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Workshop Proceeding of the 1st Workshop on Green (Responsible, Ethical and Social) IT and IS – the Corporate Perspective (GRES-IT/IS)

Preface

The 1st Workshop on Green (Responsible, Ethical and Social) IT and IS – the Corporate Perspective (GRES-IT/IS) includes extended abstracts covering the broad range of environmental (green), responsible, ethical and social issues investigated from researchers in the information systems research area. This first workshop in Vienna at Institute for Information Management and Control at Vienna University of Economics and Business attracted researchers investigating the whole bandwidth of possible topics. We aimed at starting the discussion on how these topics could gain more attendance in the field. We received 36 extended abstract fitting the requirements of the workshop and nine of them were presented and discussed in the workshop.

The organizers of the 1st Workshop on Green (Responsible, Ethical and Social) IT and IS decided to bring out all extended abstracts, presented at the workshop, in full. The idea behind this publication is to show the variety of topics in this area. On one hand, environmental issues of information systems have been addressed, i.e. 'green' approaches in Industry 4.0 and measurement of impacts of Green IT. On the other, social issues and impacts dominated the workshop, i.e. influence of smartphone usage on people and society, ways to address co-founders, human centric decision support systems, privacy responsibility and privacy issues from companies' and individuals' perspective. It is our hope that this working paper will make a good starting point and be of great use for other researchers doing research in this interesting and relevant area.

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Extended Abstracts in this Proceeding

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Where is the Green in Industry 4.0?
or
How Information Systems can play a role in creating Intelligent and Sustainable Production Systems of the Future

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Industry 4.0 – the last Chance for Truly Sustainable Production

Industrial organizations are facing substantial challenges due to a new industrial (r)evolution taking place. The so called Fourth Industrial Revolution (aka Industry 4.0) propagates an increasing digitalization and intelligentization [1] of production processes which inevitably will lead to a higher degree of automation and autonomy of future production systems. Industry 4.0 can be understood as both a "political-economical" program to re-industrialize Europe[1] [2], [3] but is also a "techno-logical" consequence of current developments in industry and science [4]. Accordingly, production technology will interweave with information and communication technology to form intelligent networks of factories, machines, devices, materials, and workers, which fulfills highly individualized customer demand in a highly responsive manner.

However, at the dawn of Industry 4.0 and the common excitement about the potential rise of European industry it seems that sustainability as an important and highly interrelated goal of European policy makers has been lost out of sight. In this article, I argue that a new industrial revolution has to take into account the pressing problem areas (e.g. growth of human population, environmental pollution, decrease of natural resources, climate change), modern society faces. I will argue for a fourth industrial revolution that is not only targeted at leveraging competitiveness but is also built upon the concept of sustainability as a basis for a long-term economic prosperity and welfare. I argue for information systems as a major enabler for this vision. Finally, I will present an exemplary implementation of an information system that facilitates the evaluation of the ecological impact of a production process.

[1] Similar initiatives can be found all over the world, e.g. Industrial Internet, Smart Manufacturing in US and in Japan

From pure Intelligence to Rationality and Sustainability in Production of the Future

Establishing smart and intelligent networks, factories and machines is a recurrently mentioned goal of Industry 4.0. While I consider a "smartness" as a limited intelligence, which enables a company to gain a competitive, advantage in the short-term I consider an "intelligent" production system something more far reaching. Ideally, an intelligent system is capable of taking into account long-term impacts of decisions. In the following I will firstly summarize the concept of intelligent production systems as it is propagated by the Industry 4.0 visionaries and subsequently will extend this concept with regard to ecological sustainability.

Intelligent production systems as conceptualized by Industry 4.0 visionaries are production systems where the production factors act intelligently on the individual and on the aggregate level. To be more concrete, in an intelligent production system material, parts, storage systems, transport systems and manufacturing machinery have an identity, have the ability to process information, have the ability to evaluate information, make decisions and interact with their environment. Such a system requires all subsystems to be well equipped with sensors, embedded software and actuators that continuously and ubiquitously generate and exploit data to be able to plan and execute concrete actions. A major enabler of such intelligent production systems will be the consequent vertical and horizontal integration of subsystems. Vertical integration refers to the data integration of the "virtual" planning layer (e.g. an ERP system) with the "physical" world of the shop floor. Horizontal integration refers to the data integration of different production processes, e.g. manufacturing with assembly and also out-sourced processes.

The promise of an intelligent production system in the above sense is mainly that human interventions are reduced

to a minimum, flexibility regarding individual customer demands (lot-size 1) and adaptivity regarding environmental changes (e.g. changing market price of materials, failure of suppliers) is increased to a maximum. The guiding principle behind such intelligence is and has always been to satisfy one or more of the typical objectives of production management: inventory, throughput-time, utilization and delivery date adherence. Objectives regarding the minimization of the ecological footprint of a production order are typically not explicitly formulated or are not part at all of traditional production optimization problems.

Industry 4.0 does not explicitly refer to ecological sustainability of production systems as a major objective of its program. However, the production technology and operations research community has addressed ecological impact and sustainability in various ways throughout the past decades [5]–[8]. Linking the rather limited concept of intelligence form the Industry 4.0 vision with well-established theories, concepts of sustainable production is at hand and needs to be accomplished to arrive at a truly intelligent and therefore also ecologically sustainable production systems of the future. I hypothesize that only those production systems that incorporate sustainability in their concept of intelligence will be competitive in the long-term.

A Promising Application Example of an Information System for Evaluating the Greenness of the Value Chain

In the production domain a production process is typically conceptualized as a value stream. The value stream is the set of activities that lead to the final customer ready product. The notion of value stream points to the added value as the measure of an activity's importance within the production process regarding resource allocation. Identification of activities together with evaluation of their resource allocation is usually performed through Value Stream Mapping (VSM), a practical method originally developed by Rother and Shook [9]. A major goal of VSM is the identification of "waste". Waste in the sense of Lean Management are activities that do not contribute to the value of a product, e.g. the set-up of a machine or the cleaning of a work place. In other words, "waste" are those activities that consume resources without contributing to the utility of a product. The original approach of value stream mapping expresses waste solely in terms of time and related costs.

In a project recently conducted by the Institute of Management Science and Fraunhofer Austria an information system has been developed that takes up the concept of the value stream to evaluate the ecological footprint of a production process [10]. To do so, a software tool has been developed that allows for the graphical sketch-up of the value stream of production facility as the basis for a subsequent systematic collection of ecologically relevant data and its effective visualization along the value stream. Thus, it is not only possible to systematically describe production processes in terms of costs but also in terms of the ecological impact. The combination of a well introduced and accepted graphical method[2] to sketch a value stream with the visualization of "greenness" indicators has the potential to raise awareness for ecological sustainability of a product and its related process. Consequently, production processes can be evaluated for their sustainability during design and run time. Decisions regarding the appropriate resources and technology to be used for a production process can be made more easily and in early stages of product/process engineering.

[2] VSM is well introduced in typical production departments of any industry

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