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Designing sustainable work systems: The need for a systems approach

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ABSTRACT

There is a growing discussion concerning sustainability. While this discussion was at first mainly focused on a society level – and sometimes regarding especially environmental problems, one can now see that this topic is of increasing relevance for companies worldwide and even the social dimension of this three pillar approach is gaining more and more importance. This leads to some questions: Is sustainability already a part of human factors thinking or do we have to further develop our discipline? How can we define sustainable work systems? What are the topics we have to consider? Do we need a new systems ergonomics perspective regarding whole value creation chains and a life-cycle perspective concerning products (and work systems)? How can we deal with potential contradictions about social, ecological, and economic goals?

1. Relevance of the topic

Discussing the relevance of sustainability for human factors means first of all to discuss the relevance of sustainability. In this paper sustainability shall be understood as the simultaneous pursuit of economic, ecological and social objectives with a development that "meets the needs of the present without compromising the ability of future generations to meet their own needs." (WCED, 1987) There are different reasons for an increasing interest in sustainability:

- The current dramatic ecological changes,
- an increasingly critical discussion about the consequences of globalization,
- wrongly understood shareholder value concepts and the crisis of the financial markets,
- and – as a consequence – a growing demand for corporate social responsibility, including the need for a stakeholder orientation.

From an ergonomics point of view aging workforces in Europe but also e.g. in China and other parts of the world are one reason among others why sustainability is also an important topic for human factors. Therefore, it is not surprising that various scientific societies such as the Italian, Nordic and German Human Factors Society organized congresses under the headline of sustainability. Even the 2012 congress of the International Ergonomics Association (IEA) in Recife/Brazil dealt with this topic.

On the one hand this may show a growing importance of sustainability also within our discipline. On the other hand there is a danger that sustainability is becoming a buzzword for all "modernistic" activities.

2. Sustainability, sustainable development and corporate sustainability

Before asking whether sustainability is a strategic option for human factors we have to clarify the history and definition of sustainability.

Sustainability (on a society level) is an old economic principle coming from forestry in the Middle Ages, when timber served as a main source for several economic processes (e.g. as energy source, building material etc.). The growth of population led to excessive overuse and clearings causing an economic and ecological crisis back then. As a consequence forestry anchored different regulations of felling and systematic afforestation allowing balancing the regeneration of timber resources and their use (Nutzinger, 1995). Sustainable forestry shows that sustainability is a primal economic principle and is finally necessary for the long-term survival of societies. Of course, our modern understanding of sustainability is much more complex than the example of forestry in the Middle Ages.

Sustainable development (as a process) relies on three basic ideas (see Zink et al., 2008):

- The focus on human needs: "Human beings are in the centre of concerns for sustainable development. They are entitled to a healthy life in harmony with nature" (UNCED, 1992).

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- The normative claim for intra- and intergenerational fairness as it was stated in the well-known definition of sustainable development by the World Commission on Environment and Development (WCED) in 1987 (WCED, 1987).
- And the concurrent combination of economic, ecological and social goals: the so-called three pillars of sustainable development, which should be considered equally (UNCED, 1992).

Transferring this general definition on a corporate level (company level) leads to the concepts of "corporate sustainability", coming along with the following definition elements (cp. Dyllick and Hockerts, 2002):

- Not only economic but also social and environmental prerequisites and impacts as well as the interdependencies between them have to be taken into account.
- Corporate sustainability requires a long-term business orientation as a basis for satisfying stakeholders' needs now and in the future.
- The rule to live on the income from capital, not the capital itself has to be applied for all kinds of capital: financial, natural, human, and social capital.

3. Sustainability and human factors

The discussion about the relevance of sustainability for human factors and ergonomics is also influenced by the definition of our discipline:

1) If we look at the very early statements of Jastrzebowski (1857), we can find the following definitions of work and ergonomics: "The exertion of our vital forces for the common, which is called work […] by which we and our fellow creatures attain to all that is good for ourself and the common welfare. The Science of Work […] we shall venture to call Ergonomics".
2) In a definition of the German Human Factors and Ergonomics Society (Gesellschaft für Arbeitswissenschaft) (GfA, 1999), we find: "Ergonomics (or human factors) integrates social, economic, and ecological goals and is obligated to concepts, which are useful for all stakeholders".
3) And the International Ergonomics Association (IEA) defined in 2000: "Ergonomics (or human factors) is the scientific discipline concerned with the interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well being and overall system performance" (IEA, 2000).

All three definitions have something in common with the idea of sustainability as they all share the joint focus on satisfying human needs while taking a systemic perspective that comprehensively covers the interdependencies and interrelations of human activities with their surrounding systems (according to the three pillar model of sustainability).

Referring to the definition of corporate sustainability given by Dyllik and Hockerts and their understanding of sustainability as an approach to preserve or enlarge different forms of capital, human factors and ergonomics is mainly concerned with human and social capital – but also has to consider the two other dimensions of sustainability. Summarizing the definition of human capital in literature (see e.g. Osranek and Zink, 2013) one can find three main definition elements: The core refers to all individual social, professional and methodical skills and competencies useful and valuable for the organization, but also the health and motivation of individuals to make a contribution. Social capital is understood as an ability of actors to gain benefits by their membership in social networks or other social structures (Portes, 1998; Baker, 2000). Coleman (2000, pp. 27f) has indicated that human capital is also generated by social capital in the family and community. But social capital can be influenced by human capital as well, e.g. social competences as a part of human capital are necessary to use social networks and to build up trust in other people (Lewis and Weigert, 1985) respectively human capital can facilitate the effective use of social capital for task performance (Pil and Leana, 2009). These very few definitions show the interdependencies between human and social capital and first hints for designing sustainable work systems to preserve these categories of capital.

4. Sustainable work systems and human factors

As human factors is dealing (among others) with work systems it might be helpful to look at the current discussion about sustainable work systems (Docherty et al., 2009): It is not surprising that again the concurrent development of economic, ecological, human, and social resources engaged in work processes is the main goal. Therefore, sustainable work systems have to be able to function in their environment and to achieve economic or operational objectives, while there is also a development in various human and social resources engaged in their operations. Employees' capacity to deal with new demands in this context grows through concepts of work-based learning, development, and well-being. The growth of social resources is secured through equal and open interaction among various stakeholders, leading to better mutual understanding and a greater capacity for collaboration. The diversity and regeneration of ecological resources is safeguarded as well. There is no simple satisfaction of certain needs of certain stakeholders, but the need to satisfy the needs of many stakeholders. Here again the focus should not only be on short-term, static efficiencies, such as productivity and profitability, but also on long-term, dynamic efficiencies such as learning and innovation. There are no simple trade-offs between short-term and long-term goals or between different stakeholders, but there is a need for a just balance in development for them all. One important task is to bring the (often more short-term) requirements of competitiveness and those representing a long-term sustainability together. Sustainable work systems aim to regenerate all resources utilized. The development of one type of resource does not exploit resources of other types. And a sustainable work system does not build its existence on the exploitation of external resources. Exploitation of external resources can be seen in different ways: Outsourcing dangerous or less paid work to another company working under the same roof, or outsourcing work to other – mostly developing – countries with less pay and without "restrictions" of work and environmental laws (as in some Industrial Developing Zones of Industrially Developing Countries (IDCs)).

These definition elements are based on the following basic assumptions formulated by Docherty et al. (2009, p. 7):

- The opportunity to develop as a person, a professional and a member of a society through work experiences is a basic human right.
- The sustainability of human and social resources is one of the foundations of economic sustainability.
- Sustainability at work is one of the foundations for social development and sustainability of whole societies.
- Sustainability of human and social resources is needed to secure ecological sustainability, "because only people and groups who operate sustainably are able to grasp, prioritize, and work toward ecological sustainability." (Docherty et al., 2009)