

Sustainability of Information and Communication Systems (ICS)

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Abstract

Sustainability of Information and Communication Technologies (ICT) is one of the main goals of today. The SAP AG phrases this task in the following way: “SAP is committed to improving its own operations to become more sustainable and to delivering customer solutions to improve sustainability on a grand scale.” (SAP AG 2009)

Sustainability is first of all related with aspects of economic, environmental and social impacts of organizations (enterprises, service suppliers, administration, academia etc.). Nowadays there is an intensive research in the field of sustainability of information and communication technologies. Mainly the “Green IT”-movement is to be taking into account in this context, which has developed an own industrial-specific trend in this field, yet.

But the principle of entirety is to be considered in his classical meaning and therefore sustainability has to be essentially drawn to immaterial goods too – without be limited to that. Hence, we will present a first approach named “Grand Management Information Design” which centers sustainability of information and communication systems (ICS) – on the immaterial layer.

1. Introduction

Information and Communication Systems (ICS) can't imagine from the today's working environment. On the one hand they are useful for saving, handling, resumung and analyzing information and on the other hand to represent the communication or forward processes and the understanding process of the receiver. ICS are utilized for the formalized assistance proceeding business process and for the structures strategic decision making in companies and in the public administration. (Mertens et al. 2001)

Especially organizations, which work together over different locations or implement standards and prepare documentation for this, profit by the using of this kind of system. To make the acquisition, implementation and use of an ICS for the company long-term worthwhile, the existing development concepts of software systems have to adapt.

In the recent 20 years the concern Microsoft publishes regularly different versions of the word-processing program. If we compare the different systems and look especially to the toolbar, we can see strong changes.

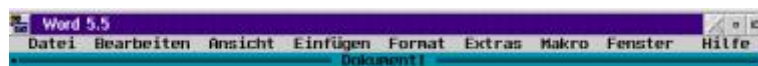


Figure 1: Word 5.5 in the year 1991

Word 5.5 worked on the operating system OS/2. It hasn't got any icons (see figure 1), to select functions in a short way. The more years of developing in Microsoft Word spent, the numerous and colorful the icons became, until in Word 2007 the user interfaces was complete multicolored and the drop-down menu removed. Now the user has to work with a multiplicity of icon palette. We can see the development of the different toolbars in Word in the figures 2 to 7.



Fig. 2: Microsoft Word 2.0 (1991)



Fig. 3: Microsoft Word 6.0 (1993)

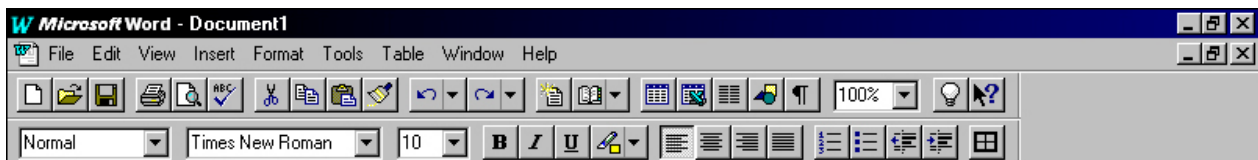


Fig. 4: Microsoft Word 7.0 (1995)

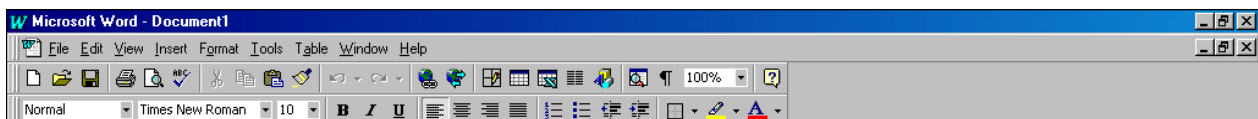


Fig. 5: Microsoft Word 8.0 (1997)



Fig. 6: Microsoft Word 11.0 (2003)



Fig. 7: Microsoft Word 2007 (2007)

In tests user of all ages and with different level of experience had to realize an example in Word 5.5, Word 2003 and Word 2007. Although the arrangement of the menu bar until the 2003 version was the same it emerged that a lot of people during the test need period of vocational adjustment to work without icons. After that they work faster with the short cuts. Especially the well versed Word user had to become acquainted with Word 2007. They had to put oneself in the position of the system – in fact a system they already know. The time they need to start to work with the actual Word, was too much, so that they finally avoid working with it. Otherwise the newcomers were significant faster in using the 2007 version then the 2003 or 5.5.

If the user taps the full potential of icons in the Word 2003, there remains only a minimal face for the main function, the writing. Word 2007 is in this point more efficient and clearly arranged. In the normally tool bar appear contextual (for example by the work with tables and drawings) further tabs with matching functions. At this the work space remains the same and the user finds the toolbars always on the same position. Here is the work with this product more efficient.

At this point it can be seen that a sustainable development, which is established in the Information and Communication Technology (IKS), known as “Green-IT”, is also important in the development of software systems. Because of that in the following we present an approach, which is called “Grand Management Information Design”. At this we focus the sustainability of ICS – the immaterial level.

Therefore we present the points for a sustainable development, which are issued by the German Government in 1998. Moreover we responsive to the triple bottom line with its criteria.

Following up the Bauhaus tradition and the tradition of the Hochschule für Gestaltung (HfG) Ulm the ten principles to good design by Dieter Rams, which stand for sustainable product designs, shall assigned to ICS.

2. Sustainable development of Information and Communication Technology

The German Government draft a concept for sustainability, which reproduce here in the three dimensions to ICT. It contain the economic, ecological and social. By Teller und Poelchau (2003) the target was to form a “concept and tool for the integration of the sustainability in the development and application of ICT in the dialog with economy, politics and science. With innovation paths as well as research and de-

veloping necessity it will be demonstrate, how economic potentials of the ICT harmonized with the ecological, social and cultural chances the general principle of sustainable development.”

The focus of the environmental dimension is by Behrendt and Erdmann (2004) on the development of energy-saving hardware, the prevention of hazardous material like plumb or quicksilver and the reduction of the amount of waste. Otherwise an increasing consumption of energy come along with the intensified usage of the computer engineering in several sections, which counteract to the goal of climate control.

The economic dimension is necessary for sustainable development a strategic orientation of companies with a deep anchoring of the general orientation and a long-dated main aim and self-commitment. The economic performance of a company can also be evaluated by the speed and flexibility to adapt on an ICT. In addition Behrendt and Erdmann (2004) emphasize the high importance for the development of future market for sustainable products and services.

With the social dimension points like the free way for the population to use the ICT and saving the rights of the user have to consider. Behrendt and Erdmann (2004) expose that the “protection of an informational basic offer and the open access to information and communication sources” is an important dare.

3. The “Grand Management Information Design” Approach

Transferring the successful approaches for product design of the Bauhaus and of the Hochschule für Gestaltung (HfG) hich was established by Max Bill, to the business informatics is an aim of the research approach.

The Bauhaus created products – material and technical systems of the daily life – which are first-class, innovative and top-quality, in fact sustainable. The concept of the development was established by the entrepreneur Erwin Braun and the designer Hans Gugelot from the HfG Ulm with the name “Grand Design”. Therefore, the goal of the main research Grand Management Information Design is to retrieve the fundamentals and principles according to the ideas of Bauhaus and HfG Ulm (“less is more”) to achieve a conceptual design of innovative and sustainable information and communication systems of organizations of any kind (e.g. companies, enterprises, administration, hospitals or academia).

Whereby the development of immaterial systems focused on most essential in technological, creative and functional regard. So an important step to better and sustainable Information and Communication Systems will be gone.

One of the guiding ideas of this approach is to enable research and teaching in a way that information and communication systems turn to something which is incorporated by the Ulm stool (“Ulmer Hocker”) of Max Bill established in the year of 1954: a timeless and sustainable product, which can be used in a flexible way. Even so the Ulm stool was and will be used not only as seating-accommodation but also as side table, rack and tray until now.



Fig. 8: Ulm Stool (Ulmer Hocker)

Industry designer Dieter Rams, who created numerous products for the concern Braun, represented during the prize giving ceremony of the Lucky Strike Designer Award (Raymond Loewy Foundation, 2007) the position design have to increase the functionality. Only in this way industrial design has to apply.

His ten principles for the designing of products are (Rams 1995):

- Good design is innovative.
- Good design makes a product useful.
- Good design is aesthetic.
- Good design helps us to understand a product.
- Good design is unobtrusive.
- Good design is honest.
- Good design is durable.
- Good design is consequent to the last detail.
- Good design is concerned with the environment.
- Good design is as little design as possible.

The implementation of this ten principles can be found in the Ulmer Hocker. If we refer these to imateriel products, like software, it is not that simple. On the next pages we will analyze it after Keller and Strehl (2007).

Good design is innovative.

With this principle Rams accented, that with good design not only existing product forms would copied or the novelty as an end in itself will be understood, instead of that the product have to extend and enhance with functions. Concerning to the software developing it could be for example the use of a new basic software architecture. Existing software products wouldn't only enlarge with new functions, but rather through the possible revision of the basis a chance for the innovation arises. The product should be conceived thereby in the form that it is optically freely configurable on the one hand functionally on the other hand and can achieve a cooperative work in a team, even if there are many different countries, languages and faiths involved.

Good design makes a product useful.

Is put out, that the user a product with the thought acquires, it to use and so that determined about carrying out intentions. That the task, the optimal utility of the product, has design to guarantee. Software behaves in this point exactly as physical products. If an activity with an information system is not feasibly, it is useless covered on this task. This can has fatal consequences, when it the actually central one case of

application of the information system concerns. From that this puts demand forcing a basic component of the evolution of Information systems. During the job with the information system user faced in the first place with the user interface. If this is designed unsuitably for the user or essential elements are missing, it contains the danger, classified as useless, because the actually planned purpose not or only partial can be filled. In addition the utility is restricted, if the information system repeats through mistakes in the implementation in his functionality is influenced. From that the demand implies according to utility related to information systems also the claim on a carrying out as faultless as possible.

Good design is aesthetic.

In this context Dieter Rams means fewer the aspect, that a product for the user have to be “nice”, but emphasizes, that the consumer in the situation must be, to establish a relationship to the product, what would be complicated considerably, when the product in his appearance than also to his service is confusing. However, Dieter Rams admits that the discourse turns out in a difficult way concerning this thesis. Words are subjected more frequently different nuances'. With that it will be heavy to notify of visual. Beyond that the aesthetic quality can be judged only by experience for many years. This point keeps up with great probability the role of the most conflict-pregnant thesis. Different people normally different having ideas of aesthetics.

However these theses require for the evolution of information systems, that it is made for the user possible, to identify with that system, in particular with his user interface. This begins with a principal natural requirement like the language, which should orient itself at the user, to use i.e. neither a potentially incomprehensible foreign language for it as also one not into the range of application fitting technical language. In order to simplify the structure of the relationship, Dieter Rams before confusing operation and feature warn. An analogy for this purpose would be for example a consistent one appearance of the surface also in different fields of the information system. A further aspect would be a cultural observation of the importance of colors, symbols and gestures, that in particular to have another importance outside of the European room and thus too being able to lead irritations with the user. Similarly to the organization of material products efforts would have to be undertaken here to develop as generally as possible valid form and color. The estimate Rams', that aesthetic quality only can judged by experience, applies in all probability also with the organization of the user interface, since this represents direct correspondence to the control surface of a material product. In this case the aesthetic arrangement should be supported by suitable education, which lends or at least promotes this capability.

Good design helps us to understand a product.

The product is to explain itself, due to its plausible structure, for the user if possible. It is to thus communicate with the user and optimally the study of manuals or manuals to make unnecessary. This thesis expresses the comprehensive desire for information systems, which are in such a manner intuitively arranged that manuals are unnecessary. This desire can be formulated easy after Gui Bonsiepe, former student and later university lecturer of the Ulm HfG, however, hardly to put into the practice. So far in particular more complex programs can hardly do without a detailed documentation. Whereupon points already the large number of textbooks even for popular programs, as for example. Microsoft Office. Beyond that a to a large extent self-describing information system does not open necessarily the possibility for the efficient work, since in this connection two goals face each other: A system, which is aligned to efficiency in the use, is frequently difficult to learn, why it is used only by a limited number of users. Reversely it is valid however that an information system which can be learned simply must offer a possibility for the fast interaction, since otherwise experienced users will do without a use. Thus information systems differ in a further point from material utensils, since by these usually one does not expect to support different operations by users with different experience stages. The development of solutions, which combine both goals with one another, is thereby a task of the software respectively system development. Nevertheless this thesis

Rams' can be understood as a request to more user focusing with the development, since this is in the long run that, which must work with the product.

Good design is unobtrusive.

According to Dieter Rams well arranged products are characterized by the fact that they are tools for the management of tasks and from there more decoratively or an artistic character outside forwards is to be left. On the contrary: The product should not pull straight the attention on itself and be neutrally arranged. With this thesis the picture of the design is reflected according to the opinion the Ulmer Hochschule presumably most clearly against: The delimitation of art which is presumably at the most vehement of Otl Aicher with the thesis "Art is escape before the life" was shaped. Beyond that Dieter Rams agree here also with the conception of the world: humans are located in the center and the things take however a serving position and are not in the center of the interest. Software is not subject accurately to the same circumstances and restrictions as physical articles. If software provides within equipment for the control, the user doesn't come into contact with, if necessary notices he this circumstance not at all. Otherwise it is represented usually on a screen and can be removed unproblematic from the surrounding physical area by switching the same off. Thus it exists in certain form in its own environment, which can quite have relations with the world outside of the computer, but not necessarily. This environment, into which they have to fit themselves in, impose it primarily technical basic conditions like e.g. the arithmetic performance and defaults of the operating system. Formative fitting in is already partly carried out with the usual graphic operating systems over the standardized appearance by window frameworks and controls. Information technologists nevertheless remain for the responsible person during the further visual arrangement large freedoms.

Concerning the surface organization the requirements of this thesis in a request could to the restraint, for example in the renouncement on the use of aggressive colors, which avoidance of inadequately large control elements or importunate audio elements, to flow. Software can have however further abilities, like e.g. the influence of on the same system of installed software. The request to the restraint should include these possibilities.

Good design is honest.

An honest product, tried in the opinion of Dieter Rams not to deceive the user over its efficiency its value or its contained innovations it thereby errs to lead and (potential) a buyer or a user thereby to manipulate. An information system is subject less than material products to the danger to become estimated only judged due to its surface and value. Since it isn't used for representation purposes, this requirement is probably hardly near-carried of user side. From there the correlation of the performance of false efficiency is to be seen less problematic. Contrary to material products an information system orders over larger possibilities influence on its environment to usually take and/or their resources use. The demand of honesty is to be arranged thus rather on this criterion. Honesty is located in direct connection to confidence. The feeling of honesty can promote confidence in many cases. Reversely it is valid that someone, which feels rear will in most cases limit its confidence. Therefore an information system should not undertake anything, which contradicts the presumed will of the user.

Good design is durable.

The use of fashionable elements contains the danger that the product is already outdated after short time, if the spirit of the time changes. Thus Dieter Rams defines a fundamental difference to products which are planned for a short life cycle in a waste-oriented society, which he considers not to be tolerable anymore. An information system possesses the advantage contrary to material products that it is not subjected to wear marks as immaterial product. So long the necessary environment (e.g. Operating System or certain hardware) is present, the information system can also be used. The other understanding for longevity,

which addresses Rams with this thesis primarily, the use of fashionable elements, can be transferred directly to information systems. On the one hand the organization of the user interface can be called here, which is comparable with the surface and styling in the Design. This becomes clear in the fact that in software surfaces even frequently one tries to have a feeling for the surface of a material product. Before this background longevity of an information system could be reached if the preference is on timeless elements instead of fashionable ones. On the other hand this thesis can be understood in such a way to use technologies which have the potential to be at longer term used and not only a short term feature will be.

Good design is consistent until the last detail.

According to Dieter Rams is an efficient and precise arrangement an essential component of the good design. This criterion is used for the respect evidence for the product and his functions, but also compared to the user. The demand which results from this thesis during the transfer to the field of information systems is to be compared with the design of physical products very well. If the success is not supposed to be left with the chance it is indispensable in the process of development of an information system to use a detailed plan. The science makes corresponding techniques with the system development available which facilitate an engineering procedure. With this thesis Rams calls for not putting the methods only into the overall results, but practicing this planning and arranging consistently and not neglecting any fields, however. For example this does mean to lend a special focus not only on the function scope, but to dedicate oneself in same comprehension technical realisation, operational concept, layout and so forth. Related to the user interface and the associated control concept, this thesis is a demand after a consistent organization for example a uniform or at least comprehensible colour scheme, consistent designation, implementing of different similar tasks by means of just as similar operational sequence or constantly uniform operation.

Good design is environmentally friendly.

Dieter Rams represents the opinion, that also the design has its own responsibility for the care and preservation of the environment. In this case this task is not restricted only to the environmental preservation in the ecological sense, but also onto keeping free the environment of visual pollution. The environment-friendliness here mentioned by Rams can concerning the evolution of information systems on different applying tiers. In the ecological dimension an information system has due to his immateriality only a few direct effects on the resources of our planet. Only the demand on energy that however normally is used for the operation of hardware falls here into consideration. Nevertheless the development of information systems carries responsibility to the preservation of resources everywhere where its results have effect on the environment. Next to the ecological dimension there is the tier of the environment of installed operating system.

A positive effect regarding the ecology within this range could be achieved for example by careful implementation regarding resources consumption, with which smaller requirements can be obtained to the necessary hardware or the number of necessary hardware units, what again can be a contribution to the environmental conservation in the ecological sense. A positive effect on the ecology within this range could, for example, through careful implementation of related resources consumption to be achieved with smaller hardware requirements necessary or required number of hardware units to be achieved, which may contribute to global environmental conservation in the direction again.

Good design is made with using design as little as possible.

These simple thesis express Dieter Rams` motto under which he managed the design department of the "Braun" company. With that he is positioning himself into the tradition of functionalism, what can be seen in the "Bauhaus" but also in the device of the HfG Ulm. Since the cooperation between the HfG Ulm and Rams` company the products are characterized from the functionalism. Rams asks to renounce everything

not necessary to avoid an overloading of a product in every respect. His opinion faces the statement that by an increase of optical features or by expansion of the function volume the products will be totally enhancing their statuses. When we based the development of information systems on the opinion of Rams it means, that a decision against any layout-design with jewel elements or any function expansion which are not necessary should fall.

During the investigation of the theses it became clear that these are convertible also with the development of immaterial products.

As a first declaration for Grand Management Information Design (GMID) it might be set up following: Grand Management Information Design deals with the development, implementation, maintenance and use of management information systems in the organization and raises a special focus of the lasting requirement and needs of the user with the intention to support his job as efficiently as possible.

This activity does not consider the problems which should be solved, but it relates both general conditions and effects to direct environment, organization and society and it take over responsibility for the effects.

4. Outlook

Sustainability of Information and Communication Technologies (ICT) is one of the main goals of today. The SAP AG phrases this task in the following way: "SAP is committed to improving its own operations to become more sustainable and to delivering customer solutions to improve sustainability on a grand scale." (SAP AG 2009)

In next step a requirements analysis have to be done, which shall give informations about the requirements enterprises of different sizes and industries have on universal Information and Communication Systems – the economic dimension of sustainability. The resulting concept has to be thought about the best suitable software architecture for developing a probably very modular system design. Architecture forms the basis of an environmentally friendly product - the ecological dimension. The subsequent user interface designing follows Dieter Rams points of aesthetic, unobtrusiveness, consequence to the last detail and less design as possible. So it is another main pillar for the sustainable development of software systems – the social dimension.

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