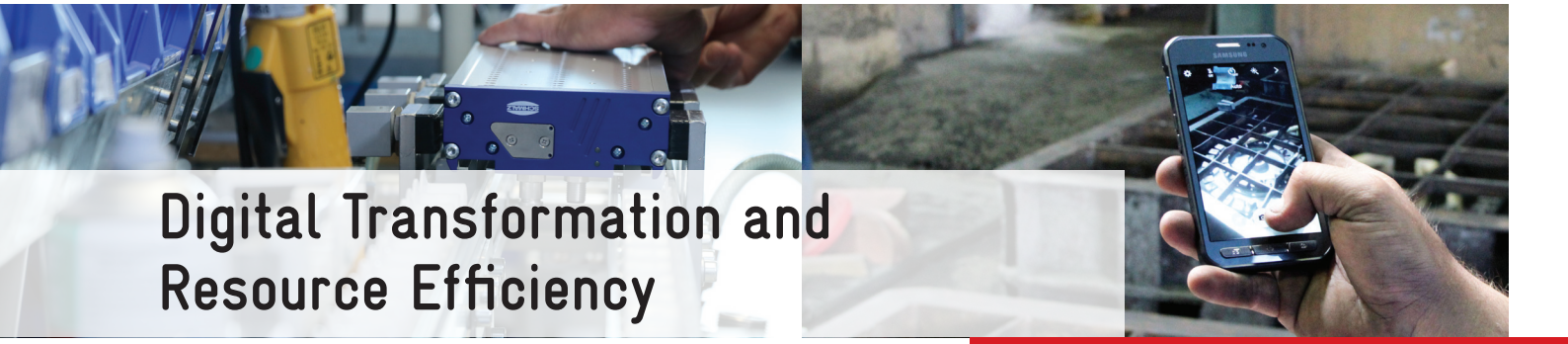

Digital Transformation and Resource Efficiency

Dual benefits for the productive sector

1 Tapping the Potentials of Digitization

Digital Transformation is advancing rapidly in the productive sector. Assimilating it represents a considerable challenge for many companies, but if done properly, it also offers great potentials. Throughout the past two decades, the sector has been indeed the subject of technological changes in order to cope with the growing need to adapt products, production, and logistics to the current market situation. In this context, characterized by information connectivity and a high competition at national and international level, making innovative uses of digital technologies has become increasingly important across all productive sectors. Digitization helps optimizing processes in a way that improves productivity and by that, it offers great potentials for using natural resources more efficiently.

A very important foundation for these optimizations is the access to real-time information of a product or service at every location and point in time of its lifecycle. This requires comprehensive networking between the various agents involved in the entire value chain so that the production can be constantly adapted to changing demands. The implementation of digital technologies enables this networking, which according to a study published by the VDI Centre for Resource Efficiency (VDI ZRE), can lead to savings in resources of up to 25% (VDI ZRE 2017). Next to an improvement in productivity, competitiveness and innovation, enhancing resource efficiency through the technology driven optimization of production processes also contributes to the reduction of CO_2 emissions, environmental pollution and the conservation of increasingly scarce and valuable resources.

2 Digital transformation and potentials for resource efficiency

There are various digitization measures that can contribute to an increase in resource efficiency. However, it is important for companies to assess the potential of different measures regarding resource efficiency at an early stage in their digitization process, so that it can be tapped most cost-effectively.

Some examples of measures that are frequently implemented by companies and can enhance resource efficiency are:

- Introduction and use of positioning and localization systems
- Measures for support and assistance of workers (such as apps)
- Predictive maintenance of machines
- Monitoring of operating conditions
- Virtual product development
- Cloud computing
- Continuous data integration

The digital transformation of production requires a major increase in the capacity of servers and other internet services. Therefore, in order to assess the resource efficiency increase resulting from digitization measures, the material and energy consumption required for servers and related services must be also taken into account.

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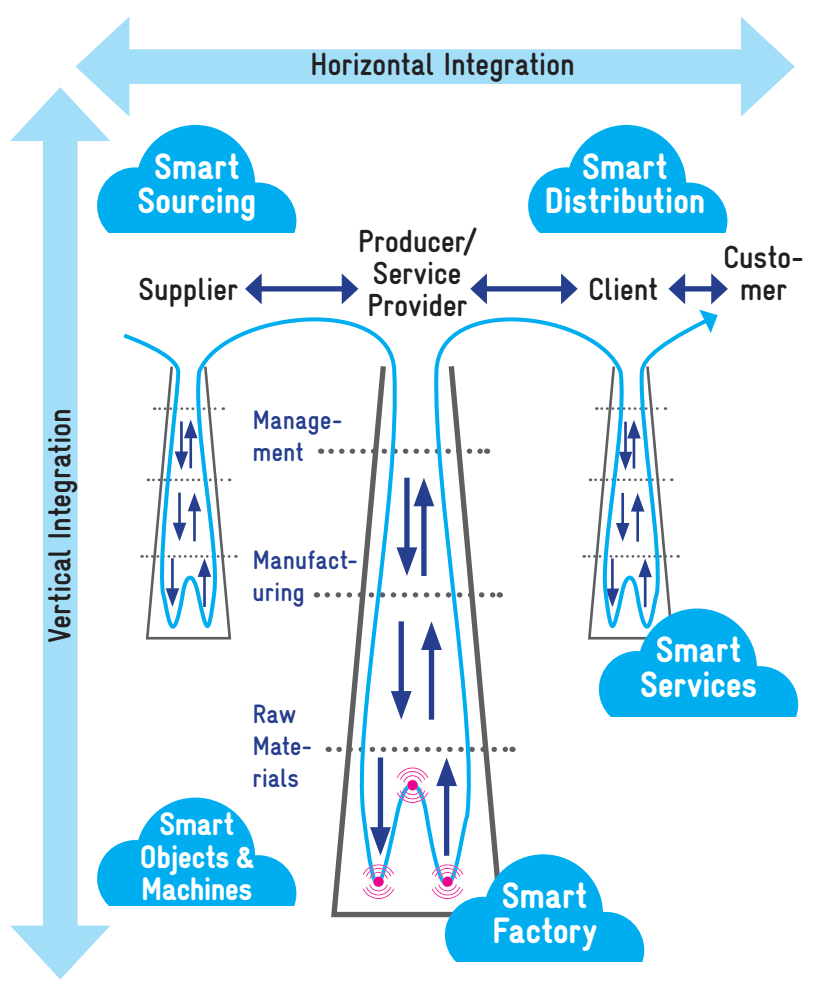
BOX 1

ICT4RE: Principles of digitization and resource efficiency

The implementation of digitization measures can contribute to an increase in resource efficiency in various ways. For instance, through the collection of large quantities of data, whose analysis serve as the basis for the optimization of production processes, which in turn can lead to savings in resource inputs.

Moreover, digitization increases the networking between different levels of a company and the means of productions inside (vertical integration). This facilitates, for instance, the effective implementation of Enterprise Resource Planning (ERP) and Manufacturing Execution systems (MES) that can contribute to a more efficient use of resources in the company, beyond the mere production process.

Furthermore, it allows for the horizontal integration between companies in the same value chain, linking for instance individual production facilities with logistics and retail. This is particularly relevant for avoiding overstock and overproduction.



3

Best-Practice Examples of resource efficiency through digitization in industry

J. Schmalz GmbH
(mechanical engineering sector)

The family-run company is a world leader in vacuum technologies for industrial production. Once the specific parameters of a product are determined, it is given a product key, which is digitally transferred to the production department. According to the product key, only those components required for the so called "one-piece flow" are prefabricated, a just-in-time production allowing top material efficiency, as well as reducing storage to zero. Whether changes are made by the customer or a product becomes obsolete, this approach puts an end to superfluous inventory. Regarding total material savings, the company can achieve savings of up to 2,625 kg EPDM-rubber foam and up to 233 kg aluminium per year, which respectively accounts to a reduction in emissions of 15,304 kg CO_2Eq and 2,367 kg CO_2Eq per year.[1]

Wetropa Kunststoffverarbeitung GmbH & Co. KG
(plastics industry)

This medium-sized company dedicated to the production of customized plastic foam packaging shifted the product development to their customers using a specially developed app called "FoamCreator". This change in their production process has allowed them to reduce the costs for individualized products, while at the same time significantly saving resources. Most importantly, material that would be otherwise required for the construction of prototypes which would have had to be sent to the costumers for corrections. To this respect, the use of the app has managed to save up to 25% of material annually, or 2,500 kg, which represents emission reductions of up to 7,000 kg CO_2Eq per year. Moreover, as the development process occurs on a digital setting, the transport requirements have also been reduced by up to 33%.[1]

Hydro Aluminium Recycling Deutschland GmbH
(metal recycling industry)

The company has managed to increase the recycling rate of aluminium from window frames using specialized shredding and sieve processes, as well as through the analysis of the resulting small metal chips by means of X-rays and sensors. The data generated is processed by a computer and then used to control compressed air nozzles that separate single aluminium alloys precisely. As the window frame production requires particular aluminium alloys, a separation into individual alloy-groups increases the amount of recycled materials that meet the required quality standards. Thus, less amount of primary aluminium required for the production of new frames. As a result of these measures, the company can produce up to 30,000t recycled Aluminium per year, which can save up to 15,000t of primary aluminium. Considering the entire production chain from the extraction of the ores to the production of the window frames, the company can save up to 200,000t CO_2 and 650,000 MWh energy.[2]

4 Recommendations for policy makers and companies

Policy makers

Funding of information, advisory and training offers related to digitization and resource efficiency in the productive sector

- Companies often lack a concrete overview of digitization options and their impacts on resource efficiency. Therefore, a consistent offer of advisory and information services provided by expert institutions, with the support of the state, has great potential for helping companies to shape their digitization strategies. Through that, it is possible to systematically contribute to the optimization of resource management in production, procurement and distribution.

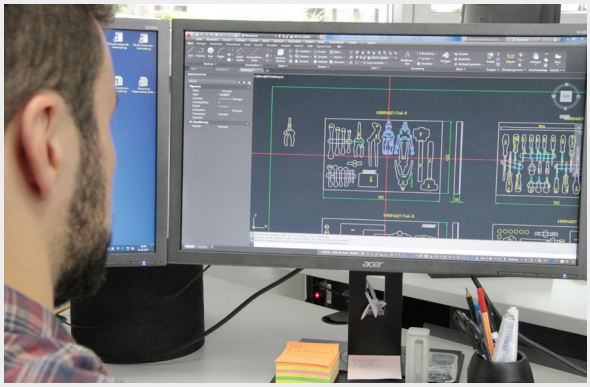
Labelling of electricity consumption values of ICT and internet services

- The nexus between digitization and an increase in resource efficiency depends greatly upon the infrastructure of services associated to digital technologies. Thus, resource efficiency also requires optimization measures in servers and other service providers. A possible way of incentivizing such improvements is the

BOX 2

Video 1:
Industry 4.0 – Saving materials – in development and in production

J. Schmalz GmbH, manufacturer of vacuum technologies and
Wetropa Kunststoffverarbeitung GmbH & Co. KG, producer of costumized plastic packaging

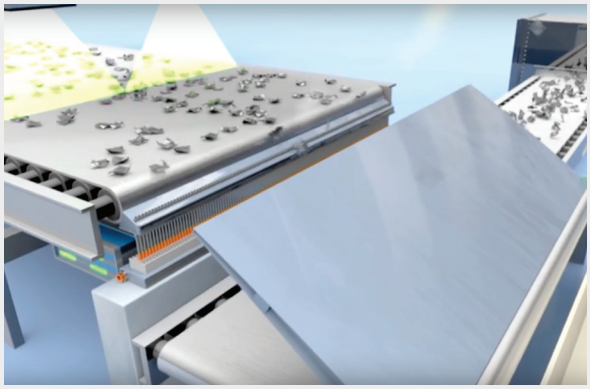


[1] VDI-ZRE, https://www.youtube.com/watch?v=czKYyiWcWGw

BOX 3

Video 2:
Perfect material cycle for aluminium | Resource Efficiency

Hydro Aluminium Recycling Deutschland GmbH,
Recycler of aluminium



[2] VDI-ZRE, https://www.youtube.com/watch?v=ZievvK4aSVw

introduction of standardized labelling. Through such labels, the increased transparency allows companies to be able to decide from which provider to buy services based on how efficiently they manage resources.

Provide research funding oriented at further understanding the interrelations between digitization in production and resource efficiency

- Currently, very few companies are aware of the extent to which implementing digitization measures has had a positive impact on resource efficiency. Moreover, this has seldom been the subject of extensive research. Public funding could contribute to increase knowledge about the potentials that this field offers, as well as how to tap them.

Companies

Determining the degree of maturity of digitization and selection of measures

- When undergoing digital transformations, companies must choose from a variety of measures according to their particular conditions. For instance, it is very important to assess the degree of digitization that already exists in the firm. Consequently, companies should choose digitization measures and ways to implement them that are appropriate for their current state of digitization. At the same time, it is advised to consider the resource efficiency potentials of such measures at this early phase, when it is most cost-effective to implement them.

Resource data collection and analysis

- Parallel to other measures, it is always recommendable for companies to measure, store and process data about their resource consumption at all their levels. Through this, resource efficiency potentials for the company's particular situation can be identified at different points in time.

Development of a resource efficiency strategy in the company

- Once enough information on the resource consumption of the company is available, it is possible to implement further measures, which then allows a continuous and consistent increase in resource efficiency. In this context, the development of a resource efficiency strategy can be effective way for systematically identifying potentials and ways how to tap them.

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Responsible/contact:
Elisabeth Dürr
E elisabeth.duerr@giz.de

Authors:
GIZ: Detlef Schreiber, Elisabeth Dürr, Michael Funcke-Bartz,
Ariel Araujo Sosa

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