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Sustainability in Information and Communications Technology (ICT) Projects

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ABSTRACT

Sustainability is without doubt one of the most important challenges of our time. How can we develop prosperity, without compromising the life of future generations? Companies are integrating concepts of sustainability in their marketing, corporate communications, annual reports and in their actions. It is for that reason that sustainability is rapidly gaining importance as a criteria in the selection and execution of information and communication technology (ICT) projects.

This paper explores the impact of the concepts of sustainability on ICT projects. Based on a literature review of the concepts of sustainability, and the role of ICT in sustainability, we will apply the concepts of sustainability to ICT projects and create a framework for developing sustainability indicators in ICT projects. We will conclude the paper by reporting a small scale expert research project that explored the application of sustainability in projects today. In this study we found that the concept of sustainability is not really recognized in projects and project management yet.

INTRODUCTION

At the 22nd World Congress of the International Project Management Association (IPMA) in 2008, IPMA Vice-President Mary McKinlay stated in the opening keynote speech that the further development of the project management profession requires project managers to take responsibility for sustainability. Her plea summarized the development of project management as a profession as she foresees it. In this development project managers need to take a broad view of their role and to evolve from 'doing things right' to 'doing the right things right'. This implies taking responsibility for the results by the project, including the sustainability aspects of that (McKinlay, 2008).

Sustainability is without doubt one of the most important challenges of our time and the immediate future. The recent world crises makes clear that a strategy focused on unlimited shareholder value is in the long term not successful, not even from a financial point of view. Following the success of Al Gore's 'inconvenient truth', awareness is growing that a change of mindset is needed, both in consumer behaviour as in corporate policies. How can we develop prosperity without compromising the life of future generations? Proactively or reactively, companies are looking for ways to integrate ideas of sustainability in their marketing, corporate communications, annual reports and in their actions. It is for that reason inevitable that

sustainability will find its way to information and communication technology (ICT) projects and project management in the very near future.

This paper explores the impact of the concepts of sustainability on ICT projects. After a review of the concepts of sustainability, the role of ICT in sustainability will be explored. The following sections will apply the concepts of sustainability to ICT projects and create a framework for developing sustainability indicators in ICT projects. We will conclude the paper by reporting a small scale expert research project that explored the application of sustainability in projects today.

CONCEPTS OF SUSTAINABILITY

Sustainability in the context of sustainable development is defined by the World Commission on Environment and Development (1987) as "forms of progress that meet the needs of the present without compromising the ability of future generations to meet their needs". This broad definition emphasizes the aspect of future orientation as a basic element of sustainability. This care for the future implies, among others, a wise use of natural resources and other aspects regarding the environmental footprint. The 'green' aspect of sustainability is recognized in many other definitions of sustainability. For example the Organization for Economic Cooperation and Development (OECD) states that, "The sustainable development concept constitutes a further elaboration of the close links between economic activity and the conservation of environmental resources. It implies a partnership between the environment and the economy" (Organization for Economic Cooperation and Development, 1990).

Other authors emphasize sustainability to the development of underdeveloped regions. For example, Barbier (1987) links sustainable development to "...increasing the material standard of living of the poor at the 'grassroots' level, which can be quantitatively measured in terms of increased food, real income, educational services, healthcare, sanitation and water supply, emergency stocks of food and cash, etc."

The combination of both social and environmental perspectives can be found in the earlier mentioned "Our Common Future" report by the United Nations World Commission on Environment and Development (1987). The report states that, "In its broadest sense, sustainable development strategy aims at promoting harmony among human beings and between humanity and nature".

The International Institute for Sustainable Development elaborates on the generic definitions in a definition more focused on sustainable management of organizations: “Adopting business strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting, sustaining and enhancing the human and natural resources that will be needed in the future.”. Important in this definition is the mentioning of the “...needs of the enterprise and its stakeholders today...”. This aspect recognizes that without profitability today, care for the environment and humanity cannot be sustained. John Elkington, in his book “Cannibals with Forks: the Triple Bottom Line of 21st Century Business”, identified this as the ‘triple bottom line’ or ‘Triple-P’ concept: Sustainability is about the balance between economic sustainability, social sustainability and environmental sustainability (Elkington, 1997), as illustrated in Figure 1.

SUSTAINABILITY AND ICT

The different approaches to sustainability mentioned above can also be found in studies about sustainability and ICT. These studies roughly divide into studies on ICT and environment sustainability and ICT and social sustainability.

ICT and environmental sustainability

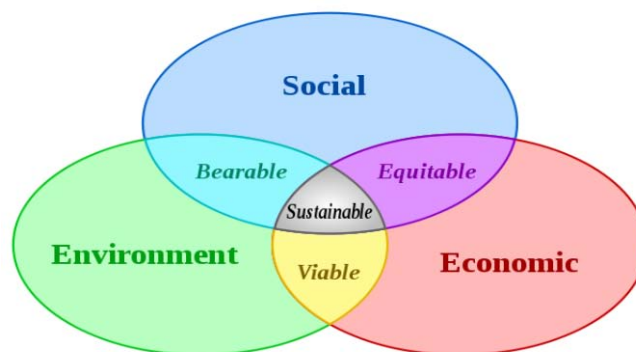
The environmental impact of ICT has always been subject to discussion. The promise of a decreased environmental footprint because of paperless offices and tele-working has been opposed by claims of increased power consumption and hazardous waste because of ICT.

According to Erdmann (2008), the environmental footprint of ICT can be considered on different levels.

The first level being *environmental effect because of the physical existence of ICT*, causing increased consumption of energy, increased emission of greenhouse gas and increased non-recycled solid waste.

The second level concerns *environmental effects because of the use and application of ICT*. On this level effects are generated by virtual goods, virtual stores, tele-working, tele-meetings, tele-collaboration, etc.

Figure 1: The Triple-P concept of sustainability.



The third level of consideration are the *systemic effects of the use of ICT*. These effects include impacts on facilities managed, on supply chains, on total freight transport and on total passenger transport.

Because of this diversity of direct and indirect indicators, the overall effect of ICT on environmental sustainability is not easy to determine. The effects on the environmental indicators are heterogeneous and complex (Erdmann & Würtenberger, 2003). For example, telematic applications and e-business/e-commerce affect both freight and passenger transport intensity. Tele-work and tele-cooperation reduce passenger travel. The net effects are discussed controversially. ICT based optimization of products and processes as well as e-business have a potential for the reduction of energy intensity of the industry as well as greenhouse gas emissions from energy industries. ICT appliances in the domestic and the tertiary sector consume energy on the other hand offices, buildings and other facilities can be run more efficiently. The effects of ICT on the amount of municipal waste are ambivalent, but ICT has a considerable potential for improved collection and recycling of municipal waste. ICT leads to a restructuring of the whole economy, fostering services, changing the importance among different industries and changing transport patterns. On the consumer side ICT influences our mobility needs, our attitudes towards waste and entails general shifts in lifestyles.

Plepys (2002) concludes “The discussion on what the role is of ICT and, particularly, Internet for sustainability is still going on and will hardly reach any definite conclusion, as the environmental impacts of the new technologies will depend on how they are used.”

ICT and social sustainability

ICT can be a powerful enabler of social sustainability and contribute to development goals because its unique characteristic to dramatically improve communication and the exchange of information to strengthen and create new economic and social networks (United Nations Development Program, 2001). The reasons for this being the following.

ICT is pervasive and cross cutting

ICT can be applied to the full range of human activity from personal use to business and government. It is multifunctional and flexible, allowing for tailored solutions based on personalization and localization, to meet diverse needs.

ICT is a key enabler in the creation of networks

ICT thus allows those with access to benefit from exponentially increasing returns as usage increases i.e. network externalities.

ICT fosters the dissemination of information and knowledge

ICT has the ability to separate content from its physical location. This flow of information is largely impervious to geographic boundaries, allowing remote communities to become integrated into global networks and making information, knowledge and culture accessible to anyone.

ICT can radically reduce transaction costs

The digital and virtual nature of many ICT products and services allows for zero or declining marginal costs. Replication of content is virtually free regardless of its volume, and marginal costs for distribution and communication are near zero.

ICT can enhance efficiency

ICT's power to store, retrieve, sort, filter, distribute and share information seamlessly can lead to substantial efficiency gains in production, distribution and markets. ICT streamlines supply and production chains and makes many business processes and transactions leaner and more effective.

ICT enables innovation

The increase in efficiency and subsequent reduction of costs brought about by ICT is leading to the creation of new products, services and distribution channels within traditional industries, as well as innovative business models and whole new industries. Intangible assets like intellectual capital are increasingly becoming the key source of value. With the required initial investment being just a fraction of what was required in the more physical-asset intensive industrial economy, barriers to entry are significantly lowered, and competition increased.

ICT facilitates disintermediation

ICT makes it possible for users to acquire products and services directly from the original provider, reducing the need for intermediaries.

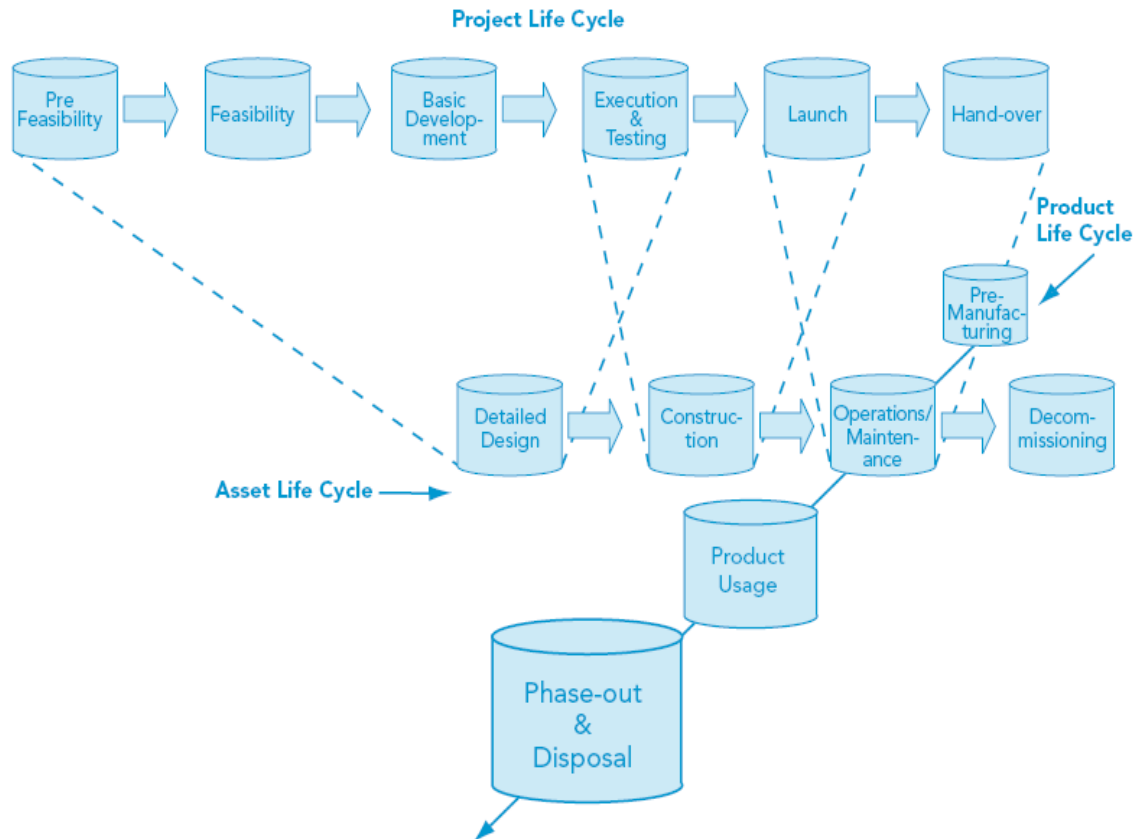
In some parts of the world, information and communication technologies and services are contributing to revolutionary changes in business and everyday life. In other parts of the world, the lives of people have hardly been touched by these innovations. If people in developing countries are unable to acquire the capabilities for using the new ICT applications, they will be increasingly disadvantaged or excluded from participating in the global information society. The social and economic potential of these new technologies for development is enormous, but so too are the risks of exclusion (Mansell, 1999). Economic research suggests a positive correlation between the spread of ICT and economic growth (Siegel, 2003). ICT can contribute to income generation and poverty reduction. It enables people and enterprises to capture economic opportunities by increasing process efficiency, promoting participation in expanded economic networks, and creating opportunities for employment (Organization for Economic Cooperation and Development, 2005).

INTEGRATION SUSTAINABILITY IN PROJECTS

The concepts and authors mentioned in the above sections bear a number of core concepts that should be taken into account when considering the impact of sustainability on ICT projects. Given the future-orientation of sustainability, a logical implication is to consider the full life cycle of a project or product, from its conception to its disposal. This view is further developed

by Labuschagne and Brent (2006). In their work they confirm the Triple-P view, but add the concept of life cycles.

Figure 2: Interrelating life-cycles (Based on Labuschagne & Brent, 2006).



They argue, that when considering sustainability in projects, the total life cycle of the project (e.g. initiation-development-execution-testing-launch) should be taken into account. But not just the life-cycle of the project is relevant. The project will ‘produce’ a result, being a change in assets, systems, behavior, etc. This result, in her words: the asset, should also be considered over its full life cycle. And even another level further, also the life cycle of the product or service that the asset produces should be considered. Figure 2 visualizes how these life cycles, ‘project life cycle’, ‘asset life cycle’ and ‘product life cycle’, interact and relate to each other. Including sustainability considerations in projects suggests that these three life cycles are taken into account.

Because Labuschagne and Brent include the result of the project in their framework, it is sensitive to the context of the project. Their studies regarded the manufacturing sector in which projects generally realize assets that produce products. In the context of ICT projects, the result of a project may be not a manufacturing asset, but a new information system, a new business process, or a new service. The general insight that can be derived from Labuschagne and Brent, (2006), however, is that sustainability in projects should be regarded on the level of the project, its result and its effect.

Figure 3: A framework for developing sustainability indicators in ICT projects.

	People <i>Social sustainability</i>	Planet <i>Environmental sustainability</i>	Profit <i>Economic sustainability</i>
The Project			
Its Result			
Its Effect			

In order to develop a simple model that fits a wider range of different types of projects we propose a framework to identify the sustainability aspects of projects. In this framework we recognize the people-planet-profit concept of sustainability in the way that we suggest that projects are measured against criteria on social sustainability, environmental sustainability and economic sustainability. These criteria or indicators should then be applied on the level of the project itself, its result (an asset, product or a change) and its effect (what is it that the asset delivers).

The framework that results from these views (Figure 3) provides an overview of considerations and can be used by practitioners and academics as a practical ‘map’ to develop meaningful performance indicators or criteria for sustainability in ICT projects.

An important source of knowledge about sustainability performance indicators is the Global Reporting Initiative (GRI). This international organization aims to harmonize information provided by organizations on sustainability in order to allow for benchmarking of indicators. The GRI developed a set of sustainability performance indicators, that organizations can use as a source of reference in their reports. These indicators are downloadable on the website: www.globalreporting.org. Some examples of indicators:

‘People’ indicators for sustainability:

- Labor (e.g. health, safety, education, development, career opportunities, etc.);
- Human rights (e.g. child labor, freedom of religion, gay rights, etc.);
- Society (e.g. community development, corruption, competition, etc.);
- Product (e.g. product safety, marketing, privacy, etc.).

‘Planet’ indicators for sustainability:

- Materials used (e.g. losses, waste);
- Energy consumption (e.g. direct consumption, indirect consumption);
- Water consumption;
- Transport;
- Emission of greenhouse gas;
- Etc.

'Profit' indicators for sustainability:

- Financial benefits;
- Market and competitive position;
- Other economic effects.

SUSTAINABILITY IN PROJECTS TODAY

In order to explore the understanding of sustainability in projects today, we performed a small scale expert study. This qualitative and expert approach was chosen because of the immature and developing nature of this new crossroads of concepts. A panel of 14 international experts on projects, academics and practitioners, were approached for this study. The backgrounds of this expert group are shown in Table 1.

Table 1: Backgrounds of the experts.

	<i>Background</i>		
	<i>Male / Female</i>	<i>Academic / Practitioner</i>	<i>Country</i>
Respondent 1	Female	Academic	Netherlands
Respondent 2	Male	Practitioner	Belgium
Respondent 3	Female	Both	United Kingdom
Respondent 4	Male	Both	Netherlands
Respondent 5	Male	Practitioner	Netherlands
Respondent 6	Male	Practitioner	United States
Respondent 7	Female	Both	Australia
Respondent 8	Male	Both	Canada
Respondent 9	Female	Academic	Germany
Respondent 10	Male	Both	South Africa
Respondent 11	Male	Practitioner	United Kingdom
Respondent 12	Male	Academic	Iceland
Respondent 13	Male	Academic	United Kingdom
Respondent 14	Male	Practitioner	United States

The questions for the expert group were:

- *Do you think sustainability will be increasingly important in ICT projects?*
- *What aspects do you consider as characteristic of 'Sustainable Project Management'?*
- *Do you experience any aspects of sustainability already implemented in ICT projects?*

We included these questions in a semi-structured individual telephone interview. The experts were informed about the questions beforehand. One respondent answered by email because of time difference.

FINDINGS

Question 1: Do you think sustainability will be increasingly important in ICT projects?

On this question, 12 of the 14 experts responded that they believed sustainability would become more important in project management. Reasons that were given for this opinion included “Sustainability is increasingly important in every aspect of business”, “Project managers can’t close their eyes for what’s going on in the world” and “The project manager must be aware of the business context he or she is working on”. The two respondents that did not believe sustainability would be increasingly important in project management gave as their main reason for this opinion that they believe the project manager should not take on the role of the project sponsor. This conclusion seems to suggest a broad support for the idea of sustainable project management. But when we look closer into the definitions people use it turns out that sustainable project management is interpreted in a diverse way.

Question 2: What aspects do you consider as characteristic of 'Sustainable Project Management'?

The answers of the experts on this question are summarized in Table 2.

Table 2: Perceived characteristics of sustainable project management.

	<i>What aspects do you consider as characteristic of 'Sustainable Project Management'?</i>		
	Economical aspects	Social aspects	Environmental aspects
Respondent 1	√	√	
Respondent 2		√	
Respondent 3		√	
Respondent 4	√	√	
Respondent 5	√		√
Respondent 6		√	√
Respondent 7	√		
Respondent 8		√	
Respondent 9		√	
Respondent 10		√	√
Respondent 11	√		
Respondent 12	√	√	√
Respondent 13		√	
Respondent 14		√	
	43%	79%	29%

Surprisingly, the experts include most of all the social perspective in Sustainable Project Management, even more than the environmental aspects. This is suggesting that most experts in the project management field have a different working definition on Sustainable Project Management. The widely used definition of the United Nations is not very well known in the

project managers' field. This is of course not very surprisingly since the ideas on Sustainable Project Management are still in a very early stage of development.

Table 2 shows that sustainability is by many experts seen as "not paying attention" to the economical aspects of project management. Furthermore it shows that the experts mainly regard social aspects as being part of sustainable project management. The attention for the social aspects of project management fits very well with the observation that soft values are becoming increasingly important for project management.

Overall we can conclude that the concept of sustainability is in bad need of a good definition in order to build a bridge between the discussions in society about sustainability and the discussions in the project management field about the future of this field,

Question 3: Do you experience any aspects of sustainability already implemented in ICT projects?

Again surprisingly, a large fraction of the experts responded that they experienced already some of the aspects of sustainability in the management of the organization they were working in. For the economic aspects, this should not be surprising, but for the social and environmental aspects the results are encouraging.

Table 3: Aspects of sustainability already implemented.

	<i>Do you experience any aspects of sustainability already implemented in ICT projects?</i>		
	Economical aspects	Social aspects	Environmental aspects
Respondent 1	Yes	Yes	
Respondent 2	Yes	Yes	Yes
Respondent 3	Yes		Yes
Respondent 4	Yes	Yes	
Respondent 5			Yes
Respondent 6	Yes	Yes	Yes
Respondent 7	Yes		Yes
Respondent 8	Yes	Yes	Yes
Respondent 9	Yes		Yes
Respondent 10	Yes	Yes	
Respondent 11	Yes	Yes	Yes
Respondent 12	Yes		
Respondent 13	Yes	Yes	Yes
Respondent 14	Yes		Yes
	93%	57%	71%

Table 3 shows very clearly that the experts might not see environmental aspects as a part of Sustainable project management (as shown in table 2), but that they do see that this aspect is being implemented in project management already. This supports our idea that the first signs of

sustainable project management are glooming in practice and that it is very important to start thinking about a broader perspective on these developments.

CONCLUSION

The concept of sustainability will need to find its way to ICT projects in the near future. From the literature on sustainability, the triple P concept and the life-cycle approach can be derived as concepts of sustainability that can be applied to ICT projects. By combining these concepts, we developed a framework that provides an overview of considerations that can be used by practitioners and academics as a practical 'map' to develop meaningful performance indicators or criteria for sustainability in ICT projects.

A small-scale expert survey, however, leads to the conclusion that the concept of sustainability in projects is not really recognized yet. Although aspects of sustainability are found in the management of organizations, the terms 'Sustainable Projects' or 'Sustainable Project Management' are not necessarily related to these aspects. In the traditional methods of managing projects, the triple constraint of cost, time and quality, the social and environmental aspects of sustainability also seem to be lacking.

It is clear that still a lot of work has to be done on the implications of sustainability in ICT projects and that there is a growing need of expertise, criteria and concepts to practically implement the concept in (the management) of ICT projects. The consequences are not at all clear yet and may even be underestimated. It can be expected that implementing the concept of sustainability in projects will require different skills than those that are the 'bread and butter' of most project managers today.

The developments and views summarized in this paper should raise discussion about how we can prepare practitioners and students for a future in which sustainability needs to be an integrated part of our actions. In professional practice, the increasing uncertainty in projects, and the responsibility that a project manager needs to take for the result the project delivers, calls for a further shift in project management competences. Further strengthening of business and contextual competences is needed, in order to enable project managers to deal with a wide variety of new problems in the near future.

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