Consequences of Industry 4.0 on Human Labour and Work Organisation

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ABSTRACT

This article comprises a literature review on recent research results analysing the implications of industry 4.0 and cyber physical systems on human labour and work organisation meant to provide an overview of the current status of discussion on this matter. It therefore provides a summary of the results from several international research studies and initiatives consolidating respective research findings further supplemented by the results of an additional non-representative expert panel review. The main findings indicate that Industry 4.0 would lead to a substantial decrease in standardised low-skill and an increase in high-skill activities, embracing planning, control and IT-related tasks. The majority of researchers expects a growing complexity in many job profiles, along with an increasing need for cross-functional work organisation and cross-company partner networks. They also project a growing importance of continuous learning, training and education in order for the workforce to be able to adapt to future qualification requirements derived from Industry 4.0 technologies. As a result of those developments, a transformation of the tax system is suggested, away from the current focus on labour taxes.

Key Words: Industry 4.0, Cyber physical systems, Internet of things, Digitalisation, Change Management, Cross-company cooperation, Job profiles

1 Introduction

There is a current trend debating the implications of integrating virtual computer networks with physical items, resulting in so-called cyber physical systems. In Germany, this has led to the visionary concept "Industry 4.0", reflecting a major element of the high-tech programme launched by the German government meant to boost digitalisation of traditional industry sectors like mechanical and automotive engineering. According to this concept, production systems will be able to direct and optimise themselves fairly autonomously with little human intervention, leveraging to a large extent on a seamless interconnectivity and huge amounts of available information data (Bauernhansl, 2014; Hirsch-Kreinsen, 2014).

This would consequently pave the way for an internet of things which enables subjects and objects to communicate with each other on a real-time basis (Kagermann, 2014). The major enabling factor for such developments has been the continuous improvement of computer technology, basically doubling its performance every 18-24 months, confirming Moore's law. Besides the consequences of Moore's law, the internet of things has also been profiting from a convergence of multiple technologies, which have become so cost attractive that their comprehensive application is now feasible (Kagermann, 2014).

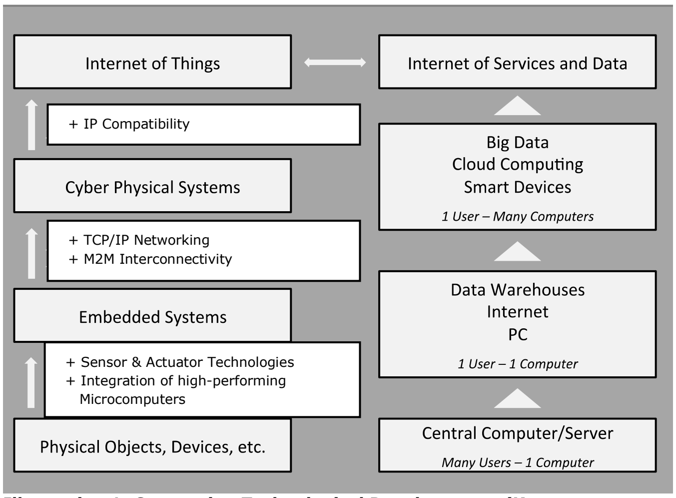

Illustration 1: Converging Technological Developments (Kagermann, 2014)

Against this background, it is possible that in the near future such systems may imply huge impacts on both labour content and work organisation and may change the way the human factor is taking part and adding value in many industrial value chains (Bauernhansl, 2014). This may not only have consequences for low-skilled workers and their operational shop floor activities, but also for high-skilled white collar and management representatives. On top of that, particularly in Germany, with its comparatively large industrial base, representing 22 percent of the gross domestic product, such implications may put the local workforce under significant pressure to sustain their employability and associated attractiveness for the future labour market.

In view of this situation, this article firstly provides an overview of the current discussion on the consequences of Industry 4.0 on jobs and secondly contributes further research results to this context, interviewing a panel of seven representatives from industry, consulting and science institutions on their views about the respective impact of Industry 4.0 on labour content and work organisation.

2 Literature Review

The following section provides an overview of the relevant topic-related publications regarding possible implications of Industry 4.0, internet of things and cyber physical systems on the human factor, with particular reference to labour content and work organisation.

In an analysis based on the situation in 2009, Martin Ford designed a comprehensive scenario of the implications cyber physical systems and the rapidly increasing capabilities of computer technology may have on human employability and work organisation. According to his analysis, technologies such as artificial intelligence, machine learning and software automation applications would no longer primarily impact low-wage, uneducated workers, but would also increasingly enable computers to fulfill jobs that require significant training and education. Consequently, university graduates who perform highly skilled jobs would find themselves threatened by machines and software algorithms that would be able to perform sophisticated analysis and decision making (Ford, 2009).

In Ford's view, ongoing progress in manufacturing automation and the introduction of advanced commercial robots would continue to reduce opportunities for low-skilled workers simultaneously. He believes that technological progress is relentless, and machines and computers would eventually approach the point where they would match or exceed the average worker's ability to perform most routine work tasks. Ford draws the conclusion that the result of this development is likely to be structural unemployment that ultimately impacts the workforce at virtually all levels from workers without high school diplomas to those who hold graduate degrees (Ford, 2009). This would ultimately lead to the fact that the business models of mass market industries would be threatened, as there would simply be too few viable consumers to purchase their products, resulting in a new social and tax system designed to impose higher taxes on capital in order to be able to nurture a significantly bigger class of unemployed people.

Drawing from a classification provided by Jeremy Bowles in his recent publication on the computerisation of European jobs, Ford - in view of his conclusions - may be assigned to the camp of skeptics who are fairly conservative about overall future job opportunities against the background of consequences resulting from industry 4.0 (Bowles, 2014). In the same camp, the recent work of Robert Gordon has put forward a hypothesis that in a coming period of expected low economic growth, new technological advancements would have less impact than former ones. Gordon projects a diminishing usefulness of innovation compared to the great inventions of the past, but he does not specifically comment on the impact of new computer and software technologies on jobs (Gordon, 2012).

Similarly, Erik Brynjolfsson and Andrew McAfee, who project significant economic changes resulting from the rapidly growing appearance of cyber physical systems, are rather skeptical about potential positive job impacts arising from Industry 4.0 and therefore expect an intensifying competition for jobs fed by a race between technological and educational progress. In their view, technological advancements would not only tend to eliminate routine jobs, but also high-skilled jobs defined by pattern recognition and cognitive non-routine tasks (Bowles, 2014; Brynjolfsson & McAfee, 2014). Similar to Ford in his work, Brynjolfsson and McAfee bring forward a set of measures to mitigate negative impacts from cyber physical systems and to compensate for job losses arising from ever advancing computer and software technologies, such as better education, more focus on entrepreneurship and startups, more support for academic research or the introduction of Pigovian and negative income taxes (Brynjolfsson & McAfee, 2014). Those measures tend to go in the same direction as the ones Ford is proposing, though lacking a more comprehensive social impact analysis.

Further to this, Frey and Osborne undertook a study in which they addressed the question of how susceptible jobs are to computerisation. Using a Gaussian process classifier, they estimated the probability of computerisation for 702 detailed occupations in the US labour market in order to analyse the potential jobs at risk and to assess potential correlations between computerisation probability, wages and educational attainment (Frey & Osborne, 2013). Such computerisation risks range from 99 percent for telemarketers to 0.28 percent for recreational therapists. The main result of their study is that 47 percent of US jobs are exposed to the risk of becoming redundant through computerisation. According to Frey and Osborne, robots would not only be able to perform standardised programmes, but also sophisticated tasks beyond routine in future times. They further provided evidence of a strong negative correlation between an occupation's computerisation probability and its wages and educational attainment, promoting the argumentation of other authors that computerisation risk is particularly apparent for low-skilled jobs (Frey & Osborne, 2013). As a consequence, most of the lower skilled human jobs would be eliminated and replaced through technology, leading to the remaining human jobs becoming more complex and comprehensive. In an attempt to transfer this study approach from the US to Europe, Bowles came to the conclusion that Northern European countries such as France, Germany, Sweden and the UK show similar results as the US and would potentially be less affected by computerisation risk than Southern European countries, which have a range from 45 to over 60 percent of the work force that could be affected by a potential level of high and persistent unemployment (Bowles, 2014).

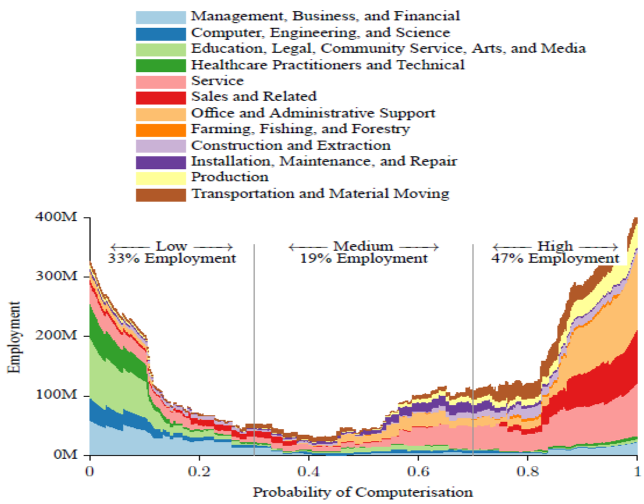

Illustration 2: Distribution of Occupational Employment over the Probability of Computerisation based on US Employment Data (Frey & Osborne, 2013)

On the contrary, Boston Consulting Group, in an exclusive study for a German management journal, projected a rather positive future scenario on the consequences of Industry 4.0. They estimated that based on implications derived from Industry 4.0 technologies, more than 100,000 new jobs could be created in mechanical engineering and construction within a period of 10 years. They built their logic on the fact that the introduction of cyber physical systems would require a significant amount of additional employees with specialised technical expertise. Boston Consulting Group also hinted in this context the growing importance of IT and programming skills for employees (Maier & Student, 2014).

Hirsch-Kreinsen analysed the consequences of Industry 4.0 on operational, indirect and management tasks and activities. On the operational working level, he came to the conclusion that lower skilled jobs containing simple and repetitive activities would be replaced to a large extent by intelligent and cyber physical systems (Hirsch-Kreinsen, 2014). He also projected a tendency towards de-qualification on the level of skilled workers or technicians, as such systems might lead to more automation in former domains dominated by human supervision, such as control, supervising and scheduling activities. Apart from that, he sees a reversing trend towards more job enrichment, as new technologies would lead to higher decentralisation in decision and planning processes, going along with the need for higher process integration and cross-functional perspectives (Hirsch-Kreinsen, 2014). This would consequently result in a further reduction of hierarchical levels and to less demand for central management capacities. On the indirect working level, processes such as quality assurance and maintenance would likely to be subject to further automation, whereby increasing complexity arising from integrated process and system architectures would most probably require more demand for cross-functional management control capabilities and capacities in trouble shooting and improvisation, a viewpoint also shared by Porter and Heppelmann to a certain extent in their analysis how smart products would change competition (Hirsch-Kreinsen, 2014; Porter & Heppelmann, 2014).

In a recent survey conducted by Fraunhofer IAO, 518 representatives in industrial companies were asked about their views on the consequences of Industry 4.0. 51 percent expected less manual activities while 54 percent of the respondents anticipated an increase in planning and control activities. 86 percent of the surveyed representatives estimated an increasing importance of life-long learning, while 77 percent expected a higher importance of interdisciplinary cooperation and 76 percent anticipated higher standards for IT competence. In view of these findings, Fraunhofer scientists expect workforces to shrink as a result of cyber physical systems, but they do not believe in a future scenario where factories will operate completely without the intervention of human beings (Fraunhofer IAO & Ingenics AG, 2014). In a further study conducted by the Institute for Leadership Culture in the Digital Age amongst first and second level managers of 100 companies in Germany, the authors examined how digitalisation would change work contents and procedures and came to the conclusion that teamwork would become more important (85 percent of responses), employees would pay more attention on social media risk (82 percent), customer ideas would play a stronger part in product development (80 percent), work life would become more flexible (80 percent) and partner networks would be gaining more importance (79 percent). Finally, 77 percent of all surveyed managers confirmed that digitalisation would increase pressure on them (IFIDZ & FAZ-Institut, 2014; Engeser, 2015).

3 Supplementary expert panel interviews

Against the background of the above literature review results, a non-representative expert panel review has been performed which aimed at supplementing the research on human work force-related impacts of Industry 4.0, internet of things and cyber physical systems through an interview-based approach. Interviews were held on a semi-structured survey basis, enabling a problem-focused approach and allowing to conduct a personalised discussion alongside the survey, leading towards the disclosure of detailed subjective views and information from the interviewed experts on the research topic (Mayring, 2010).

Interview partners have been selected from different environments in order to obtain a balanced and differentiated view on the research topic. As a result, representatives from both manufacturing and consulting firms as well as from university institutions have been chosen. As the human factor is in the consequential research focus, a balance has been reached in the selection of representatives with engineering and research background, of representatives in management positions with know-how and experience in change and project management and finally of representatives with a consulting background and particular expertise in business psychology. The interview panel consisted of seven interview partners, thereof four with an engineering and three with a business administration and psychology background, one university professor and one PhD research scientist, two top managers and one project manager as well as two consultants. Interview panelists have been ranked in three age categories, embracing categories from 26 up to 40 years (two representatives), from 41 up to 55 years (one representative) and from 56 up to 70 years (four representatives) going along with a track record concerning their current positions of less than three years (two interviewees), between 3 and ten years (two interviewees) and more than ten years (three interviewees). All the interviewed persons had experience with industry 4.0-related technologies and/or with associated implementation processes and projects, thereof four representatives with an experience background of more than two and a half up to four years, two representatives of more than one up to two and a half years and one of up to one year. Interviewees have been contacted based on personal knowledge (one representative), based on third person's references (three representatives) or based on "cold calls" after associated internet research (three representatives). Another three contacts had been identified as suitable experts to be interviewed in this context, but finally turned down their participation. The interviews have been designed to be conducted for a period of approximately 30 minutes, whereby six of them have been conducted over the phone and one face-to-face. A detailed description of the interview panel's demographics is provided in appendix 2 of this article.

The questionnaires were sent to the interview partners prior to the interviews in order for them to better prepare themselves for the discussion process. The questionnaire has been developed on the basis of current research work and has been pre-discussed and refined in a discussion with a panel of scientists with educational engineering background. It consisted of seven main chapters containing personal questions on the interviewed person, on Industry 4.0 in general, on preparations for Industry 4.0, on objections and fears regarding Industry 4.0, as well as on employee motivation, new jobs and further developments derived from Industry 4.0. Interview results have been recorded and subsequently transcribed. Further to the transcription, text results have been structured and categorised according to major topics followed by a specific coding. The coding process resulted in a category system which has been designed to structure and guide the information data evaluation process. The selected categories comprise the following: (1) estimated time horizon until a comprehensive, industry-wide application of cyber physical systems and internet of things in German companies is carried out, (2) modification of the work environment, (3) modification of job profiles, (4) change measures and (5) social consequences. The corresponding full list of designed categories and codes is provided in appendix 1 of this paper.

Interviewed experts conclude in general that it may take rather decades than years before Industry 4.0 technology would fully evolve in German companies with particular reference to industries with job process-dominated production structures. Participants agree on the fact that simple, highly standardised physical human activities would be eliminated and replaced by computerised automated systems and devices. The scientists envision a more aggressive development towards smart factories with very little remaining employees in production processes compared to the other interviewed experts. There is agreement among the participants that Industry 4.0 technologies would not only eliminate jobs but also create new ones. This is particularly projected for the area of planning and control and for IT jobs. The interviewees are also in accord with their views on the consequences for employee supervision and control. They argue that due to the introduction of cyber physical systems, processes and activities would become completely transparent for management, and would pose a lot of challenges on individual rights concerning data protection.

Interviewees expect cyber physical systems and the corresponding digitalisation of the work environment to impose new requirements on qualifications and capabilities of employees. According to their views, this would lead to higher levels of adaptability and flexibility. The latter would go along with the need for continuous learning and a stronger need for personal responsibility to assess and undertake necessary training and education measures at their own initiative beyond the level provided by employers. There is also consensus on the fact that digitalisation and internet of things would result in a generally higher degree of complexity in work processes, which would coincide with a growing demand for higher skilled specialists. In this respect, participants also argue that continuous learning, training and education would automatically boost employability and therefore reduce the risk of long-term unemployment for employees, even if they were to be made redundant temporarily.

Interviewed experts share the view that Industry 4.0 would enforce a closer cross-functional cooperation between different company units, leading towards the establishment of cross-company partner networks. Here, most of them see bigger hurdles for German companies. In contrast to the American and Asian conglomerates, where cross-company cooperation is already being intensely practised and supported by the governments, this is still not a common phenomenon in German companies. They further argue that necessary change management initiatives and measures should accompany required changes in labour content and work processes even before such changes are introduced, as many of these changes may go along with significant consequences for the respective employees in terms of substance and organisation of their daily work, making a proactive change management approach necessary. In this respect, participants are of the opinion that the expected higher job transfer rates within companies and within their partner networks would need to be prepared and smoothened through suitable change measures in order to keep employees motivated and avoid negative psychological consequences.

In terms of industry sector impact, a more diverse spectrum of experts' opinions becomes evident. Some argue that most of the jobs in the agricultural sector would be at risk, whereas others have a more conservative view on the scope of replaceable activities and work processes within the sector. The experts basically agree on the fact that the potential for job redundancies through Industry 4.0 technologies is limited in the care sector, as machines would not be able to compete with human beings in showing empathy to patients. Most of them think that this sector might provide job potentials for employees who have been made redundant in production processes. On the topic of tax ruling, interviewees brought up the idea of a basic income for everybody, making jobs possible that would not be paid sufficiently high enough to maintain a living. They also commonly criticise that human labour is still in the focus of taxation and suggest instead higher VAT rates.

4 Discussion

A consolidated view on the aforementioned literature review results supplemented by the findings of the above described non-representative sample of expert panel interviews leads to the conclusion that the pressure on human working environment would be likely to increase in the future, whereby the majority anticipates a significant decrease in lower skilled highly standardized jobs, being replaced by cyber physical systems to a large extent. With regards to higher skilled jobs, research results suggest a more diverse future scenario, leading towards less demand for central management capacities, further automation of indirect processes and more demand for decentral integrative and cross functional management capabilities leading to the consequence that planning and control jobs would gain more importance. In addition, a growing importance of teamwork, interdisciplinary cooperation and partner networks is expected, along with an increase in flexibility of individual work life, attention towards social media risks and IT and programming capability requirements for all levels. German expert panel interviews reveal a more conservative view on the time horizon required before the actual impact of Industry 4.0 technologies may take place compared to their American and Anglo-Saxon peers, whereby this view corresponds to a certain extent with recent doubts about the readiness of significant parts of German small and medium-sized companies to face the challenges of digitalisation and cyber physical systems and to progressively advance towards the integration of Industry 4.0 technologies into their business models (Maier & Student, 2014; MHP, 2014).

In a certain way, the reduction of manual and standardisable jobs and the corresponding shift towards higher qualified jobs could also help to make the remaining jobs more secure (Doll, 2015). Against the background of substantial demographic changes projected to lead to a reduction of the number of available skilled workers by around six million until the year 2030, estimated job loss potentials might be less problematic than currently thought (Paul, 2014). In this context, interviewed German experts are of the opinion that due to a boost in the transparency of individual performance data supervised and controlled through digitalised processes, additional challenges would be imposed on data protection rights, which has been only partly but not consistently and comprehensively addressed in the current literature. This may be due to the fact that such topics are still not of equal importance to both companies and public in the US or UK compared to Germany or other countries in continental Europe. Current literature review results estimate that the growing complexity as a result of digitalisation and the associated growing demand for higher skilled and flexible specialists would necessarily lead towards an increase in the importance of continuous learning, training and education. This aspect would also be of particular interest for unions and associated working councils, as an integrated future initiative embracing industrial and educational policies has to be negotiated between the company managements and their union counterparts, which could ultimately lead towards the principle right to lifelong regular education (Kurz, 2013; DPZ, 2014). Future work organisation would be significantly more marked by close cooperation between machines and workers than it is today which would most probably lead to further emphasis on change management initiatives and measures (Paul, 2014).

In a certain way, there is also agreement across current literature with regards to the consequences of Industry 4.0 in terms of a necessary intensification of cross-functional cooperation as well as cross-company partner networking. Especially the latter aspect has been controversially discussed in recent articles. Some authors are rather skeptical in their assessment on the initiatives of German industrial companies towards cooperation with competitors. Those industrial companies are facing the risk of losing their competitive advantage and may consequently lag behind American technological companies such as Google or Apple, who are aggressively trying to enter traditional industries like mechanical engineering and automotive also by intending to leverage on the expertise of their network partners (Maier & Student, 2014; Sommerfeldt, 2015). Finally, significant parts of the current literature along with interviewed German experts are in accord in their opinion that in order to balance off job redundancies and associated tax revenue losses, tax rules and regulations would need to be reformed and transformed into a system less dependent on income from labour taxes. This topic has only recently been further discussed in the context of the debate on the introduction of an unconditional basic income as a potential consequence of the growing shift towards income from capital gains at the expense of income from human labour (Blasi & Freeman & Kruse, 2013; Piketty, 2013; Laudenbach & Heuer, 2015).

5 Conclusion

A review of current literature on implications of Industry 4.0 on human labour and work organization reveals a rather consistent view particularly on job redundancies for low-skilled jobs and the necessary shift towards more high-skilled complex jobs which require a generally more intense focus on continuous learning and education. However, it becomes evident that a growing number of researchers view the implications of Industry 4.0 technologies not only from a microeconomic but also from a macroeconomic point of view addressing consequences from a broader perspective especially with reference to implications for social welfare and tax systems which may be completely reviewed in order to compensate for lost job income and balance off growing inequality. In general, German companies appear to be more reserved about the time horizon it may take for German industry to fully leverage on Industry 4.0 technologies realising all its consequences on human labour and work organization compared to their American and Anglo-Saxon peers. To what extent those consequences would become evident and materialise in the future remains uncertain at this point in time. How such new technologies may affect worker well-being and inequality is also most likely dependent on who owns them in the future (Blasi & Freeman & Kruse, 2013). Though technological advances may be to a large extent already predictable, their consequences on social impacts and associated regulations on a national or international basis are obviously not.

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Appendix

A1: Categories and Codes

C 1 Time horizon until comprehensive, industry-wide application
C 1.1 Speed of development
C 1.2 Industry sector dependence
C 1.3 Full scope implementation timeframe
C 1.4 Evolutionary vs. revolutionary process
C 1.5 Consequence of application delay
C 2 Modification of work environment
C 2.1 Degree of process change
C 2.2 Degree of process automation
C 2.3 Higher skilled vs. lower skilled jobs
C 2.4 Implications of greater data availability
C 2.5 Process performance traceability
C 2.6 More focus on IT capabilities
C 2.7 Different IT skill requirements
C 2.8 Digital footprint
C 2.9 Increasing transparency vs data protection rights
C 2.10 New relation between planning and execution tasks
C 2.11 More focus on value-adding activities
C 2.12 Smarter information management
C 2.13 Digital information flow between devices
C 2.14 Trend towards autonomous machine planning activities
C 2.15 Continuous reduction of routine process time
C 2.16 Less human control activities
C 2.17 Degree of replacement of human activities through electronic devices and machines
C 2.18 Service activities to remain in humans hands
C 2.19 Demographic change coincidence with automation levels
C 2.20 Transfer of physically hard work from workers to machines
C.3 Modification of job profiles
C 3.1 Increasing speed of change
C 3.2 Increasing challenges and pressure to adapt to changes for employees
C 3.3 Increasing IT know how importance
C 3.4 Changing job requirements and profiles
C 3.5 More intense cooperation between workers and machines
C 3.6 More job redundancies for unskilled workers
C 3.7 Increasing importance of disposition and planning activities
C 3.8 Need for continuous learning and qualification
C 3.9 Remaining uncertainty about future job landscape
C 3.10 Social tensions as a results of job redundancies
C 3.11 New lines of work to be defined
C 3.12 Government support to facilitate changes measures
C 4 Change measures
C 4.1 Cultural change requirements
C 4.2 Challenges for employee motivation
C 4.3 Need for open and continuous communication
C 4.4 Different/more cooperation between functions and between companies
C 4.5 Government initiatives on skill development
C 4.6 Cooperation with working council
C 4.7 Resistance to change
C 4.8 Need for individual treatment and support for employees
C 4.9 Employee age as important differentiator
C 4.10 Need for open-minded employees
C 4.11 Transparency on job profile changes
C 4.12 Fear about job redundancies and/or loss of “big picture”
C 4.13 Impact of changes in input-output relations on employees
C 5 Social consequences
C 5.1 Impact on daily life situation
C 5.2 Repatriation of automated processes from low cost countries
C 5.3 Potential redefinition of sources of income
C 5.4 Idea of a basic income
C 5.5 Shift in the importance of tax bases (income tax vs VAT)

A2: Demographics of and additional information about interviewed expert panel

Interview 1
Scientist / Chair in Production Systems
Technological University
Male
Age Category 41-55
Job Experience in Position: 6-10 Years
Experience with Industry 4.0: approx. 4 Years
Automation Expert
Contact Establishment: "Cold" after Internet-based Research
Telephone administered interview
17 December 2014
20 Minutes

Interview 2
Head of Division & Competence Center
Private Company / Mechanical Engineering
Male
Age Category 56-70
Job Experience in Position: 3-6 Years
approx. 1,5 Years
Digital Manufacturing & Factory Setup Expert
Contact Establishment: Facilitated through third person reference
Telephone administered interview
17 December 2014
28 Minutes

Interview 3
Project Management
Private Company / Mechanical Engineering
Male
Age Category 26-40
Job Experience in Position: < 3 Years
approx. 1 Year
Expert for Cyber Physical Systems
Contact Establishment: "Cold" after Internet-based Research
Telephone administered interview
18 December 2014
59 Minutes

Interview 4
Scientist / Postgraduate
Technological University
Male
Age Category 26-40
Job Experience in Position: < 3 Years
approx. 1,5 Years
Research in Industry 4.0
Contact Establishment: "Cold" after Internet-based Research
Telephone administered interview
19 December 2014
31 Minutes

Interview 5
Board Member
Private Company / FMCG
Male
Age Category 56-70
Job Experience in Position: > 10 Years
approx. 4 Years
Experience in Industrie 4.0
Contact Establishment: Facilitated through third person reference
Telephone administered interview
20 December 2014
48 Minutes

Interview 6
Consultant
Consulting Company
Male
Age Category 56-70
Job Experience in Position: > 10 Years
approx. 4 Years
Experience in Industrie 4.0 -related Projects
Contact Establishment: Facilitated through third person reference
Telephone administered interview
03 January 2015
35 Minutes

Interview 7
Consultant
Consulting Company
Male
Age Category 56-70
Job Experience in Position: > 10 Years
approx. 4 Years
Experience in Industrie 4.0 -related Projects
Contact Establishment: Personally known
Face-to-Face interview
06 January 2015
11 Minutes