Environmental Sciences Based Maturity Model on Green IT 3.0

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From environmental sciences it is known that the carrying capacity of the environment is under pressure by three types of human interventions, i.e. (1) pollution, (2) depletion and overexploitation, and (3) degradation. Both, negative and positive, impacts associated with IT are substantial. The Belgian technological industry is an IT intensive sector and thus an involved party. The goal of this research is to design a framework by means of which the level of green IT of the mentioned sector can be measured. This action is necessary because of increasing pressure of all kinds of stakeholders who urge to use green technology. Green IT refers to ways to reduce the negative impact of hardware on the environment, as well as to software applications that are enabling development of green technology.

In the literature several groups work on green IT and frameworks to assess its maturity or readiness. Of the three human interventions in the environment, degradation of ecosystems due to climate change gets the most attention in the literature. This is due to the high energy-intensity of IT and because the generation of electricity causes CO_2-emission which is responsible for the enhanced greenhouse effect. The so called first order of green IT concerns the complete lifecycle of the hardware, including production and procurement, use of the equipment, and its end of live. The second order of green IT concerns green technology that is enabled by software applications. Both can realize substantial energy savings. The different frameworks to measure green IT mostly consist of five maturity levels and consider the company as a whole or only the IT department. None of them is explicitly based on the human interventions defined by environmental sciences neither can they be applied one to one to the Belgian technological industry. Therefore, starting from the environmental sciences perspective, an innovative framework has been designed that is taking into consideration all three types of human interventions in the environment and the different orders of green IT. It can be noticed that there is also a third order of green IT, which concerns technological and behavioral changes that may force the realization of the necessary paradigm shift. We expect that people are more aware of the problems and solutions when they understand the type of intervention they cause on the environment by using IT.

The framework we designed describes several components by type of intervention in the environment and by order of green IT. Two columns are used to describe the content per component. On the one hand some examples are mentioned of the negative impact of IT in the environment. On the other hand the green alternative is described. The goal of the empirical part of the research was to find out if the newly designed framework still should be adapted in order to be applicable for measuring the green IT level of the Belgian technological industry. Furthermore it has been examined if the framework is complete, how the components can be quantified, and which weighting factors should be applied to the components.

The empirical part of the research was carried out by means of a case study in a large, representative company of the Belgian technological industry which consists of 1832 associated companies. The data collection is a combination of documentstudy, informal conversations and semi-structured interviews. This step-by-step approach benefits the internal validity of the research. The collected data has been used to find out if there are enough leads to apply the framework, which is started from an environmental perspective, to the mentioned sector.

A comparison of the portfolios shows that the case organization is representative for the sector. The six respondents for the interviews have the appropriate background and were willing to participate in the research project. They confirmed that the environmental perspective of the framework is applicable within the sector. As a result of the interviews some components of the framework were grouped together, some others were omitted, and still others were added to the model. The criteria to do so, are linked to the questions if components are quantifiable and what their environmental impact may be. Quantifiable units of measurement were defined for all components as well as the conditions for measurement. The framework can thus be used as a concrete measurement instrument. The weighting factors are not yet precise because this would imply a concrete measurement first. This was beyond the scope of this research. However, the respondents expect that the green alternatives are realizable for most of the components.

The Belgian technology industry is an influential sector. The concerned framework is therefore of great social value because it can be used to measure the environmental impact of a big part of the market. However, an extrapolation of a case organization to a sector and beyond increases the uncertainty of a measurement. The economical part is missing in the framework and therefore a measurement only has an ecological (and not a sustainable) meaning. Nevertheless, the scientific value is the uniqueness of a framework that combines several disciplines, such as environmental science, green informatics, and electrotechnology.