Industry 4.0:
A Strategy of the European Union and Germany to Promote the Manufacturing Industries – Opportunities and Challenges of Digitization

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INTRODUCTION

The German Government and the European Commission have launched the strategic initiative named Industrie 4.0 for a re-industrialization in Germany and Europe, and for achieving more competitiveness and sustainable growth. The top down strategy promotes the implementation of digital technologies especially at Small and Middle Sized Enterprises (SMEs) of the traditional manufacturing industries (Novakova, D. 2017). Digital technologies include Cyber Physical Systems, Cloud Computing, Robotics, 3 D-printer-technology, Smart Factories, Additive-Manufacturing, and Artificial Intelligence. The impact of digitization on the economy, on employment, and on business results of SMEs is not yet clear due to insufficient availability of business data and results of pilot projects on enterprise level. Balasingham, K. (2016) argues in his thesis that Industrie 4.0 is still a very recent topic. The confidentiality of business data is to be taken into account, too.

Thus the methodological framework of a SWOT-Analysis normally used to assess organizations and projects might be most convenient (Investopedia, 2018) to discuss the strength, weakness, challenges, and opportunities of the strategy and the threats on its implementation by SMEs. The contribution is addressed to politicians, academics, media, startups and managers of SMEs that are less familiar with Industrie 4.0.

BACKGROUND

The term Industrie 4.0 is the "name given to the German strategic initiative to establish Germany as a lead market and provider of advanced manufacturing solutions", explains the German Trade and Invest Association (2018). In 2011, at the German International Fair on Industries in Hanover (2018) the concept Industrie 4.0 and its technologies have been presented to the public by the German Government and by digitally leading enterprises like Bosch and Siemens. The term is also a German "brand" of a digital platform being founded by the Government in collaboration with large enterprises and company associations in 2013 (Banthien, H. 2017).

Then President of the EU Commission (2014, 2017), Claude Juncker, is supporting the strategy by the European version Industry 4.0. To promote the "re-industrialization" the EU Commission (2018) has also launched the Digitizing European Industry Program. After the financial crisis SMEs in industries contributed significantly to economic stability (Du Plessis, C.J. 2017). The Industrie 4.0 - programs

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are funding public and private research and development (R&D) and investment to boost the digital infrastructure and to strengthen competitiveness and economic growth.

The strategy refers to the vision of Rifkin, J. (2015) a former adviser to the German Chancellor Angela Merkel. Rifkin recommends the promotion of Information and Communications Technology Industries (ICT), digital startups and SMEs for establishing a demand driven intelligent production in smart factories: "By digital innovations and renewable energy a digital industrial revolution is on the way in Germany and Europe".

THE IMPACT OF THE INDUSTRY 4.0 INITIATIVE

National and International Publications

A review of publications on Industrie 4.0 approves the concept has spread world-wide and influenced other sectors, e.g. health, Logistics 4.0, and Agriculture 4.0. Similar programs have been established in the United States, Japan, China, India, South Korea, Brazil, and in many developing countries by taking into account specific national perspectives (Zhong, R.Y., Xu, X., Klotz, E., Newman, S.T. 2017). Masdefiol, R., del Mar, Stävmo, F. (2016) have checked the feasibility to implement Industrie 4.0 in Sweden. The academic community is committed to stimulate R&D, conferences, studies, and publications on implementing digital technologies in economic sectors (Gausemeier, J., Klocke, F., 2016).

Balasingham, K. (2016), however, emphasizes in his thesis that the implementation of the new technologies in SMEs "is not discussed excessively". Most companies and organizations have not yet implemented the new digital technologies. The bulk of publications is still provided by the German Government, the EU Commission, and public research institutes. Academic publications focus on reports and analyzes of official papers on this topic and on technical descriptions of the innovations. (Friedrich-Ebert-Foundation, 2018)

Impact of Digitization on the Economy

The impact of digitization on the economy is controversially disputed. Quantitative information about and from innovative SMEs is poor. Trade unions criticize the expected risks of unemployment caused by the digital transformation and robotics and the substitution of labor force. A positive impact on the economy is proposed by the World Economic Forum surveying managers and their investment plans for digitization (Schwab, K., 2018). The EU Commission (2018) estimates the benefits reach "more than €110 billion of annual revenue for our industry until 2020". The Boston Consultant Group (2015) estimates a 1% per year contribution to Germany's GDP (Gross Domestic Product) over ten years and the creation of 390,000 jobs, but "the full digital transformation will take 20 years". Time and cost savings are proposed in consultancy reports of Deloitte and McKinsey (Nilsen, S., Nyberg, 2016). Experts of Roland Berger (publ. 2016) forecast positive results in general.

All estimates are only based on small samples of surveyed managers planning the digitization of their companies. Approved findings about business results on firm level are poor. Price Waterhouse Consulting (2015) and the German Mechanical Engineering Industry Association (2017), are admitting only 15-20% of German SMEs have implemented digital technologies in industrial manufacturing.

The transformation is still at the beginning, and accountant data are confidential (Nilsen, S., Nyberg, 2016). Before digitization, innovative managers have to conduct company assessments, SWOT-analyses,