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# Service Robotics and Human Labor: A first technology assessment of substitution and cooperation

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### Highlights

- â€¢ We discuss how service robots interact with human labor.
- â€¢ We identify different job segments that might come under pressure.
- â€¢ We describe how humanâ€™ machine cooperation should be developed from a work science perspective.
- â€¢ We define first concluding criteria to assess service robots with respect to human labor.

## Abstract

Since the beginning of robotics, the substitution of human labor has been one of the crucial issues. The focus is on the economic perspective, asking how robotics affects the labor market, and on changes in the work processes of human workers. While there are already some lessons learnt from industrial robotics, the area of service robots has been analyzed to a much lesser extent. First insights into these aspects are of utmost relevance to technology assessment providing policy advice. As conclusions for service robots in general cannot be drawn, we identify criteria for the ex-ante evaluation of service robots in concrete application areas.



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## Keywords

Service robots; Technology assessment; Aggregate production function; Labor substitution; Labor complementarity

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**Michael Decker** studied physics (minor subject economics) at the university of Heidelberg, 2006 habilitation at the University of Freiburg with a study on interdisciplinary research for technology assessment. Since November 2009 he is Professor for Technology Assessment at the Karlsruhe Institute of Technology (KIT).

He worked as scientist at the German Aerospace Center (DLR) in Stuttgart and at the Europäische Akademie GmbH in Ahrweiler before he became vice-director of the Institute for Technology Assessment and System Analysis (ITAS) at the KIT. He is spokesperson of the German Speaking Network of Technology Assessment (NTA), spokesperson for the Topic "Key Technologies and Innovation Processes" in the Helmholtz Program "Technology, Innovation and Society", Chair of the advisory board "Society and Technology" of the Association of German Engineers (VDI) and chair of the "Innovation and Technology Analysis"-council of the German Federal Ministry of Education and Science. Main research areas: Theory and methodology of technology assessment; TA of new and emerging sciences and technologies; epistemology of inter- and transdisciplinary knowledge.



**Martin Fischer** Since 2007, Prof. Dr. Martin Fischer has been heading the Institute of Vocational and General Education of Karlsruhe Institute of Technology (KIT) "University of the State of Baden-Württemberg and National Research Center of the Helmholtz Association, Phone: +49 (0)721 608-43690; Fax: -46104; E-mail: [m.fischer@kit.edu](mailto:m.fischer@kit.edu), Homepage: [www.ibp.kit.edu](http://www.ibp.kit.edu). As collaborator and research director, Professor Fischer has participated in numerous European and national research and development projects. Among others, he supervised the first national vocational education pilot program "Neue Lernkonzepte in der dualen Berufsausbildung" (New Learning Concepts in Dual Vocational Training) and the BMBF/BIBB pilot program "Qualitätsentwicklung und -sicherung in der betrieblichen Berufsausbildung" (Quality Development and Quality Assurance in In-house Vocational Training). At KIT's Institute of Vocational and General Education, his activities cover teaching within engineering education study courses (teachers and trainers in the industrial-technical field) as well as B.A. and M.A. educational science study courses with emphasis on vocational education. His research focuses on work-oriented skill development, didactics of vocational education, organizational learning, and innovations in vocational education.





**Ingrid Ott** is working as an economist in the field of innovation, growth, and regional development. Her work includes the development of theoretical growth models as well as empirical work with a focus on productive government activity and regional development. Special attention is given to high technologies, especially the general purpose technologies that induce drastic innovation thus being a key driver of economic growth and inducing long term cycles. Since 2010, she is full professor of Economics at KIT and holds the Chair in Economic Policy which is embedded in the Institute of Economics (ECON) at the Faculty of Economics and Business Administration. She is also Research Associate at the Kiel Institute for the World Economy (IfW), one of Germany's leading research institutes in economics (since 2008). Former positions include an assistant professorship (Chair in Innovation and Growth) at Leuphana University Lüneburg (2002–2007 and 2009) and as head of the research group "High technologies and regional development" at the Hamburg Institute of International Economics (HWWI; 2007–2009). Research stays include visiting positions at the University of Washington at Seattle and at the Max Planck Institute for the Research on Collective Goods in Bonn.

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