

# Chapter 1

## ICT Enabling More Energy Efficient Processes, Including e-Invoicing as a Case

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### ABSTRACT

*ICT has the potential to enable a low carbon economy, as pointed out by many studies. One example of the energy (and CO<sub>2</sub>) saving potential of ICT is illustrated in this chapter: how much energy (and emissions) can be saved if the invoicing process is redesigned? Although there is a net positive effect, the way the actual process is implemented can make a large difference. This led to the question of how to evaluate different projects or different designs, when it comes to the net sustainability effects. Then a framework is introduced to compare the combined sustainability effects of all the steps in a work process compared to alternative processes. The authors then describe existing indicators and metrics that can be used to fill the framework.*

### INTRODUCTION

There are many metrics and frameworks that all address some kind of sustainability in relation to Information and Communication Technologies (ICT). A commonly used definition of ‘sustainability’ is in the “Brundtland report” (World in Balance,

1997), defining sustainability as “development which meets the needs of the present without compromising the ability of future generations to meet their own needs.” Sustainable development is frequently associated with the Triple Bottom Line, economy, society and environment; or more popularly, People, Planet and Profit. We use this Triple Bottom Line as the basis for our assessment of sustainability of ICT.

DOI: 10.4018/978-1-4666-1839-8.ch001

Historically, the application of ICT has been driven mainly by economic factors. Roughly speaking, the *'profit'* part of ICT is an aspect that is already incorporated in the sector. Although there is some debate on this (the Productivity Paradox: productivity growth in companies is not as fast as the growth in ICT performance), we will not elaborate this aspect much deeper.

The *'people'* aspect of ICT comes immediately after the *'profit'* aspect. This aspect can be operationalized on various levels:

- Working conditions during production of the software. This includes topics like fair wages, equal opportunities, freedom to join labor unions, etcetera.
- Impact of the ICT on the workplace of people who use the system. The usability of a system is included in this, but also labor conditions, like increased risk of Repetitive Strain Injury (RSI).
- Impact of the ICT on administrative, business or societal processes, analogous to the introduction of the assembly line in manufacturing industry. Will the work become more tedious and lower valued, or will it enable workers to grow and learn?
- The transformative power of ICT on the way people work and behave, like social networks. Examples are the creation or loss of jobs, communication and work patterns that arise.

The *'planet'* aspect of ICT has recently received most attention. This chapter aims to give a view on how to assess the green-ness of processes using ICT. As pointed out in many studies like the Climate Group (2008) and Hilty (2008), ICT has the potential to enable a low carbon economy. In the ICT sector plans and activities to significantly step up the energy efficiency of its products and services are unfolded but ICT's largest influence will be by enabling energy efficiencies in other

sectors. That opportunity could deliver carbon savings up to about 20% (Hilty, 2008).

Based on the outcomes of a study on the sustainability impact of e-invoicing (Van Hoorik, et al., 2010) we start with this case to illustrate the effects of different processes on the sustainability outcomes. We show that different process designs have a great impact on sustainability outcomes.

Then ICT sustainability impact framework (Van Hoorik & Bomhof, 2010) is introduced for a structured assessment of sustainability effects. On one hand, it contains the three well known sustainability aspects people, planet and profit. On the other hand, it includes the three types of effects. When assessing the effects of a project or intervention, effects will occur on different levels, according to Hilty (2006) and Berkhout and Hertin (2004).

- Direct effects: the effects that are caused by the existence and use of ICT. For example, the use of energy and materials of producing, using and discarding ICT equipment.
- Indirect effects, also called enabling effects: the effects that are caused by the impact of the usage of ICT on its environment, for example sensors that will switch off the lights when leaving the room.
- System effects: the longer term and behavioral effects, for example by working at home in the morning, people are able to avoid traffic jams and spend less time in the car.

Next to that, rebound effects make it difficult to evaluate the effects of ICT on sustainability. Rebound effects are the effects of ICT that seem to have good advantages in the short term could be undone in the long run (Bomhof, et al., 2009). For example, if people are able to avoid traffic jams in the morning by working at home, they can choose a job that is located further from home. That will increase the number of kilometers spent

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