, things, and worlds without causing *conflict and confusion*.

This meets with usability, with ergonomic, psychological and physiological requirements, and with construction principles for computer systems.

### **Social Issues**

Practically productive labor has to be adopted in the ideas of information society. Blue collar workers that behave on their own have to be admitted in the models. Education, training and computer tools that are obviously suited for an emancipative usage on the job have to encourage blue collar workers to engage in this development. Schools, universities and practical work have to be connected through the web. We need concepts for teaching the productive information society during education.

### **Economic Issues**

The use value of products has to be considered globally, in long terms and in relation to nature *before* an object is produced. But competitors retain information in order to be winner on the market. They put the exchange value to the foreground instead of a fully determined use value. This hinders the free discussion on the use value. We need public funding to evolve the opportunities of the productive information society.

### **Issues in Legislation**

Acting in web and production oriented structures people observe a lot of formal and legal bounds. Contracts of employment give them no equal rights in accessing the information and the productive inventory in society. We need a framework securing the equality of individuals' rights during their life, supporting and legalizing the free use of information and of new opportunities, and stabilizing social security in the evolving productive information society.

## ***Conclusion***

**The solution of the 21C problem strongly intertwines with a free, extending and efficient use of the web by all men.**