Properties of Sustainable Information Systems

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Introduction

The paper examines which properties of information systems are required to provide the greatest possible benefit for sustainable development. There are three streams of research that are of particular relevance at the intersection between information systems research and sustainable development. First, "Sustainability by Information Systems", which evaluates the contribution of information systems to sustainable development; Second, "Sustainability in Information Systems" aims to reduce the consumption of resources within the infrastructure, mainly caused by the lifecycle of information technology; Third, information systems have to be created and maintained such that they are constantly used to optimise their impact. We call this third dimension "Sustainability of Information Systems". We conclude that all three dimensions are relevant when classifying information systems as "Sustainable Information Systems (SIS)". SIS are information systems that are created, used and maintained to provide the greatest possible benefit to sustainable development. The paper follows a conceptual approach and brings the three research domains together. The findings contribute both to theory and to practice, since the results raise awareness of the short-term thinking of digitalization and support considerations on the need for Green IS with lasting benefits.

Three dimensions of Sustainable Information Systems

The existence of information systems, as well as their creation and use, may have manifold effects on sustainable development, which can be either positive or negative. In order to better analyse the various contributions made by information systems to sustainable development, a differentiated approach is valuable. Hilty and Aebischer (2015) suggest distinguishing between effects on three different levels. The "Life-Cycle Impacts" (level 1) are direct effects of the use of ICT. The "Enabling Impacts" (level 2) are indirect effects of the application of information systems. These may lead to changes in production and consumption on the micro level. The "Structural Impacts" (level 3) are socio-economic effects of the use of IT-applications. These may lead to persistent changes on a structural and institutional level and, therefore, occur on a macro level. The impacts of both level 2 and level 3 can be positive, but also negative with respect to sustainable development.

"Sustainability by IS", "Sustainability in IS" and "Sustainability of IS" strengthen the positive impact of information systems on level 1, 2 and 3. "Sustainability in IS" reduces the "Life-Cycle Impact" by providing solutions for more efficient and/or effective use of information systems. Sustainability by IS contributes to sustainable development mainly on level 2 and/or level 3.

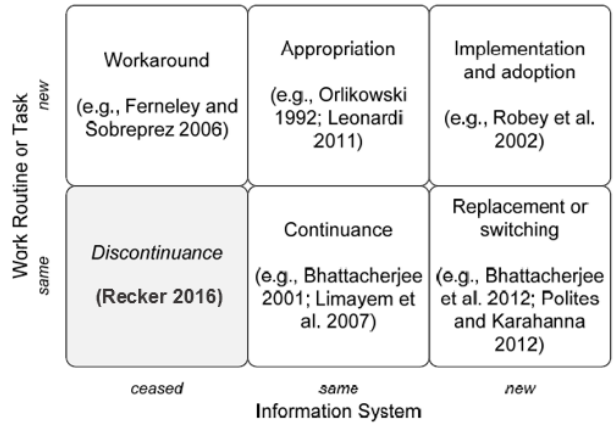

Figure 1. Continuance / Appropriation (Recker 2016)

Assuming that we have information systems that (1) contribute to sustainable development on level 2 and level 3 ("Sustainability by IS") and (2) the system is optimized in the consumption of natural resources ("Sustainability in IS"), the short-term thinking that has become so prevalent in the age of digitalization limits the positive impact of information systems on sustainable development. This is where the third research stream ("Sustainability of IS") really comes into its own. This stream mainly explores the maintenance and use of the information

systems. Users need to adopt the information systems (Venkatesh 2000; Seidel et al. 2013), but adoption alone is not sufficient for continued use (Bhattacherjee 2001). Additionally, systems need maintenance (Swanson and Dans 2000; Heales 2002; Ye et al. 2008) for instance and possibilities for interoperability (Mora-Rodriguez and Preist 2016). Recker (2016) elaborates a 2*3 Matrix of prior research to discern whether an information system is still used (continuance and appropriation), replaced (implementation and replacement/switching) or ceased (discontinuance, workaround) if the same or a new work routine are implemented over time. Generally, we assume that continuance and appropriation are beneficial, as the insights acquired are less under threat of loss. Of course, there are situations in which a replacement is inevitable, but a long-term perspective in the creation and maintenance extend the date of replacement and therefore reduce the drain on resources, which can then be used to build new systems. Therefore, it is important to distinguish between the hardware life-cycle, the software life-cycle and the data life-cycle, as these do not necessarily need to be synchronized.

Conclusion

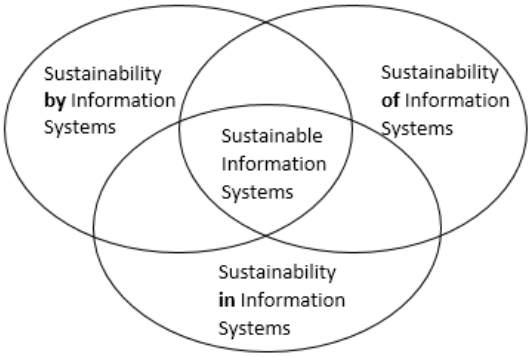

Figure 2. Sustainable Information Systems

The lack of consideration afforded to factors for durability in Green IS design places information systems under threat of becoming obsolete and data being lost (Heminger and Kelley 2005). Therefore, we propose incorporating all three dimensions into the design process for Sustainability by IS in order to enhance the "Enabling Impacts" and the "Structural Impacts" of information systems. The concept of the knowledge economy assumes a constant accumulation of knowledge (by building on previous knowledge) (Drucker 2001). However, if data, information and knowledge from Sustainability by IS are not maintained and created with a long-term perspective, the idea of continual development of the knowledge economy and, in consequence, society as a whole, is not feasible.

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