

Artificial Intelligence and Robotics, the Workplace, and Employment Law

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A. Introduction

Numerous robots are already in use in workplaces throughout the world today. Robots are already among us. We are in the so-called Second Machine Age,¹ also frequently referred to as Industry 4.0.² Many enterprises are working towards the goal of optimising work and production processes and creating a so-called smart factory in which humans and machines work together and automation is achieved through the deployment of intelligent machines. These intelligent self-learning systems are driven by cloud computing, breakthroughs in sensor technology and the creation of new algorithms that harness the power of big data.³ The new workplace is constantly changing, increasingly uninhibited by geographical boundaries and inspired by the arrival of robots and new technologies. Robots are becoming more integrated into the human workplace, not only completing tasks autonomously, but also enhancing human performance and safety in the workplace and at home.⁴ As new technologies facilitate remote work, the physical and temporal bounds of the workplace are becoming more flexible. These changes are simultaneously and cumulatively transforming the conditions of work.

The aim of this article is to examine the effects of robots and artificial intelligence (AI) on employment law. The introduction first defines what we understand by robots and AI (A.I. below). It is then explained which robots play a role in the workplace today and could play a role in the workplace in future (A.II. below). These changes will also have consequences for employment law (A.III. below). For this reason, I would like to use this chapter of the Handbook to travel forward in time to the employment law of the future changed by robotics and AI. In the course of this journey, seven challenges for employment law will be identified (in B.I.-VII. below). Swiss law serves as the national system of reference here.

I. Artificial Intelligence and Robotics

Artificial Intelligence (AI) is a field of computer science devoted to creating computing machines and systems that perform operations analogous to human learning and decision-

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¹ ERIK BRYNJOLFSSON/ANDREW MCAFEE, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*, New York/London 2014.

² JENS GÜNTHER/MATTHIAS BÖGLMÜLLER, *Arbeitsrecht 4.0 – Arbeitsrechtliche Herausforderungen in der vierten industriellen Revolution*, NZA 2015, p. 1025 et seq.; Federal Ministry for Employment and Social Issues, *Grünbuch Arbeitsrecht 4.0*, p. 34 et seq.

³ Littler Report, *The Transformation of the Workplace Through Robotics, Artificial Intelligence, and Automation: Employment and Labor Law Issues, Solutions, and the Legislative and Regulatory Response*, January 2016, p. 1.

⁴ Idem.

making. As the Association for the Advancement of Artificial Intelligence describes it, AI is “the scientific understanding of the mechanisms underlying thought and intelligent behaviour and their embodiment in machines.”⁵ Computer scientist John McCarthy, who is credited with coining the term in 1955, defines it as “the science and engineering of making intelligent machines.”⁶ AI has seen a resurgence in recent years as a result of the development of machine learning – a branch of AI that focuses on designing algorithms that can automatically and iteratively build analytical models from new data without explicitly programming the solution.⁷

As for defining robotics, there is no general consensus about what a robot is and which machines are to be classified as robots.⁸ Robotics experts define robots as mechanical objects capable of three things:⁹ (1) “**sense**” – automatic and continual awareness of the world around them, (2) “**think**” – processing this awareness by means of data analysis, and (3) “**act**” – performing physical (navigating, moving something) or non-physical functions (warnings, recommendations, decisions, orders). A technology does not “act” just because it offers information in a comprehensible form; instead, it must exert agency in the physical world.¹⁰ Pure software without agency in the physical world is therefore not robotics,¹¹ even if the English language media in particular¹² often refer to robots and actually mean software.

The possibility to act is also referred to as “**autonomy**” in robotics. In many definitions, autonomy is described as a characteristic which classifies a machine as a robot, as in the vocabulary of the International Organisation for Standardization (ISO).¹³ However, autonomy in a technical context has an entirely different meaning from autonomy in a humanities context, in which autonomy is closely linked to being human.¹⁴ From a practical point of view, the use

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- ⁵ AI Overview: Broad Discussions of Artificial Intelligence, AI Topics, <<http://aitopics.org/topic/ai-overview>>.
- ⁶ JOHN MCCARTHY, Basic Questions, What is Artificial Intelligence?, 12.11.2007, Stanford University, <<http://www-formal.stanford.edu/jmc/whatisai/>>.
- ⁷ DANIEL CASTRO/JOSHUA NEW, The Promise of Artificial Intelligence, The Center for Data Innovation, October 2016, <www2.datainnovation.org/2016-promise-of-ai.pdf>.
- ⁸ NEIL M. RICHARDS/WILLIAM D. SMART, How should the law think about robots?, in: Ryan Calo/A. Michael Froomkin/Ian Kerr (Eds.), Robot Law, Cheltenham UK/Northampton USA 2016, p. 3 et seq.
- ⁹ See ROLF PFEIFER/CHRISTIAN SCHEIER, Understanding Intelligence, Cambridge, MA 1999, p. 37; RODNEY A. BROOKS, Intelligence Without Reason, Proceedings of the 12th International Joint Conference on Artificial Intelligence 1991, p. 569 et seq., p. 570; GEORGE A. BEKEY, Autonomous Robots, Cambridge, MA 2005, p. 2; RYAN CALO, Robotics and the Lessons of Cyberlaw, California Law Review 2015, p. 513 et seq., p. 529.
- ¹⁰ In this sense, “embodiment” is used in the literature, see HAMID R. EKBIA, Artificial Dreams: The Quest for Non-Biological Intelligence, Cambridge, MA 2008, p. 258. As in RoboLaw deliverable D6.2 Guidelines on Regulating Robotics, 22.9.2014, <<http://www.robolaw.eu>>, p. 15; MELINDA FLORINA MÜLLER (NOW LOHMANN), Roboter und Recht – Eine Einführung, AJP 2014, p. 595 et seq. p. 596.
- ¹¹ See GEORGE A. BEKEY, Current Trends in Robotics, in: Patrick Lin/Keith Abney/George A. Bekey (Eds.), Robot Ethics, Cambridge, MA 2012, p. 17 et seq., p. 18; RICHARDS/SMART (footnote 8), p. 6.
- ¹² E.g. The Economist, Big Data and hiring: Robot Recruiters, 6.4.2013, <<http://www.economist.com/news/business/21575820-how-software-helps-firms-hire-workers-more-efficiently-robot-recruiters>>.
- ¹³ ISO 8373:2012 “Robots and robotic devices – Vocabulary”.
- ¹⁴ For a critical view, see JACK B. BALKIN, The Path of Robotics Law, The Circuit 2015 Paper 72, <<http://scholarship.law.berkeley.edu/clrcircuit/72>>, p. 49 et seq.; THOMAS BURRI, The Politics of Robot Autonomy, Special Issue on the Man and the Machine, EJRR 2/2016, p. 341 et seq.

of the term “autonomy” in interdisciplinary discussions harbours the risk of confusion and misunderstandings.

In most cases, robots do not look **humanoid**. There are, of course, robots such as Pepper and Nao from Aldebaran, which sell Nescafé machines, take orders in Asian Pizza Hut restaurants, greet passengers on cruise ships or welcome patients in the hospitals of Ostend and Liège in Belgium, or which advise customers at the Mitsubishi Bank in Japan. Yet, until now, the humanoid robots have hardly attained technical and economic significance.¹⁵ By contrast, there are approximately 300,000 industrial robots which are taken into service each year and they have considerable economic importance. However, these “programmable multi-purpose handling devices”¹⁶ simply do not generate the same media enthusiasm as do the humanoid, anthropomorphic robots.

II. The Rise of Artificial Intelligence and Robotics in the Workplace

One example of an **industrial robot** is Baxter from Rethink Robotics.¹⁷ He is an affordable¹⁸ multi-purpose robot for production purposes, friendly to people and easy to program by colleagues for different tasks. He costs a mere USD 22,000 and – like all robots – is always available, never sick, never takes a holiday, is never in a bad mood, does not embezzle money and does not demand a bonus. Going on strike is also not part of his program.

In the **logistics and transportation sector** too, robots already play a significant role. At Amazon in the USA, robots from Kiva Systems drive the warehouse shelves to the workers, so that the workers can swiftly put together the right goods for shipment according to customer orders. Amazon bought Kiva Systems for USD 775 million in 2012.¹⁹ The Swiss postal service is likewise starting a new chapter in E-commerce logistics. It relieves online traders of the entire logistics from storage through packaging and shipment to the management of returns. The “YellowCube” logistics centre forms the heart of this system.²⁰ Goods are stored here in stackable containers. Each of these containers can be fetched by a robot within just a few seconds and taken to a commissioning station where staff package the ordered goods for shipping.

In the **services sector**, robots serve in hotels and restaurants or in retail, especially in the USA and Japan. In the Aloft Hotel in Cupertino, California, a robot hotel page, for example, brings

15 NZZ, Das Gefühlsleben der Roboter, 22.3.2016 <<http://www.nzz.ch/meinung/kolumnen/affective-computing-das-gefuehlsleben-der-roboter-ld.9188>> (“However, there is the fourth law of robotics: the more human the appearance of a robot, the greater its appeal to our empathy, and the lower its technical and economic importance.”, own translation); JACK CLARK, Why Google Wants to Sell Its Robots: Reality Is Hard, Bloomberg, 18.3.2016, <<http://www.bloomberg.com/news/articles/2016-03-18/why-google-wants-to-sell-its-robots-reality-is-hard>>.

16 Definition according to the Robotic Industries Association, 1979, <<http://www.robotics.org>>.

17 <<http://www.rethinkrobotics.com/baxter>>.

18 See FRANK TOBE, Low-cost robots like Baxter, UR5 and UR10 successfully entering small and medium enterprises (SMEs), Robohub.org, 14.5.2014, 2013, <<http://robohub.org/rethinkrobotics-baxter-and-universal-robots-ur5-and-ur10-succeeding/>>.

19 JULIANNE PEPITONE, Amazon buys army of robots, CNN Money, 20.3.2012, <<http://money.cnn.com/2012/03/20/technology/amazon-kiva-robots/>>.

20 <<http://www.post.ch/yellowcube>>.

guests their luggage, beverages or food.²¹ OSHbot serves customers at the Orchard DIY store in San Jose, California, leading them to the right aisle in which the desired product is located.²²

In robot-friendly Japan, the demographic crisis is being countered with the aid of **eldercare robots** which care for, entertain, monitor or nurse the elderly. “Robear”, for example, supports nursing carers in lifting patients.²³ According to a report of the Japanese Ministry of Economics, Trade and Industry, the market for eldercare robots apparently amounted to more than 400 billion Yen (USD 4.09 billion) in 2013 alone.²⁴ Eldercare robots have now also arrived in Europe: an example of this is “Henry” in Vienna, who shows dementia patients the way in hospital and accompanies them to their destination, as well as providing them with news such as weather forecasts and the menu plan.²⁵

The success of the **self-driving Google cars** suggests that it will not be long before taxis and trucks will be driverless.²⁶ In Sion, Valais, Switzerland, driverless post office buses took to the roads in June 2016.²⁷ They are 5m long and can transport 15 people.

The development of **exoskeletons** is also exciting. They provide humans with an exterior – therefore “exo” – skeleton which supports or takes over human movements.²⁸ The robot system is generally steered through body movements on the basis of cognitive and physical interaction with the human enabled by the drivetrains, sensors and microcontrollers, as well as the intelligent control system.²⁹ In a robot suit like this (“wearable robot”), a person can lift heavier loads, walk further or walk in spite of spinal cord injury.³⁰ There are numerous applications for exoskeletons.

In the **medical field**, people who have been paralysed after an accident or who suffer disruptions to physical functions as a result of advanced age will be able to walk again with the aid of exoskeletons. The first commercial version of such an exoskeleton was produced in 2012

21 CLAUDE CAIN MILLER, As Robots Grow Smarter, American Workers Struggle to Keep Up, The New York Times, 15.12.2014, <<http://www.nytimes.com/2014/12/16/upshot/as-robots-grow-smarter-american-workers-struggle-to-keep-up.html>>.

22 <<http://www.lowesinnovationlabs.com/innovation-robots/>>.

23 <<http://www.wxyz.com>>; NICK VALERY, Difference Engine: The caring robot, The Economist, 4.5.2013, <<http://www.economist.com/blogs/babbage/2013/05/automation-elderly>>.

24 JOHN HOFILINA, Japan pushing for low-cost nursing home robots to care for elderly, Japan Daily Press, 29.4.2013, <<http://japandailynews.com/japan-pushing-for-low-cost-nursing-home-robots-to-care-for-elderly-2927943/>>.

25 ORF, Testeinsatz für Krankenpflegeroboter, 30.3.2016, <<http://wien.orf.at/news/stories/2765466/>>.

26 See also Scientific American, AI Special Report, The truth about “self-driving” cars, 6/2016, p. 45 et seq.

27 <<https://www.postauto.ch/de/news/schweizer-premiere-mit-autonomen-shuttles>>.

28 RoboLaw Guidelines (footnote 10), p. 108.

29 JOSÉ L. PONS, Rehabilitation Exoskeletal Robotics, The Promise of an Emerging Field, IEEE Engineering in Medicine and Biology Magazine, May/June 2010, p. 57 et seq., p. 59.

30 By contrast, a differentiation is made in the natural sciences between exoskeletons (for the improvement of performance by a non-handicapped person) and orthotic braces (playing a supporting role in the case of illness of an extremity), see SILVESTRO MICERA ET AL., Hybrid Bionic Systems for the Replacement of Hand Function, Proceedings of the IEEE 9/2006, p. 1752 et seq.; HUGH HERR, Exoskeletons and orthoses: classification, design challenges and future directions, Journal of Neuro Engineering and Rehabilitation 6/2009, p. 1 et seq.

by Ekso Bionics in the USA, which obtained FDA approval.³¹ In Japan, HAL by CYBERDYNE, which functions with an interactive biofeedback system, is used in various medical institutions and hospitals.³² In 20 years' time, exoskeletons could mean the end of the approximately 68 million wheelchairs in use today.³³

The application of exoskeletons in **industry** is on the ascendant, meaning that heavy loads and tools will be less of a burden on workers in the future. Workers in production and assembly often lift up to 10 tons of material a day³⁴ and 44 million workers in the EU suffer from work-related musculoskeletal disorders.³⁵ This can result in damage to the spine and in long-term illness, not only causing personal suffering for the worker, but also involving high costs for the health system. Employers suffer disadvantages as a result of illness-related absence from work and invalidity. Exoskeletons are therefore an interesting innovation.³⁶ The industrial exoskeleton by Ekso Bionics, "EksoWorks"³⁷ or by the Swiss company Colas³⁸ come to mind here, both of which were conceived for **use on construction sites**. The prototype of such an exoskeleton was presented at the Fraunhofer IAO in Stuttgart on 12 June 2015; it relieves the weight burden down to one tenth.³⁹

All these examples show that robots **have long since arrived** in the workplaces of this world. Robotics technology has reached the stage now enabling large numbers to appear on the market. The progress of automation, robotics and AI in the workplace is unstoppable.

III. Legal Consequences of Robotics and AI in the Workplace?

Automation, robotics and AI are developing at an exponential pace and lead to a working environment and working conditions which were still unthinkable at the time the work-relevant legislation entered into force. However, manufacturers and users of robots must nevertheless comply with the legal framework conditions. Many robotics enterprises are small and medium-sized enterprises who wish to concentrate on their product and not on court proceedings with employers or employees. Employers in turn can likewise avoid legal difficulties as users if they know which legal regulations must be complied with in the integration of robotics in the workplace. The **challenge** for manufacturers and users of modern robotics systems alike is

³¹ <<http://www.eksobionics.com>>.

³² YOSHIYUKI SANKAI, HAL, Hybrid assistive limb based on cybernics, Robotics Research, Berlin/Heidelberg 2011, p. 25 et seq.

³³ ILLAH REZA NOURBAKASH, The Coming Robot Dystopia, Foreign Affairs, 8/2015, p. 23 et seq.

³⁴ <<https://www.iao.fraunhofer.de/lang-de/ueber-uns/presse-und-medien/1604-erstes-exoskelett-fuer-die-industrie-praesentiert.html>>.

³⁵ Work Foundation Alliance, Lancaster UK, cited in <<https://www.iao.fraunhofer.de/lang-de/ueber-uns/presse-und-medien/1604-erstes-exoskelett-fuer-die-industrie-praesentiert.html>>.

³⁶ RoboLaw Guidelines (footnote 10), p. 107 et seq..

³⁷ <<http://eksobionics.com/eksoworks/>>.

³⁸ Zentralschweiz am Sonntag, Macht es der Roboter bald allein? Ein Roboter-Skelett soll für mehr Sicherheit auf Baustellen sorgen, 12.7.2015, p. 43; <<http://www.colas.ch/exosquelette/>>.

³⁹ <<https://www.iao.fraunhofer.de/lang-de/ueber-uns/presse-und-medien/1604-erstes-exoskelett-fuer-die-industrie-praesentiert.html>>.

anticipating legal issues in advance while work and the workplace are continually changing.⁴⁰

As yet, there are few studies **in Europe and Switzerland** on the consequences of robotics on employment law,⁴¹ in spite of the proposal in 2012 in the course of the EU RoboLaw Project to conduct employment law research.⁴² This is different in the USA where, for example, the American Bar Association devoted its employment law conference to this topic in 2015,⁴³ and where numerous researchers and lawyers are examining these issues. Only very recently, in April 2017, the International Bar Association Global Employment Institute has published its first report on “Artificial Intelligence and Robotics and Their Impact on the Workplace”.⁴⁴

The **legal risks and imponderables** involved with the use of automation processes, robotics and AI in the workplace will be analysed in the following. What must be taken into consideration from an employment law point of view so that employer and employee, but also the social partnership, can continue to thrive in a “bot-based economy”?

B. Seven Challenges for Employment Law

Employment law expertise to deal with the widespread use of robotics and AI still has to be developed. Until such time, we must apply our existing employment law practice to the new technology as best we can. In the following discussion, I would therefore like to examine **seven employment law issues that might be problematic in the light of existing regulation today** (B.I.-VII. below). The key to a good employment law compliance programme is the identification of potential legal issues, even if the underlying law is uncertain and still remains to be developed.

I. The Robo-Boss

The Japanese electronics group **Hitachi** has started to develop an AI system which allocates work tasks to human employees on the basis of data analysis and past working processes.⁴⁵

⁴⁰ GARRY MATHIASON/BONNE CHANCE, Robots, the Workplace and the Law, May 2013, <http://www.roboticsbusinessreview.com/article/robots_the_workplace_and_the_law>; BALKIN (footnote 14), p. 45 et seq.; Littler Report, The Transformation of the Workplace Through Robotics, Artificial Intelligence, and Automation, Employment and Labor Law Issues, Solutions, and the Legislative and Regulatory Response, February 2014, p. 22.

⁴¹ For Switzerland, see my work: ISABELLE WILDHABER, Die Roboter kommen – Konsequenzen für Arbeit und Arbeitsrecht, ZSR 2016 I, p. 315 et seq.; ISABELLE WILDHABER, Robotik am Arbeitsplatz – Von „Robo-Colleagues“ und „Robo-Bosses“, AJP 2017, p. 213 et seq.

⁴² See CHRISTOPHE LEROUX/ROBERTO LABRUTO, euRobotics – The European Robotics Coordination Action, D3.2.1 Ethical Legal and Societal Issues (ELS) in robotics, 2012, p. 26, <https://eu-robotics.net/cms/upload/PDF/euRobotics_Deliverable_D.3.2.1_ELS_IssuesInRobotics.pdf>; euRobotics – The European Robotics Coordination Action, Suggestion for a green paper on legal issues in robotics, Contribution to Deliverable D3.2.1 on ELS issues in robotics, 2012, <<http://www.robolaw.eu>>, p. 41 et seq.

⁴³ American Bar Association, Labor Law Section, March 2015, 2015, National Symposium on Technology in Labor and Employment Law.

⁴⁴ GERLIND WISSKIRCHEN ET AL., Artificial Intelligence and Robotics and Their Impact on the Workplace, IBA April 2017, <<https://www.ibanet.org/>>. This Handbook chapter was finished off in March 2017, before the IBA Report was published.

⁴⁵ Hitachi Press Release, Development of Artificial Intelligence issuing work orders based on understanding of on-site kaizen activity and demand fluctuation, 4.9.2015, <<http://www.hitachi.com/New/cnews/month/2015/09/150904.pdf>>.

For many years, Hitachi has used the so-called Kaizen method to introduce change through permanent monitoring and precise analysis in order to perfect and accelerate working processes. Through the integration of learning AI into the business systems, as Hitachi has succeeded in doing, Kaizen monitoring and optimisation of the working processes is also accompanied by the implementation of employees' ideas to improve work as a direct reaction to changed working conditions or fluctuations in demand. The AI programme enables robots to issue instructions. According to the group, analysis of great quantities of data generated daily and its verification in logistical tasks, in other words through the issue of orders, is intended to increase productivity by 8%.⁴⁶

Constellations in which robots or AI act independently as employers are not yet possible due to the stage of technological development and the legal framework conditions.⁴⁷ However, robots can **be used as intermediary superiors**. Robots used as superiors are colloquially referred to as “robo-bosses”. In October 2015, the market research institute Gartner estimated that three million employees worldwide would be supervised by a robo-boss by 2018.⁴⁸ According to a study by the Massachusetts Institute of Technology (MIT) in 2014, humans were happier taking instructions from robots and were both more productive and more satisfied.⁴⁹ Using robots as superiors also reduces staff costs for the employer. Unprejudiced, objective decision-making processes can avoid subjectively influenced assessments.

1. Responsibility of the Employer

According to the current legal situation, a robot as a superior is incapable of providing a legally binding declaration of will due to a lack of legal capacity and capacity for action.⁵⁰ Electronic declarations of will or acts must be attributed to a human.⁵¹ For this reason, the **responsibility** for the transmission of declarations of will and for the implementation of legal transactions **must currently clearly remain with the employer** as the natural or legal person behind the robot.⁵² The validity of an electronic declaration of will or a digital legal act in legal relations always presupposes that these declarations have been caused by a human, thereby creating an “objective declaration of fact” in legal transactions.

Due to robots being able to “sense, think and act”, the robots of the future will increasingly no longer be mere technical aids and consequently not the result of an anticipated formation of

⁴⁶ <<http://www.hitachi.com/New/cnews/month/2015/09/150904.pdf>>.

⁴⁷ See also NADJA GROSS/JACQUELINE GRESSEL, Entpersonalisierte Arbeitsverhältnisse als rechtliche Herausforderung – Wenn Roboter zu Kollegen und Vorgesetzten werden, NZA 2016, p. 990 et seq., p. 991.

⁴⁸ <<http://www.gartner.com/smarterwithgartner/gartner-predicts-our-digital-future/>>.

⁴⁹ ADAM CONNER-SIMONS, Want a happy worker? Let robots take control, CSAIL study finds that human subjects prefer when robots give the orders, MIT News, 21.8.2014, <<http://newmit.edu/2014/want-happy-workers-let-robots-take-control>>.

⁵⁰ WILDHABER (footnote 41), p. 317 et seq.; BORIS DZIDA, Wenn auf dem Chefsessel ein Roboter sitzt, FAZ, 12.9.2015, p. 11; WALTER FRICK, When Your Boss Wears Metal Pants, Harvard Business Review, 6/2015, p. 84 et seq.

⁵¹ CLAUD-D. MÜLLER-HENGSTENBERG/STEFAN KIRN, Intelligente (Software-)Agenten: Eine neue Herausforderung unseres Rechtssystems, MMR 2014, p. 307 et seq., p. 308. See also BGH dated 16.10.2012 (online flight booking), MMR 2013, p. 296 et seq.

⁵² For German law, see GROSS/GRESSEL (footnote 47), 991; PETER BRÄUTIGAM/THOMAS KLINDT, Industrie 4.0, das Internet der Dinge und das Recht, NJW 2015, p. 1137 et seq., p. 1138.

will by the employer as their user.⁵³ **The greater the learning capacity** of a robot superior, **the more difficult** this responsibility of the employer will become.⁵⁴

2. *Right of the Robots or the Software to Issue Instructions*

Robots and/or software programmes issuing instructions are **possible under (Swiss) employment law**. The employer does not have to exercise the right to issue instructions in person, but may transfer it onto others, including machines. In Amazon warehouses, the allocation of work is undertaken by GPS-driven equipment and not by humans. Naturally, a precondition of this is programming the robot in such a way that it complies with the applicable legal system. The instructions must remain within the framework of the instructions a human superior would be permitted to issue. In addition, a human within the enterprise must accept responsibility for the robot's instructions.⁵⁵ The enterprise's management can at most pass on this employer's responsibility by means of recourse to the robot's programmers.

The instructions of a robot are intended to optimise working processes. This optimisation takes place through **data analysis**. For example, urgent tasks such as the repair of a machine in a factory can be delegated to the person who, taking into consideration his/her location and specialist qualifications, can perform this task best.⁵⁶ The identification of certain employees is also conceivable in order to establish whether someone is at work or whether a replacement must be organised. For this reason, the applicable data protection law provisions must be ascertained. The data protection law problems involved with this will be discussed later (see B.IV. below).

The exercise of the right of instruction by robots raises the question of a **prohibition of automated individual decisions**.⁵⁷ On the basis of new information and communication technology, decisions which have legal consequences for the persons affected or have significant adverse effects on them are increasingly taken in automated procedures, also often on the basis of profiles based on statistical data and calculations (profiling).⁵⁸ For some time already now, the EU has had provisions on the permissibility of automated individual decisions.⁵⁹ In

⁵³ See MICHAEL MARTIN KIANIČKA, Die Agentenerklärung. Elektronische Willenserklärung und künstliche Intelligenz als Anwendungsfall der Rechtsscheinhafung, Zürich 2012, p. 73 et seq.

⁵⁴ See here GROSS/GRESSEL (footnote 47), p. 992; KIANIČKA (footnote 53), p. 99 et seq.

⁵⁵ DZIDA (footnote 50), p. 11; FRICK (footnote 50), p. 84 et seq.

⁵⁶ GROSS/GRESSEL (footnote 47), p. 994; HOFMANN (footnote 80), p. 13.

⁵⁷ See JOSHUA A. KROLL ET AL., Accountable Algorithms, 165 Univ. of Penn. L. Rev. 2017, p. 633 et seq.; JENS GÜNTHER/MATTHIAS BÖGLMÜLLER, Künstliche Intelligenz und Roboter in der Arbeitswelt, BB 2017, p. 53 et seq., p. 56.

⁵⁸ Federal Office of Justice, Bericht der Begleitgruppe Revision DSG, Normkonzept zur Revision des Datenschutzgesetzes, Bern 29.10.2014, Reference COO.2180.109.7.138327 / 212.9/2012/00754, p. 26.

⁵⁹ Regulation EU/2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) also provides for "measures based on profiling" in Art. 22; see also Art. 3 and 11 of Directive EU/2016/680 on the protection of natural persons with regard to the processing of personal data by competent authorities for the purposes of the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, and on the free movement of such data, and repealing Council Framework Decision 2008/977/JHA of the Council (Data Protection Directive). See also Art. 8 para. 1 letter a of the modernisation draft of the European Council on the Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data (Data Protection Convention, E-SEV 108), (T-PD(2012)04 rev2).

order to determine the allocation of tasks amongst the individual employees, the robot processes data for the purpose of evaluating certain characteristics of a person.

On 21 December 2016, the Swiss Federal Council sent the Preliminary Draft for the Total Revision of the Swiss Data Protection Act and the amendment of further enactments on data protection into the legislative process by consultation. The revision creates the preconditions for Switzerland to ratify the Data Protection Convention of the European Council and take over the EU Data Protection Directive in the sphere of criminal prosecution. However, a prohibition on automated individual decisions appears not to enter into force in Switzerland even in the revised Swiss Data Protection Act, because Art. 15 of the Preliminary Draft for the Total Revision of the Swiss Data Protection Act of 21 December 2016 exclusively provides for a **duty of information and hearing** (but not a prohibition with provisions concerning exceptions).⁶⁰ Other than in EU countries, Swiss law is therefore less restrictive when robots or software issue instructions and thus take automated individual decisions. The desire for more «humaneness» emanating from a prohibition of automated decisions assumes that human decisions are better than automated decisions, a belief which might be questioned with the advancement of AI.

3. *Firing by Algorithm*

Algorithms can collect and evaluate huge amounts of data, and use this as a basis to identify development tendencies, predict results, make recommendations and decisions and perform acts. It is therefore definitely conceivable that **the decision to fire an employee** could be taken by an algorithm in the future (“firing by algorithm”).

Other than in German law, for example, termination of employment in Switzerland does not have to be in written form, and, as mentioned, automated individual decisions are not prohibited.⁶¹ However, the problem is that robots are not able to legally act.⁶² Whereas a robot or an algorithm can take the decision to fire and make this proposal, it cannot under any circumstances announce a termination of employment **because it does not have the legitimate authority to fire a person**. In order to exercise a right by unilateral declaration which cancels a legal relationship, as is the case when announcing termination of employment, capacity to act must exist as defined in Art. 12 Swiss Civil Code. Therefore, dismissal must be announced by an authorised superior, in other words the managing director, an executive board member or an authorised person. This is reasonable because robots are not (yet) in a position to make value judgements and weigh up interests.

II. **Equal Treatment and Discrimination**

When employers introduce robotics or AI systems into the workplace, this raises questions of equal treatment and discrimination. Robotics or AI systems may not be programmed in such a way that they **directly discriminate**. They may also not **indirectly discriminate**, i.e. have

⁶⁰ Federal Office of Justice, Explanatory report on the preliminary draft for the Federal Act on the Total Revision of the Swiss Data Protection Act and the amendment of further decrees on data protection, Bern 21.12.2016, reference COO.2180.109.7.190301 / 212.9/2015/00001, p. 20.

⁶¹ Sections 623 German Civil Code and Section 6a para 1 German Federal Data Protection Act.

⁶² See here SUSANNE BECK, Der rechtliche Status autonomer Maschinen, Sonderheft zum Roboterrecht, AJP 2017, p. 183 et seq.

disadvantageous effects (“disparate impacts”) for different groups of employees (on grounds of race, age, gender, nationality, etc.) in spite of neutral regulation, unless this is objectively justified and proportionate.⁶³

However, indirect discrimination **is difficult to prove**, and, in addition, **there is only little protection from indirect discrimination** in Switzerland (other than in EU law or in the USA).⁶⁴ In Switzerland, the principle of indirect discrimination is integrated into the protection of personality under employment law.⁶⁵

1. *Hiring by Algorithm*

Today, big data is readily used in the hiring process. We talk about “hiring by algorithm”, “HR bots”, “e-recruiting” or “applicant-tracking systems” (ATS). This type of hiring procedure has become very widespread in large companies in recent years.⁶⁶ In Switzerland too, computer systems which can sift job applications are used, e.g. at Swiss, Manor, IBM or the Bernese cantonal administration. It is important that the procedure of “**hiring by algorithm**” satisfies the requirements for legally permissible interview questions and complies with employment law protection from discrimination in hiring.⁶⁷ If data about conduct is collected and compared, undesired connections may be made which have negative effects on job applicants.⁶⁸

To a certain extent, **algorithms can better adhere to employment law stipulations** because they can be examined in advance.⁶⁹ Theoretically, algorithms can make decisions based on facts without prejudice by leaving criteria such as the place of origin, age and gender of an applicant out of consideration when making their decisions.⁷⁰ In addition, there are technical methods such as “data repair” to exclude indirect discrimination in algorithms based on this data.⁷¹

⁶³ Littler Report 2014 (footnote 40), p. 5, p. 15; MATHIASON (footnote 115); KURT PÄRLI, *Vertragsfreiheit, Gleichbehandlung und Diskriminierung im privatrechtlichen Arbeitsverhältnis*, Habilitation, Bern 2009, margin no. 2792.

⁶⁴ See in detail PÄRLI (footnote 63), margin no. 1256 et seq.

⁶⁵ See here PÄRLI (footnote 63), margin no 1385 et seq.

⁶⁶ BOULDEN, Software weeds out weak resumes, CNN, 8.1.2013, <<http://edition.cnn.com/2013/01/08/business/resume-software-scanning/index.html>>.

⁶⁷ On hiring discrimination, see ArbGer ZH dated 13.1.2006, AN 050401/U1. Court cases involving hiring discrimination are extremely rare, which is amongst other things attributable to the lack of relief as regards the burden of proof, see PÄRLI (footnote 63), margin no. 1429 et seq.

⁶⁸ IFEOMA AJUNWA/SORELLE FRIEDLER/CARLOS E SCHEIDEGGER/SURESH VENKATASUBRAMANIAN, *Hiring by Algorithm: Predicting and Preventing Disparate Impact*, 10.3.2016, <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2746078>; SOLON BAROCAS/ANDREW SELBST, *Big Data's Disparate Impact*, 104 California Law Review 2016, p. 3 et seq., <<http://ssrn.com/abstract=2477899>>.

⁶⁹ See CLAIRE CAIN MILLER, *Can an Algorithm hire Better than a Human?*, The New York Times, 25.6.2015, <<http://www.nytime.com/2015/06/26/upshot/can-an-algorithm-hire-better-than-a-human.html>>; SARAH GREEN CARMICHAEL, *Hiring C-Suite Executives by Algorithm*, Harvard Business Review, 6.4.2015, <<https://hbr.org/2015/04/hiring-c-suite-executives-by-algorithm>>.

⁷⁰ MARTIN LÜTZELER/DÉSIRÉE KOPP, *HR mit System: Bewerbermanagement-Tools*, ArbRAktuell 2015, p. 491 et seq., p. 492.

⁷¹ MICHAEL FELDMAN ET AL., *Certifying and removing disparate impact*, Proceedings of the 21th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, ACM 2015. Section 4,

There is nevertheless **extensive criticism of “hiring by algorithm”** and the assumptions on which algorithms are based are increasingly disputed.⁷² After all, algorithms are programmed by human individuals and can therefore also reflect their prejudices. The repetition of human behaviour can deepen discrimination which already exists. In addition, there currently still remains a certain risk that applicants might be inadvertently excluded due to the lack of specific key words although they would fit the job profile.

“Hiring by algorithm” must satisfy the **requirements imposed by Art. 328b Swiss Code of Obligations and data protection law** (see in more detail B.IV. below), just as is the case with an assessment centre. Software algorithms used in the application procedure must naturally comply with these requirements, because they collect and process data. According to Art. 328b Swiss Code of Obligations, the employer may only work with data about the employee to the extent to which it relates to his or her suitability for the employment relationship or is necessary for the implementation of the contract of employment. This provision is relevant to the use of algorithms during the application process. Art. 328b Swiss Code of Obligations restricts the permissible processing of data for the employer in compliance with the principle of proportionality⁷³, as it is also anchored in Art. 4 Swiss Data Protection Act.⁷⁴ Data processing is considered proportionate if it is suitable and necessary for the realisation of a fundamentally legitimate processing purpose, e.g. the clarification of the suitability of the employee for a particular job, and the processing purpose and the adverse effect on personality are in reasonable proportion to each other. The algorithm would therefore have to decide in an individual case whether the question is relevant for the intended work. An algorithm is generally not capable of this evaluation. Also, algorithms must be programmed in such a way that no impermissible questions are asked which encroach on constitutionally protected employees’ interests. This is precisely the problem with numerous personality tests which form part of e-recruitment.⁷⁵ Questions about private life and character may not influence a decision in favour of or against a job applicant made by an algorithm.⁷⁶

p. 261 et seq.; IAN AYRES/JENNIFER GERARDA BROWN, Mark(et)ing Nondiscrimination: Privatizing ENDA with a Certification Mark, *Michigan Law Review* 2006, p. 1639 et seq.

⁷² See KROLL ET AL. (footnote 57); LAUREN WEBER/ELIZABETH DWOSKIN, Are Workplace Personality Tests Fair?, *The Wall Street Journal*, 29.9.2014, <<http://www.wsj.com/articles/are-workplace-personality-tests-fair-1412044257>>.

⁷³ The principle of proportionality is fundamentally located in public law; state acts must be proportionate (see Art. 5 para 2 Federal Constitution of the Swiss Confederation of 18.4.1999, SR 101). The anchoring of this principle in Art. 4 para 2 Swiss Data Protection Act means that the principle of proportionality was taken over into Swiss federal law for data processing, see URS MAURER-LAMBROU/RETO STEINER, Art. 4 DSG, in: Urs Maurer-Lambrou/Gabor-Paul Blechta (Eds.), *Basler Kommentar zum Datenschutzgesetz/Öffentlichkeitsgesetz*, 3rd Edition, Basel 2014, N 10; on the specific inclusion in Art. 328b Swiss Code of Obligations, see WOLFGANG PORTMANN/JEAN-FRITZ STÖCKLI, *Schweizerisches Arbeitsrecht*, 3rd Edition, Zurich 2013, N 438.

⁷⁴ Federal Act of Data Protection (Data Protection Act) of 19.6.1992, SR 235.1.

⁷⁵ KECIA BAL, Screens Under Scrutiny, *Human Resource Executive Online*, 27.10.14, <<http://www.hreonline.com/HRE/view/story.jhtml?id=534357777>>.

⁷⁶ In 2010, it became known that the insurance companies Helvetia and Axa Winterthur automatically sorted employees according to optimal personality profiles with the aid of an online questionnaire from the Zurich software enterprise SPSS, see STEFAN MAIR, Computer entscheiden über Jobvergabe, *Handelszeitung*, 4.11.2016, <<http://www.handelszeitung.ch/management/computer-entscheiden-ueber-jobvergabe-1253643>>.

Furthermore, a new development is represented by robots such as **Sophie**, which are programmed to ask questions to the applicant, answer the applicant's own questions and measure the physiological reactions of an applicant. These cute HR colleagues, which are 60 cm tall, have been tried and tested and are already in use.⁷⁷ They are intended to serve as objective assessors of the job candidates.⁷⁸ However, a robot like Sophie can raise a number of legal problems.⁷⁹ What does it mean for employees' rights in the hiring process if Sophie at the same time also measures the applicant's heartbeat, eye movements and facial expression? Since this concerns health data, the data protection hurdle is even harder to take.

Depending on the situation, therefore, the use of an algorithm, or of a robot such as Sophie, may require the **consent of the job candidate**. However, in view of the structural imbalances⁸⁰ between the employer and the job applicant, very strict requirements must be placed on such consent.⁸¹

Automated application procedures in addition raise the question about a **prohibition of automated individual decisions**.⁸² No sensible employer would hire a new employee solely on the basis of a decision by an algorithm without assessing the personal impression made by an applicant, e.g. his or her social competence and team player qualities.⁸³ However, not the decision to hire, but rather the decision not to hire, is difficult. The issue of automated individual decisions has practical relevance in case of the decision not to hire.

If the statutory stipulations are breached, the job applicant may sue the employer. In my view, a human individual in the company must ultimately take **responsibility** for the job interview by the robot, as in the case of instructions from a "robo-boss".

2. *Exoskeletons*

Exoskeletons can also raise issues of equality and discrimination. Firstly, the question is whether exoskeletons should be **dealt with like parts of the body** if they are connected to the human body, even if this is not a permanent state.⁸⁴ There is discussion about whether public buildings or rooms can refuse access to the wearers of exoskeletons or may require such exoskeletons to be taken off or deactivated, including for reasons other than security.⁸⁵

⁷⁷ RACHEL NICKLESS, Interviewed for a job by Sophie the robot, Financial Review, 10.4.2013, <http://www.afr.com/p/national/work_space/interviewed_for_job_by_sophie_the_gec0B69rcUsaXXFWLZrtvO>.

⁷⁸ NATHAN R. KUNCLE/DENIZ P. ONES/DAVID M. KLIEGER, In Hiring, Algorithms beat Instinct, Harvard Business Review, 5/2014, <<https://hbr.org/2014/05/in-hiring-algorithms-beat-instinct>>; MICHAEL BLANDING, Man vs. Machine: Which Makes Better Hires?, Harvard Business School, 17.2.2016, <<http://hbswk.hbs.edu/item/man-vs-machine-which-makes-better-hires>>.

⁷⁹ MATHIASON/CHANCE (footnote 40).

⁸⁰ KAI HOFMANN, Smart Factory – Arbeitnehmerdatenschutz in der Industrie 4.0, ZD 2016, p. 12 et seq., p. 14.

⁸¹ According to GROSS/GRESSEL (footnote 47), p. 993, "The application of consent will probably have no practical relevance in connection with the use of robots." (own translation).

⁸² See JOSHUA A. KROLL ET AL. (footnote 57); and B.I.2 above.

⁸³ GROSS/GRESSEL (footnote 47), p. 993.

⁸⁴ RoboLaw Guidelines (footnote 10), p. 136.

⁸⁵ RoboLaw Guidelines (footnote 10), p. 136.

This discussion is similar to the debate about the **discrimination of cyborgs**. The term “cyborg” is used for human individuals who are improved or changed by the use of cybernetic or robot technology.⁸⁶ Humans in exoskeletons are also a type of cyborg.⁸⁷ Cyborgs may require a certain degree of protection in the employment world, for example to ensure protection from not being hired or from being discriminated against during their employment relationship due to their changes. For this reason, some voices in the USA demand that they should be included in anti-discrimination legislation.⁸⁸

Secondly, exoskeletons can become **legally necessary, “reasonable accommodations”**. This would mean that an employee, e.g. a disabled person or a person suffering from back injuries, would have a claim to such a reasonable accommodation **from the employer** in an individual case. Given the continual technological further development of aids which compensate for disadvantages and the fact that their cost will reduce significantly in future, employers should keep an eye on these developments,⁸⁹ in particular in the USA, for example.⁹⁰

In Switzerland, legal measures for the promotion of integration of people with disabilities into the employment market are primarily based on the **concept of social insurance**. Social insurances are linked to the term of “disability” and provide for measures for the employment integration of entitled disabled persons. The focus is increasingly being put on the earliest possible detection and treatment of potential disability. For example, the 5th/6th Swiss Disability Insurance Re-Enactment provides for support in the workplace in case of back injuries.⁹¹ Exoskeletons could help here. In Switzerland, there is only a claim to simple, practical disability aids which are economically viable.⁹² Swiss case law tends towards a narrow interpretation of the terms “simple” and “practical”⁹³, and it would be difficult to establish a claim for an exoskeleton. In Germany, however, the Speyer Social Court, for example, decided on 20 May 2016⁹⁴ that the competent health insurance scheme should approve an application by a paraplegic for the payment of the costs for a ReWalk exoskeleton (involving costs of around EUR 72,000).

⁸⁶ SUSANNE BECK, *Roboter, Cyborgs und das Recht*, in: Tade Matthias Spranger (Eds.), *Recht der Lebenswissenschaften*, Volume 1, Berlin 2010, p. 95 et seq., p. 96; SUSANNE BECK, *Roboter und Cyborgs*, in: Susanne Beck (Ed.), *Jenseits von Mensch und Maschine*, Baden-Baden 2012, p. 9 et seq., p. 13.

⁸⁷ <http://www.iso.org/iso/home/news_index/news_archive/news.htm?refid=Ref1882>.

⁸⁸ JOSEPH GUYER, *Cyborgs in the Workplace: Why We Will Need New Labor Laws*, *Future Culturalist*, 12.4.2013, <<https://futureculturalist.wordpress.com/2013/04/12/cyborgs-in-the-workplace-why-we-will-need-new-labor-laws/>>.

⁸⁹ BRYAN M. SEILER, *The Robotic Invaders: What Employers Need to Know About the Next Frontier of the Law of the Workplace*, 2011, p. 8, <http://www.americanbar.org/content/dam/aba/administrative/labor_law/meetings/2011/tech/e_03.authcheckdam.pdf>.

⁹⁰ KURT PÄRLI/ANNETTE LICHTENAUER/ALEXANDRA CAPLAZI, *Literaturanalyse Integration in die Arbeitswelt durch Gleichstellung*, Olten 2008, margin no. 1.1.

⁹¹ Swiss Federal Office of Social Insurance, *Information about the most important amendments and revisions in disability insurance*, <http://www.bsv.admin.ch/themen/iv/00021/03189/?lang=de#sprungmarke0_23>.

⁹² Art. 2 para 4 Ordinance of 29 November 1976 on the provision of aids by disability insurance (HVI), SR 831.232.51. See also KURT PÄRLI, *Sozialversicherungsrecht im Zeitalter der Robotik*, AJP 2017, p. 225 et seq.

⁹³ BGer 9C.600/2011 of 20.4.2012; BGer 8C.279/2014 of 10.7.2015; see BGE 132 V 215; BGE 141 V 30.

⁹⁴ Speyer Social Court, 20.5.2016, p. 19 KR 350/15.

In addition to the social welfare perspective, in Switzerland too, the **approach of non-discrimination and the promotion of factual equality by the employer exists**.⁹⁵ There is the obligation to make reasonable accommodations and to compensate for disadvantages on various legal bases, but to a lesser extent than in the USA. The Swiss Federal Act on the Removal of Disadvantages for People with Disabilities⁹⁶ only applies to employment relationships of the Swiss Federation and provides for a prohibition on discrimination and the duty to make reasonable accommodations in this context.⁹⁷ Federal Staff Law provides for an increased duty of care towards employees with disabilities, according to current case law of the Swiss Federal Administrative Court.⁹⁸

However, the Swiss Federal Act on the Removal of Disadvantages for People with Disabilities expressly excludes private law employment relationships, so that only general employment law applies here.⁹⁹ Generally, there is no right in Switzerland to the removal of disadvantages as long as the situation does not involve the duty to take measures to protect personality. **Art. 328 Swiss Code of Obligations** requires that an employer respects and protects the employee's personality, and takes measures to protect the employee's health and personal integrity if this can reasonably be expected of it. On the basis of Art. 328 Swiss Code of Obligations, the case law in some instances comes to the conclusion that there is a duty to make reasonable accommodations.¹⁰⁰ According to **Art. 6 para 1 Swiss Labour Act**, the employer has an obligation to take all measures for the protection of employees' health which experience shows are necessary, applicable in accordance with the latest technology and appropriate to the circumstances of the business. In particular, the employer must structure the working process in such a way that health risks to and the overexploitation of employees are avoided as far as possible (Art. 6 para 2 Swiss Labour Act). This involves the (proportionate) adaptation of the working conditions to the human capabilities, in particular with regard to organisation and the design of the workplace, and in relation to the choice of equipment, working and production methods.¹⁰¹ Depending on the prevailing technological progress achieved, such an adjustment could also include assistance by an exoskeleton. In private working life, employees can therefore ask for individual, reasonable accommodations which are, to a large extent, paid for by disability insurance or accident insurance.

The **United Nations Convention on the Rights of People with Disabilities**, which has been binding in Switzerland since 15 April 2014, is also interesting with regard to the support of

⁹⁵ PÄRLI/LICHTENAUER/CAPLAZI (footnote 90), margin no. 1.2.

⁹⁶ Federal Act on the Removal of Disadvantages for People with Disabilities (Equality for the Disabled Act, BehiG) of 13.12.2002, SR 151.3.

⁹⁷ Working group BASS/ZHAW, Evaluation des BehiG, Bern 2015, p. 50 et seq.

⁹⁸ BVerwGer A6550/2007 of 29.4.2008, E. 7.

⁹⁹ Working group BASS/ZHAW (footnote 97), p. 63 et seq.; for a critical view, see PÄRLI/LICHTENAUER/CAPLAZI (footnote 90), margin no. 4.20 und 4.21.

¹⁰⁰ BGer 4A.102/2008 of 27.5.2008; BGer 4A.2/2014 of 19.2.2014. See also PÄRLI/LICHTENAUER/CAPLAZI (footnote 90), margin no. 4.21.

¹⁰¹ Instructions of the Secretary of State for the Economy (SECO) regarding Art. 2 Swiss Labour Ordinance 3.

disabled people through exoskeletons.¹⁰² It includes all forms of discrimination against disabled people, including withholding approval of reasonable accommodations (Art. 5 United Nations Convention). It provides for support for research and development of new technologies and their provision to people with disabilities (Art. 4 United Nations Convention). In particular, the states which are party to the Convention acknowledge the **same right to work for people with disabilities**, which is described in great detail, and which includes the provision of reasonable accommodations in the workplace for people with disabilities (Art. 27 para 1 letter i United Nations Convention).

Currently, much wearable and human enhancing technology may not be objectively reasonable or may pose undue hardships because of its novelty or cost. However, as this technology becomes more common and prices reduce, it becomes more likely that social insurances or employers may be required to provide it to aid disabled employees in performing their jobs.¹⁰³

III. Safety at Work and Health Protection

1. General Liability of Robots

Who should be **liable in tort** for robots if they cause damage? In our legal system, we treat machines as an extension of the human individuals who set them in motion. If machines cause damage, we attempt to claim compensation from the manufacturer, producer or user. Robots have to comply with all regulations regarding product safety and have to take into account the health burdens of the potential operating personnel. When planning construction of a robot, the manufacturer must have a precise idea of the concrete use of the robot in the workplace. A collaboration with the employer is necessary.¹⁰⁴

However, the classical approach of torts is difficult to transfer to robots, particularly when they learn independently and become “intelligent”.¹⁰⁵ It can be difficult to establish with hindsight whether an act by the robot causing damage can be attributed to the original programming or subsequent independent learning (“training” through use).¹⁰⁶ Finding “linear” and foreseeable causality will be complicated.¹⁰⁷

The question is therefore whether the robot itself should be liable. Liability in tort is an aspect of capacity to act. A robot could be liable like a legal person if it were registered in a public

¹⁰² United Nations Convention on the Rights of People with Disabilities, concluded in New York on 13.12.2006, approved by the Swiss Federal Assembly on 13.12.2013, which entered into force for Switzerland on 15.5.2014, SR 0.109.

¹⁰³ Littler Report 2016 (footnote 3), p. 12.

¹⁰⁴ GÜNTHER BÖGLMÜLLER (footnote 57), p. 53 et seq.

¹⁰⁵ CURTIS E.A. KARNOW, The application of traditional tort theory to embodied machine intelligence, in: Ryan Calo/A. Michael Froomkin/Ian Kerr (Eds.), Robot Law, Cheltenham UK/Northampton USA 2016, p. 51 et seq.; Robolaw green paper (footnote 42), p. 53 et seq.; MELINDA F. LOHMANN, Der Roboter als Wundertüte, Zur zivilrechtlichen Verantwortlichkeit für Roboter, Sonderheft Roboterrecht, AJP 2017, 152 et seq.

¹⁰⁶ MÜLLER (footnote 10), p. 598; JAN-PHILIPP GÜNTHER, Roboter und rechtliche Verantwortung, Munich 2016, p. 38 et seq.; GÜNTHER/BÖGLMÜLLER (footnote 57), p. 54 et seq.

¹⁰⁷ KARNOW (footnote 105), p. 72 et seq.; JASON MILLAR/IAN KERR, Delegation, relinquishment, and responsibility: The prospect of expert robots, in: Ryan Calo/A. Michael Froomkin/Ian Kerr (Eds.), Robot Law, Cheltenham UK/Northampton USA 2016, p. 102 et seq. For a different view, see GERALD SPINDLER, Zivilrechtliche Fragen beim Einsatz von Robotern, in: Eric Hilgendorf (Ed.), Robotik im Kontext von Recht und Moral, Baden-Baden 2014, p. 63 et seq., p. 78 et seq. (sees no new legal challenges).

register and had assets.¹⁰⁸ Additionally, it could also be insured by obligatory third party liability insurance.¹⁰⁹ In my view, this is quite conceivable in the future.

However, robots are currently not liable in tort, so that the classical liability of the employer for accidents at work and occupational illnesses instead comes into question.

2. *Employers' Liability for Accidents at Work and Occupational Illnesses*

A **workplace must be safe**. The employer has an obligation to take all measures to protect the health of employees, and in particular to avoid accidents at work and occupational illnesses. The employer must take measures which (1) experience shows are necessary, (2) are applicable in conformity with technological progress, and (3) are appropriate under the circumstances. This results from the three statutory pillars of Art. 328 para 2 Swiss Code of Obligations, Art. 82 para 1 Swiss Federal Accident Insurance Act and Art. 6 para 1 Swiss Labour Act.¹¹⁰

If these (occupational safety and health) measures are not taken, the employer is liable to employees who suffer accidents, or to their surviving dependents, **due to a breach of the duty of care founded by the contract of employment pursuant to Art. 328 para 2 Swiss Code of Obligations**. The employer cannot delegate this responsibility, not even to an internal or external safety officer.¹¹¹ However, the employer is only directly liable to the injured person for damage/injury which is not compensated by accident insurance, such as, for example, compensation for pain and suffering or damage to property.¹¹²

In practice, injury to the employee in the workplace by a robot will mostly be **an accident at work as defined in Art. 7 Swiss Federal Accident Insurance Act** and is covered by public-law accident insurance. Payments from this source amongst other things cover the accident victim's treatment and disability costs, integration compensation and pensions for surviving dependents (Art. 10 et seq. Swiss Federal Accident Insurance Act). The shift of liability and the resultant privileged position of the employer is justified by the employer's financing of the statutory accident insurance. The employer as sole **debtor of the premiums** in the sphere of occupational accident insurance has a great interest in the avoidance of accidents (Art. 91 Swiss Federal Accident Insurance Act). The amount of the premium for occupational accident

¹⁰⁸ RoboLaw Guidelines (footnote 10), p. 19; STEFFEN WETTIG/EBERHARD ZEHENDNER, A legal analysis of human and electronic agents, *Artificial Intelligence and Law* 2004, p. 111 et seq.

¹⁰⁹ Also one of the proposals in the Draft Report with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)), Committee on Legal Affairs, Rapporteur Mady Delvaux, *Consid.* p. 31. See also RYAN CALO, *Open Robotics*, *Maryland Law Review* 2011, p. 138 et seq. On various instruments to compensate damage, see ISABELLE WILDHABER, *Von Hochwasserschäden zu AKW-Störfällen: Wer ersetzt Katastrophenschäden?*, *ZSR* 2013 I, p. 381 et seq.

¹¹⁰ The measures are defined in more detail in Ordinance 3 on the Labour Act (healthcare, Swiss Labour Ordinance 3) and the Swiss Ordinance on the Prevention of Accidents and Occupational Illnesses, together with recommendations of Suva and SECO as well as the EKAS guidelines (Swiss Coordination Commission for Safety at Work).

¹¹¹ Art. 7 para 2 Swiss Ordinance on the Prevention of Accidents and Occupational Illnesses of 19 December 1983, SR 832.30, and Art. 7 para 4 Ordinance 3 on the Labour Act (Swiss Labour Ordinance 3, Health Protection) of 18 August 1993, SR 822.113. See Suva, *Welches sind Ihre Pflichten auf dem Gebiet der Arbeitssicherheit und des Gesundheitsschutzes?*, Lucerne March 2011, order number 140.d, p. 4.

¹¹² ADRIAN VON KAENEL, *Unfall am Arbeitsplatz – Arbeitgeberhaftung*, in: *Haftung und Versicherung: Beraten und Prozessieren im Haftpflicht- und Versicherungsrecht*, Basle 2015, p. 661 et seq.

insurance depends on the accident risk in the business (Art. 92 Swiss Federal Accident Insurance Act). Premiums for accident insurance can cause substantial costs for the employer if several claims on the basis of the same cause were successful. In addition, accident insurance companies can also take **recourse** to the employer (Art. 72 para 1 Swiss Federal Act on the General Part of Social Insurance Law), although only in case of intent or gross negligence (so-called privilege of recourse, Art. 75 para 2 Swiss Federal Act on the General Part of Social Insurance Law), which, however, is only the case in practice if the employer has third party liability insurance. The existence of gross negligence can only be assessed on an individual case-to-case basis taking into consideration the relevant robot system, the design of the workplace and the skills of the employee.

For these reasons, employers should take **all possible preventative measures** to ensure that the workplace with robots is safe.

3. *New Challenges for Safety at Work through Robotics*

Robotics impose **new requirements on prevention as regards safety at work**.¹¹³

Progress in robotics could **improve safety at work in the future**. Firstly, the use of robots enables physical and psychological relief for humans doing work which is dangerous, damaging to their health, or physically very strenuous for them. This is, for example, the case for robots felling timber in forestry, cleaning rocks, or robots for bomb disposal or police overpowering of a terrorist. Secondly, where this is not possible at least simulators help engineers to conduct three-dimensional monitoring activities in order to identify potential accident risks at the early planning stage for machinery and equipment, in order to avoid them.¹¹⁴ Thirdly, applications such as exoskeletons which support employees in the physical performance of their work improve the opportunities for injured employees to return to work and reduce the risk of relapse.¹¹⁵ Exoskeletons could even become a safety requirement for certain dangerous work in the future.

On the other hand, **robotics involve new risks** which range from accident risks due to systems errors to stress-related illnesses.¹¹⁶ However, most accidents connected with robots do not occur under normal operating conditions, but instead during programming, maintenance, repair, adjustment or the like.¹¹⁷ In addition, human failure is more frequent than technical

¹¹³ Suva, Zukunftsstudie 2029 – Expertenstudien zu künftigen Unfall- und Berufskrankheitsrisiken und Präventionschancen, 1st Edition, Lucerne 12.9.2010, order number 2931.d; <<http://www.suva.ch/geschaeftsbericht-2010.pdf>>.

¹¹⁴ Suva, Früherkennungsradar: Zukünftige Chancen und Risiken für die Prävention von Unfällen und Berufskrankheiten, Lucerne December 2012, order number 2965.d, p. 40; Littler Report 2014 (footnote 40), p. 22.

¹¹⁵ Littler Report 2014 (footnote 40), p. 4, 23; GARRY MATHIASON, 10 Areas of Employment and Labor Law Most Impacted by Robotics, Human Enhancement Technologies, & the Growth of AI, <<https://www.littler.com/files/press/pdf/Mathiason-10-Areas-Employment-Labor-Law.pdf>>.

¹¹⁶ Suva Zukunftsstudie 2029 (footnote 113), p. 10. In a similar way for the German Federal Agency for Health and Safety at Work: ISABEL ROTHE, Neue Herausforderungen für Sicherheit und Gesundheit bei der Arbeit: Digitalisierung der Arbeitswelt, BAuA aktuell 2/2015, p. 12 et seq.

¹¹⁷ Occupational Safety & Health Administration (OSHA), Robotics in the Workplace, Chapter 6, <http://www.osha.gov/Publications/Mach_SafeGuard/chapt6.html>.

failure.¹¹⁸ “Smart” systems can avoid accidents which are attributable to faulty operation by humans. However, if an increasing number of activities are carried out by robots themselves, there is a risk that human skills and attention spans will wither away.¹¹⁹ Precisely the increasingly smart safety systems can tempt humans to take more risks (so-called phenomenon of risk compensation).¹²⁰ There are also indications that risk is delegated, in other words a type of blind faith in the safety of the systems and possibilities develops, leading to human watchfulness no longer being applied.

Advances in robotics in the workplace will lead to a massive increase in the interaction between workers and robots. This development contrasts directly with a vast body of occupational health and safety standards – which are designed to ensure that workers and machines operate separately. Robots which operate outside safety barriers and cages trigger alarm bells. Or, as Jim McManus, Safety Specialist at the OSHA (Operational Safety and Health Agency) said at the 2016 National Robot Safety Conference in Cincinnati, “If an OSHA compliance officer walks in and sees a robot operating without a guard, he is going to set off alarm bells. There is a robot, so there must be a cage or someone is going to get hurt, right?”¹²¹ It is therefore essential to ensure the safety of employees who work with and around robots. For this purpose, certain **norms and standards** are required, which are currently being developed. The design and use of wearable technology and collaborative robots must be contemplated within these standards.

For instance, the new generation of industrial robots called **cobots**, which collaborate with human individuals, present a challenge to safety at work.¹²² Examples of this are Baxter from Rethink Robotics or Yumi (“You & Me”) from ABB.¹²³ It is currently a huge task to work out how accidents in the form of collisions and bruises or employees being swept away can be prevented.¹²⁴ Accident prevention is possible by, for example, eliminating crushing edges, padding the robot’s arms and ensuring the operation is stopped immediately if the human touches the robot.¹²⁵ With the development of advanced collaborative robots that can carry significant weights at high speeds, all while operating in close proximity to humans, the risk of significant injury increases substantially. As cobots are industrial robots, they are also fundamentally subject to the provisions of ISO 10218¹²⁶ and Directive 2006/42/EC on ma-

¹¹⁸ See the often-cited case of a fatal accident at work at a VW plant in which a worker was crushed against a metal wall by a robot: ELIANA DOCKTERMAN, The machine grabbed and crushed the technician, TIME, 1.7.2015, <<http://time.com/3944181/robot-kills-man-volkswagen-plant/>>.

¹¹⁹ Suva Früherkennungsradar (footnote 114), p. 40.

¹²⁰ Littler Report 2014 (footnote 40), p. 22.

¹²¹ DAVE PERKON, Educating OSHA Compliance Officers on Robot Safety, Control Design, 14.11.2016, <<http://www.controldesign.com/articles/2016/educating-osh-compliance-officers-on-robot-safety/>>.

¹²² WILDHABER (footnote 41), 334 et seq.

¹²³ <<http://news.abb.com/products/robotics/de/yumi>>.

¹²⁴ DETLEF GERST, Industrie 4.0 und ihre Bedeutung für den betrieblichen Gesundheitsschutz, DGUV Forum 6/2015, p. 34 et seq.

¹²⁵ CARL BENEDIKT FREY/MICHAEL A. OSBORNE ET AL., Technology at Work v2.0 – The Future is Not What It Used To Be, Citi GPS: Global Perspectives & Solutions January 2016), p. 132.

¹²⁶ Industrial robots are regulated by ISO 10218-2011, Industrial Robots – Safety Requirements - Part 1: Robots; ISO 10218-2, Industrial Robots – Safety Requirements – Part 2: Robot Systems and Integration.

chines.¹²⁷ The **ISO technical specification on collaborative robots** (ISO/TS 15066:2016) dates from 2016. It introduces new rules of the game for industry by offering specific, data-driven safety rules to assess and control the risks presented by cobots. Since the introduction of ISO/TS 15066, traditional barriers and safety measures to keep humans and robots apart are no longer necessary for certain industrial robots in conformity with ISO 10218.

Safety at work issues are also raised in the context of **personal care robots**.¹²⁸ These are service robots which perform tasks that make a direct contribution to the improvement of the quality of life of humans (with the exception of medical treatments).¹²⁹ In German-speaking areas, PCRs are referred to colloquially as “nursing robots” (“*Pflegeroboter*”), which they precisely are *not*. ISO-Norm 13482:2014 for PCRs expressly excludes robots used as medical devices¹³⁰ from its sphere of application. Accordingly, mobile assistance robots and exoskeletons, for example, must be classified as medical applications if they are, for instance, used for the treatment of an illness or disability.¹³¹ Whereas *non-medical* exoskeletons are covered by ISO-Norm 13482:2014 for PCRs (so-called physical assistant robots pursuant to Art. 3.15¹³²), *medical* exoskeletons are medical devices covered by ISO 13485:2015. In other words, contrary to widespread opinion, ISO 13482:2014 precisely does not affect “nursing robots”, but rather *person-related, i.e. interactive, service robots*.¹³³ Personal care robots are subdivided into mobile servant robots¹³⁴, robots which support movement (e.g. industrial exoskeletons) or personal transportation robots (e.g. Toyota i-Foot/i-Wheel). They challenge the concept of safety at work because they (1) are used for numerous requirements in environments which are not precisely defined, (2) come into contact with non-specialised users, and (3) share the workspace with humans.¹³⁵ This is why safety standards are defined formally, and at an international level, in ISO-Norm 13482: 2014 on PCRs.

¹²⁷ Directive 2006/42/EC of the European Parliament and the Council of 17.5.2006 on machines and to amend Directive 95/16/EC, Art. 1 et seq.

¹²⁸ See ISABELLE WILDHABER/MELINDA F. LOHMANN, *Roboterrecht – eine Einleitung*, Sonderheft zum Roboterrecht, AJP 2017, p. 135 et seq. See also ELISA MAY, *Robotik und Arbeitsschutzrecht*, in: Eric Hilgendorf (Ed.), *Robotik im Kontext von Recht und Moral*, Baden-Baden 2014, p. 99 et seq.; ISO/TC 184 – Automation systems and integration; INB/NK 2310 – Industrielle Automation.

¹²⁹ ISO 13482:2014 Robots and robotic devices -- Safety requirements for personal care robots, Art. 3.13.

¹³⁰ See ISABELLE WILDHABER, *Zum Begriff des Medizinprodukts*, in: Bernhard Rütsche (Ed.), *Medizinprodukte: Regulierung und Haftung*, Bern 2013, 9 et seq.

¹³¹ See interview with GURVINDER P. VIRK, chairman of the leading working group on ISO 13482 ISO TC184/SC2/WG7, <https://www.roboticsbusinessreview.com/exclusive_interview_gurvinder_virk_explains_brand_new_iso_13482/>.

¹³² See ISO-Norm 13482:2014, B.3., 68 (“A *healthy* person using an exoskeleton to reduce his/her physical work”). See also <<http://www.iso.org/iso/news.htm?refid=Ref1818>>.

¹³³ WILDHABER/LOHMANN (footnote 128), p. 135 et seq.

¹³⁴ On mobile servant robots, see EDUARD FOSCH VILLARONGA/GURVINDER P. VIRK, *Legal Issues for Mobile Servant Robots*, <<https://www.researchgate.net>>. Mobile servant robots are defined in ISO 13482:2014 as a “personal care robot that is capable of travelling to perform serving tasks in interaction with humans, such as handling objects or exchanging information.” They are only covered by the PCR-ISO-Norm, if they are not medical devices (like, for example, “Robear”), see WILDHABER/LOHMANN (footnote 128), p. 135 et seq.

¹³⁵ RoboLaw Guidelines (footnote 10), p. 174.

When using **exoskeletons** at the workplace, care must be taken with regard to safety at work to ensure that the advantages of robot suits are not lost due to the increasing expectations and demands on humans who work with exoskeletons. As the physical possibilities for employees increase with the aid of exoskeletons, employers' expectations about the efficiency of employees and their performance of hard and dangerous physical labour may also increase. Exoskeletons can cause injuries if they are badly fitted to the body, the transmission is poor or the employee overestimates his or her physical capabilities due to the exoskeleton.¹³⁶

If a workplace is intended to be equipped with a cobot, a mobile servant robot, a so-called *telepresence robot*¹³⁷, an industrial exoskeleton or another robot, a **risk assessment** must be carried out on the basis of the statutory bases and the ISO norms. It is important for the manufacturer and the employer to ensure compliance with all robot-relevant provisions on safety at work and health protection.¹³⁸ These can also be industry-specific regulations, such as regulations of Swissmedic (e.g. for a robot which qualifies as a medical device),¹³⁹ or more general provisions such as the Swiss Product Safety Act¹⁴⁰ for the technical safety of equipment, products or facilities, or the Machinery Ordinance,¹⁴¹ which makes integral reference to the EU Machinery Directive 2006/42/EC.¹⁴²

However, ultimately the risk assessment with regard to safety at work is **difficult** for the manufacturer of robots and the employer using them. Preparation and formalisation of suitable safety standards and requirements within the framework of the law on safety at work are demanding. Many of the existing rules – like the ISO norms or the recommendations of Suva or EKAS – only constitute *soft law*.¹⁴³ The employer's duties to implement safety measures and to maintain a standard of care cannot always be precisely defined. The development of robots for the workplace must therefore be closely linked with the **development of new approaches within the framework of employee protection**. The idea of a safe workplace will increasingly not only focus on the implementation of independent safety measures or warning functions, but on the role of the robot for the protection of employees. Robots have certain skills for the perception, evaluation and interpretation of their environment. They must recognise risks and react to them themselves in order not to endanger the employees in their environment. New approaches will be required, and increasingly not only the human must be taught controlled and aware handling, but also the robot itself. In this way, it can and will contribute to compliance with safety at work. Technical progress can in turn raise new technical safety problems, because the more independently and “intelligently” the robot acts, the more difficult it is to anticipate the possible consequences.

¹³⁶ Littler Report 2014 (footnote 40), p. 24; MATHIASON (footnote 115).

¹³⁷ See WILDHABER (footnote 41), p. 342 et seq.; SEILER (footnote 89), p. 5. “Telepresence robots” can be classified as PCRs if they perform services, see ISO Norm 13482:2014, table 10 (“manual mode”), p. 50.

¹³⁸ MATHIASON (footnote 115).

¹³⁹ See WILDHABER/LOHMANN (footnote 128), p. 135 et seq.

¹⁴⁰ Federal Product Safety Act of 12.6.2009, SR 930.11.

¹⁴¹ Ordinance on the Safety of Machinery of 2.4.2008, SR 819.14.

¹⁴² Directive 2006/42/EC of the European Parliament and the Council of 17.5.2006 on machinery and to amend Directive 95/16/EC (new version), ABl. No. L 157 of 9.6.2006, p. 24.

¹⁴³ Robolaw green paper (footnote 42), p. 43.

However, employers should not only rely on technology to avoid accidents, but on reliable **training and safety processes**.¹⁴⁴ Correct and comprehensive instructions to the employees is essential for safety at work in dealing with robots in the workplace. In addition, robotics specialists should be consulted in danger assessment and risk analysis in the workplace.¹⁴⁵

IV. Data Protection

Many robotics systems will store and process an increasing amount of information about users and use in the future – this is often automatically connected with the flexible and individual use of working aids. However, such data is a **challenge for data protection law and the handling of data within an enterprise**.¹⁴⁶ Robots can “sense, think and act”, they can perceive, process and store the world around them. The fact that monitoring is one of the most frequent uses for robotics clearly indicates the relevance of data protection in robotics.¹⁴⁷

The optimisation of working processes in the smart factory, for example, takes place through **data analysis**. Urgent tasks, such as the repair of a machine in a factory, can be transferred to the person who can perform it fastest, taking into consideration his or her location and specialist qualifications.¹⁴⁸ The identification of certain employees is also conceivable in order to ascertain whether someone is at work or if a replacement must be organised. Telework technologies may incidentally capture a host of health information from an employee-operator in the process of calibrating the technology to the individual. For example, an assisted surgery robot may recognise and learn to compensate for the tremor in a surgeon’s hand and even for the individual’s pulse.¹⁴⁹ The robotic technology’s audio and video recording functionality may also be problematic. Individuals in a location subject to the use of telework technology may not realise that the robotic technology is recording their communications, let alone consent to such recordings.

Data protection is not new. Instead, it is a specific answer by legislation to the special threats to personality which have become possible through the technological development in data processing.¹⁵⁰ Legislation has responded to the **obligation to protect employees’ privacy** by passing Art. 328 and 328b Swiss Code of Obligations, Art. 6 Swiss Labour Act and Art. 26 Swiss Labour Ordinance 3 (protection from monitoring). There is a connection between data protection and protection from discrimination.¹⁵¹ The law of protection from discrimination

¹⁴⁴ WILDHABER (footnote 41), p. 337.

¹⁴⁵ Art. 11a Swiss ordinance on the Prevention of Accidents and Occupational Illnesses, Art. 7 para 3 Swiss Labour Ordinance 3, Directive of the Swiss Coordination Commission for Safety at Work No. 6508: Directive on the Involvement of Company Doctors and other Specialists for Safety at Work, January 2007 Edition, <<http://www.ekas.admin.ch/index-de.php?frameset=200>>.

¹⁴⁶ MÜLLER (footnote 10), p. 607.

¹⁴⁷ RYAN CALO, Robots and Privacy, in: Patrick Lin/George Bekey/Keith Abney (Eds.), Robot Ethics, The Ethical and Social Implications of Robotics, Cambridge, MA/London 2011, <http://papers.ssrn.com/013/paper.cfm?abstract_id=1599189>.

¹⁴⁸ GROSS/GRESSEL (footnote 47), p. 994; HOFMANN (footnote 80), p. 13.

¹⁴⁹ Littler Report 2016 (footnote 3), p. 16.

¹⁵⁰ FRANK SEETHALER, Entstehungsgeschichte DSG, in: Urs Maurer-Lambrou/Gabor-Paul Blechta (Eds.), Basler Kommentar zum Datenschutzgesetz/Öffentlichkeitsgesetz, 3rd Edition, Basle 2014, N 13 et seq.; KURT PÄRLI, Chapter 17 Datenschutz, in: Wolfgang Portmann/Adrian von Kaenel (Eds.), Fachhandbuch Arbeitsrecht, Zurich 2017, margin no. 17.7 [forthcoming].

¹⁵¹ PÄRLI (footnote 150), margin no. 17.7.

aims to protect people from vilification, exclusion and disadvantages due to personality characteristics. Data protection law provisions (also) constitute instruments to realise the aims of protection from discrimination.¹⁵²

In the context of robotics in Switzerland, I consider **Art. 26 para 1 Swiss Labour Ordinance 3** on the protection of health very important. It restricts the **use of monitoring and control systems** for the monitoring of employee conduct in the workplace. Monitoring and control systems include video facilities, telephone systems, intercom systems, photocopying equipment and GPS, and will certainly also include systems and networks based on big data in the future.¹⁵³ The regulation manifests the legislative will to protect the health of employees from monitoring measures which are not justified by business or other acknowledged aims.¹⁵⁴ If the monitoring or control system does not exclusively or primarily serve the monitoring of conduct, but other legitimate grounds, use is permitted in accordance with para 2 as long as this does not adversely affect the health and freedom of movement of the employees. A precondition is that it should be proportionate in an individual case and employees must be informed in advance about the use of the system.¹⁵⁵ Accordingly, all monitoring measures must be justified by an overriding interest of the employer and must be proportionate, and employees must be informed in advance about the use of the system.¹⁵⁶

The technology used for data collection and the relevance of the data with regard to the personality right of the affected person are decisive for compliance with Art. 328b Swiss Code of Obligations, the Swiss Data Protection Act and Art. 26 Swiss Labour Ordinance 3.¹⁵⁷ The affected person's **right of personality** must be set in relation to the employer's entrepreneurial freedom to organise his or her business. Data processing must be restricted to cases of specific information requirements of the employer who uses the robots.¹⁵⁸ If the robot must have access to video recordings for the performance of the instruction, general principles for video monitoring in the workplace can be applied.¹⁵⁹ If possible, such video data should be deleted without trace once it has served its purpose. If the purpose of visual recording by the robot does not require identification of the person, recognition of biometric data must be restricted.¹⁶⁰

¹⁵² Federal Administrative Court of 10.4.2012, A-4457/2011 E. 9.3.

¹⁵³ WILDHABER (footnote 41), p. 346 et seq.

¹⁵⁴ PÄRLI (footnote 150), margin no. 17.57.

¹⁵⁵ ROBERTA PAPA/THOMAS PIETRUSZAK, § 17 Datenschutz im Personalwesen, in: Nicolas Passadelis/David Rosenthal/Hanspeter Thür (Eds.), *Datenschutzrecht, Handbücher für die Anwaltspraxis*, Basle 2015, margin no. 17.55.

¹⁵⁶ PAPA/PIETRUSZAK, (footnote 155), margin no. 17.55.

¹⁵⁷ See WILDHABER (footnote 41), p. 346 et seq.; MÜLLER (footnote 10), p. 606 et seq.; GROSS/GRESSEL (footnote 47), p. 994; HOFMANN (footnote 80), p. 15 et seq.

¹⁵⁸ GROSS/GRESSEL (footnote 47), p. 995; HOFMANN (footnote 80), p. 16.

¹⁵⁹ See ULLIN STREIFF/ADRIAN VON KAENEL/ROGER RUDOLPH, *Arbeitsvertrag, Praxiskommentar zu Art. 319-362 OR*, 7. A., Zurich 2012, Art. 328b N 8.

¹⁶⁰ GROSS/GRESSEL (footnote 47), p. 995; HOFMANN (footnote 80), p. 16 et seq.

The recorded information may provide information about working speed, the health situation or the precision of the working employee.¹⁶¹ The fact that this data is collected can mean a **monitoring effect for the employee**. It is irrelevant that this is not the intention of the employer and is also not the intended purpose of the technical facility. If the data can be analysed, the machine offers the possibility of monitoring the employee without significant further steps being necessary. In this context, it is important that monitoring purposes are only legitimate if they relate to the organisation of the business processes or the protection of sensitive company data or business infrastructure. However, the employer – as the creditor of the employee’s duty to perform – is also entitled to monitor the performance of the work and to carry out checks on performance and conduct for this purpose. It will therefore be important to precisely define the purposes of the systems used and to delimit the necessary handling of data precisely on the basis of this.

This problem has long since been reality, as shown by the example of **GPS-supported mobile devices**. Such devices, for example, direct “pickers” in the Amazon warehouses to the right shelf in which they find the merchandise ordered by the customer. There are reports from England that the mobile GPS computers raise the alarm if the employee takes a break outside regular break times.¹⁶² These problems in relation to the right of personality and employee data protection will become more acute in the future in view of robotics.¹⁶³

In case of an industrial **exoskeleton** such as the one tested in Daewoo’s Korean wharfs,¹⁶⁴ wharf workers can carry very heavy loads. It therefore serves to protect the health of the employee, but can on the other hand involve risks for the right of personality. Is it permissible for the exoskeleton to analyse the posture of the wharf worker and draw conclusions about his psychic condition? Perhaps certain data here should not be used at all for the purposes of the employment relationship.

Similar questions are raised in the case of collaborative robots, referred to as **cobots**. Their robot arms can position an item to be worked on in such a way that the work to be done on it can be performed in an ergonomically comfortable and healthy body position.¹⁶⁵ In order to achieve this, the cobot ascertains the anthropometric characteristics of the employee (inside leg length, arm length, back length) and is guided accordingly. In order to register this and ensure that collisions are avoided, cameras constantly monitor the robot’s working environment and the humans working in it.

¹⁶¹ BERTHOLD H. HAUSTEIN, Herausforderungen des Datenschutzrechtes vor dem Hintergrund aktueller Entwicklungen in der Robotik, in: Jan-Philipp Günther/Eric Hilgendorf (Eds.), Robotik und Gesetzgebung, Baden-Baden 2013, p. 91 et seq., p. 93 et seq.

¹⁶² Channel 4 News, Anger at Amazon Working Conditions, 1.8.2013, <<https://www.channel4.com/news/anger-at-amazon-working-conditions>>.

¹⁶³ MAX OPREY, Rio Tinto’s plans to use drones to monitor workers’ private lives, 8.12.2016, <https://www.theguardian.com/world/2016/dec/08/revealedrio-tinto-surveillance-station-plans-to-use-drones-to-monitors-staffs-private-lives?CMP=Share_AndroidApp_Email>.

¹⁶⁴ HAL HODSON, Robotic Suits Gives Shipyard Workers Super Strength, New Scientist, 30.7.2014, <<https://www.newscientist.com/article/mg22329803-900-robotic-suit-gives-shipyard-workers-super-strength/>>.

¹⁶⁵ Final Report rorarob 2014, <<https://eldorado.tu-dortmund.de/handle/2003/33519>>.

In the case of an **intelligent assembly line in a smart factory**¹⁶⁶ which is linked to an assembly line worker and slows down if, for example, the assembly line worker's pulse becomes too high, health data about the employee is collected which should only be possible under very restricted preconditions in view of the protection of the employee's personality.¹⁶⁷

Legitimate reasons for monitoring and control systems are business operation interests such as, for example, the guarantee of uninterrupted operational processes, quality control, safety at work, the optimisation of work organisation or staff productivity.¹⁶⁸ In the case of **industrial robots**, for example, the collection of data for monitoring can be permitted for organisational or technical safety reasons or to steer production.¹⁶⁹ A precondition is that the monitoring as defined in Art. 26 para 2 Swiss Labour Ordinance 3 does not adversely affect the employees' health in an impermissible way and does not breach the provisions of the Swiss Data Protection Act.

As regards data processing in the employment relationship, the **private law provisions of the Swiss Data Protection Act** must also be complied with in addition to Art. 328b Swiss Code of Obligations. Regardless of the method chosen, monitoring must be transparent to the extent to which the method does not serve to accuse a suspicious employee of an impermissible breach against duties imposed by his or her contract of employment or by statute. The **principle of transparency** requires that the procurement of personal data and in particular the processing purpose must be recognisable for the person affected (Art. 4 para 4 Swiss Data Protection Act). To the extent to which the owners of data banks in addition also procure personal data which is particularly worthy of protection or personality profiles, Art. 14 Swiss Data Protection Act provides for an active duty of information to the person affected. Both provisions are of central importance for data processing in employment relationships. Evaluations of personal data are not in themselves impermissible, but require compliance with the principle of transparency and fulfilment of the duty of information.¹⁷⁰ It is therefore always important that the employee is informed in advance about the monitoring and the deletion of data after the lapse of a certain period of time.¹⁷¹ In addition, recordings may only be seen by authorised persons.¹⁷² In principle, data protection-friendly technologies must be chosen, e.g. cameras equipped with filters which encode the pictures.¹⁷³ Care must also be taken that personal monitoring only comes into consideration as a "last resort" in compliance with the principle of proportionality even in such cases.¹⁷⁴

¹⁶⁶ On the smart factory, see HOFMANN (footnote 80), p. 13.

¹⁶⁷ BORIS DZIDA, Gute Gründe für ein „Arbeitsrecht 4.0“, FZA of 23.11.2016, p. 23.

¹⁶⁸ PAPA/PIETRUSZAK (footnote 155), margin no. 17.51.

¹⁶⁹ PÄRLI (footnote 150), margin no. 17.62; MÜLLER (footnote 10), p. 606 et seq.

¹⁷⁰ PÄRLI (footnote 150), margin no. 17.24.

¹⁷¹ ROSENTHAL/JÖHRI, Handkommentar zum Datenschutzgesetz, Zürich 2008, Art. 328 OR N 96 et seq., Art. 4 DSG N 27; PÄRLI (footnote 150), margin no. 17.57.

¹⁷² ROSENTHAL/JÖHRI (footnote 171), Art. 4 DSG N 27.

¹⁷³ See the explanations of the Swiss Federal Data Protection and Publicity Officer on video monitoring in the workplace, <<http://www.edoeb.admin.ch/datenschutz>>.

¹⁷⁴ PÄRLI (footnote 150), margin no. 17.62.

As the statutory permission facts and circumstances have been very narrowly defined in data protection law, the **cooperation of the employees** should play an important role in case of monitoring by robots.¹⁷⁵ Either the consent of the employees should be obtained or the conclusion of a works agreement is necessary. However, such consent can create legal difficulties, amongst other things in the context of big data analyses;¹⁷⁶ in addition, given the balance of power in the employment relationship, consent will seldom be completely voluntary and it is revocable. It is nevertheless important for the employees to be informed about the use of the monitoring system in advance for reasons of transparency and for the employer to ensure that the employees' consent is obtained. Even without the employees' consent it should be attempted to guarantee the legally compliant implementation of the new technologies through a well-considered choice of the data to be stored and possibly by rendering such data anonymous.

There are also additional data protection law aspects which must be complied with in the introduction of robotics in the workplace. The use of a **“cloud-based solution”** can be impermissible from a data protection law point of view, so multinational employers should ensure precise clarification before transferring personal data to a cloud.¹⁷⁷ The law requires particular care from the data processor with regard to **cross-border data disclosure** (Art. 6 Swiss Data Protection Act)¹⁷⁸ and the **external shift of data processing to third parties** (Art. 10a Swiss Data Protection Act).¹⁷⁹

In view of the numerous purposes and roles which robotics systems can play in the modern workplace, the following **recommendations** are made to employers.¹⁸⁰ In a first step, employers should carry out a **risk assessment**. They should assess how information is transferred to the robot technology in question, how the information is to be stored and how access to the information is to be granted. The risk assessment should identify potential weak points. The employer should then address these weak points and weigh up the risks against damage and costs. In a second step, the employer must undertake an exact **categorisation** of information which is collected and used by every system. Each category must then be subjected to an individual legal evaluation (because this, for example, involves personal data which is particularly worthy of protection pursuant to Art. 3 letter c Swiss Data Protection Act).

¹⁷⁵ PÄRLI (footnote 150), margin no. 17.20; STREIFF/VON KAENEL/RUDOLPH (footnote 159), Art. 328b OR N 24; ROSENTHAL/JÖHRI (footnote 171), Art. 328b OR N 66; BGE 136 II 508, E. 5.2.4.

¹⁷⁶ VIKTOR MAYER-SCHÖNBERGER/KENNETH CUKIER, *Big Data: Die Revolution, die unser Leben verändern wird*, München 2013; ROLF H. WEBER, *Big Data: Herausforderungen für das Datenschutzrecht*, in: Astrid Epiney/Daniela Nüesch (Eds.), *Big Data und Datenschutzrecht*, Zurich 2016, p. 1 et seq.

¹⁷⁷ PÄRLI (footnote 150), margin no. 17.68; European advisory body on data protection and privacy, Opinion 05/2012 on Cloud Computing (WP 196), Article 29 Data Protection Working Party, 1.7.2012, <http://ec.europa.eu/justice/data-protection/article-29/documentation/opinion-recommendation/files/2012/wp196_en.pdf>.

¹⁷⁸ As regards the duties of the data processor and the role of the FDPIC, see Art. 5-7 Ordinance on the Federal Act on Data Protection of 14 June 1993, SR 235.11.

¹⁷⁹ PÄRLI (footnote 150), margin no. 17.64.

¹⁸⁰ In a similar vein, the Littler Report 2014 (footnote 40), p. 27.

V. Applicable Law regarding Wages and Working Times

Robotics simplify **remote work**. The physical and time boundaries of the workplace are becoming more flexible and the world of work is “unbounded“. These changes raise the question about which employment law is applicable, and in particular which statutes concerning wages and working time apply to a mobile, decentralised workplace.

Which law is applicable to people who are remotely in the office with the help of a “**telepresence robot**”? Telepresence robots are a kind of iPad on a Segway; the face and voice of the employee are projected on the iPad, like with Skype or FaceTime. They enable the employee to be physically present as a robot in the office or at another workplace. In this way, for example, a chief physician could roll along on the morning ward round while at the same time attending a congress abroad. They are telerobots, which are characterised by the remote-controlled operational mode.¹⁸¹ The situation is similar for employees far away, who are spread over several countries and control robots from abroad.

Most countries fundamentally follow the international law **principle of territoriality**, in accordance with which the laws of a country are only intended to apply inside the country’s borders.¹⁸² For example, Swiss regulations on compensation for overtime in the Swiss Labour Act do not apply to work abroad by an employee hired in Switzerland.¹⁸³ This is criticised by academic teaching.¹⁸⁴ In principle, the law applicable to a contract of employment in case of international circumstances is determined in accordance with Art. 121 Swiss Federal Code on Private International Law and the place of jurisdiction in accordance with Art. 115 Swiss Federal Code on Private International Law.

In view of the increase in remote work across borders, it can become a challenge **to determine the legally relevant place of work and/or the applicable law**. It cannot be excluded that an employee is subject to (employment) law provisions of the target country – for example, the USA – in which the employee “acts” by means of telerobots.¹⁸⁵ In this context, the statutes to be applied must be precisely clarified in an individual case in order to avoid legal risks.

¹⁸¹ MÜLLER (footnote 10), p. 597; THOMAS CHRISTALLER ET AL., Robotik, Berlin 2001, p. 46.

¹⁸² See in detail: Das Territorialitätsprinzip und seine Ausnahmen, Landesbericht der Schweiz vom XIII. Treffen der obersten Verwaltungsgerichtshöfe Österreichs, Deutschlands, des Fürstentums Liechtenstein und der Schweiz in Vaduz, 2002, <http://www.bger.ch/territorialitaetsprinzip_und_seine_ausnahmen.pdf>, with further references; Littler Report 2014 (footnote 40), p. 19.

¹⁸³ BGE 139 III 411; for a different opinion in the critical review of the judgment, see KURT PÄRLI, Keine Überzeitenentschädigung nach Arbeitsgesetz bei Tätigkeit im Ausland, ARV online 2013, No. 442, with further references.

¹⁸⁴ PÄRLI (footnote 183), No. 442; THOMAS GEISER, Art. 1 ArG, in: Thomas Geiser/Adrian von Kaenel/Rémy Wyler (Eds.), Stämpflis Handkommentar zum Arbeitsgesetz, Bern 2012.

¹⁸⁵ On the legal situation in the USA, see the Littler Report 2014 (footnote 40), p. 19; Gantchar v. United Airlines Inc., 1995 U.p. Dist. LEXIS 3910, p. 23 (N.D. III 28.3.1995).

VI. Collective Law

1. *Communication on the Introduction of Robotics and Automation Concepts*

The way in which a robotics or automation concept is explained and communicated to the workforce is decisive for its acceptance by the employees.¹⁸⁶ Many enterprises cite the commitment of the employees as a precondition for significant technological achievements.¹⁸⁷ Whereas employers see robotics as a method of increasing productivity and efficiency, the workforce often focuses on potential job losses. The fear of losing a job is one of the reasons for trade union activities. Employers should be very careful in the **communication** on the introduction of robotics and automation concepts, **should provide extensive information and perhaps even consult the workforce**. In this context, they should also describe the advantages of robotics for the employees, e.g. improved safety, less strenuous working conditions, the retrieval of production facilities back from cheap countries or another improvement in the workplace. Employee representatives often have numerous consultation and information rights as regards occupational safety and thus also the use of autonomous systems.

A European or American production enterprise must consider the application of new technologies in order to **compete with production enterprises in Asia or South America and be cost competitive**. It is likely that with the introduction of robotics or automation concepts such an enterprise employs fewer people, must retrain its workforce and that these employees will need a new mix of skills; yet if the technologies are not used, production would be shifted to countries with lower labour costs.¹⁸⁸

2. *Protection of Trade Union Activity*

Regardless of how communication takes place, employers must expect employees to react in fear of losing their jobs and become active in trade unions. The **freedom of association**, i.e. the freedom of social partners to form associations for the protection of working and economic conditions, is guaranteed by Art. 28 Swiss Federal Constitution. A dismissal is considered improper if it is announced because the employee exercises a constitutional right such as the right to freedom of opinion (Art. 336 para 1 letter b Swiss Code of Obligations), or because the employee belongs or does not belong to an employees' association, or because he legally engages in trade union activities (Art. 336 para 2 letter a Swiss Code of Obligations). To a certain extent, employees can therefore voice their opinion against the introduction of robotics or automation and protest against it; they can organise themselves in trade unions and engage in such activities.

¹⁸⁶ Littler Report 2014 (footnote 40), p. 12.

¹⁸⁷ CHRISTIE A. MOON, Technology, Robotics and the Work Preservation Doctrine: Future Considerations for Labor and Management, Pepperdine Law Review 1987, p. 2 et seq., <<http://digitalcommons.pepperdine.edu/plr/vol14/iss2/6>>, p. 418.

¹⁸⁸ See CHRIS DI MARCO, The singularity and employment, Inside Counsel, 8/2015; see also the reasoning in European Commission, EU launches world's largest civilian robotics programme, 3.6.2014, <http://europa.eu/rapid/press-release_IP-14-619_en.htm>.

For this reason, **difficulties arise** if an employer informs or even threatens the workforce that trade union activity would lead to the introduction of robotics to save money and achieve the flexibility and efficiency which is impossible with organised employees.¹⁸⁹

3. *Breach of an Existing Collective Labour Agreement*

If the employer wishes to use robotics in the workplace for the first time, he must take into consideration all relevant **clauses of an existing collective labour agreement**.¹⁹⁰ He must examine whether the unilateral alteration of the working conditions breaches the applicable collective labour agreement. Likewise, he must check whether the contractual clauses of the existing collective labour agreement do not restrict the possibility of introducing robotics in the workplace for other reasons. Collective labour agreement provisions on alterations in the business or technological changes may have to be complied with when robotics are introduced.¹⁹¹ In addition, the introduction of a new technology could be explicitly regulated in a collective labour agreement or a separate contract by prescribing the procedure to be followed to integrate a new technology in the workplace (e.g. cooperation). These are referred to as so-called “technology agreements”.¹⁹² They usually contain substantive and procedural law provisions.

It is advisable for employers to have a sound **clause about changes to the business** in a collective labour agreement which also reserves the right of the management to implement changes to the business,¹⁹³ in particular if the introduction of robotics is planned. Conversely, employees are recommended to include a precisely formulated duty to provide a severance scheme (referred to in the USA as a work preservation clause) in the collective labour agreement.¹⁹⁴ This can provide for the cooperation of employees in case of job cuts or employee retraining. It can also expressly address the introduction of robotics and automation concepts.

VII. Dismissals and Mass Redundancies

One of the most frequent discussions about automation and robotics is whether the industry will create more jobs than it eliminates. In any case, many employees will doubtless lose their jobs even if new jobs are created. Existing work will undergo significant changes, for example with the transformation of simple work performance into monitoring or controlling activities.¹⁹⁵ In addition, some areas of work will be completely taken over by machinery, which will lead to the **loss of numerous jobs**. The automation and digitalisation process in an enter-

¹⁸⁹ Idaho Frozen Foods Division, 171 National Labor Relations Board (N.L.R.B.) 1968, p. 1567 et seq., p. 573.

¹⁹⁰ Littler Report 2014 (footnote 40), p. 13; SEILER (footnote 89), p. 7.

¹⁹¹ Littler Report 2014 (footnote 40), p. 5. Other than, for example, in Germany, co-determination by the works council is not in principle necessary in Switzerland in case of technological innovations to change the business, see Section 87 I No. 6 Industrial Relations Act. See <http://www.humanresourcesmanager.de/ressorts/artikel/wo-arbeit-40-das-arbeitsrecht-die-grenzen-bringt-1746948264?xing_share=news>.

¹⁹² SEILER (footnote 89).

¹⁹³ See ISABELLE WILDHABER, Das Arbeitsrecht bei USmstrukturierungen, Habil., Zürich 2011, p. 7 et seq.; Littler Report 2014 (footnote 40), p. 14.

¹⁹⁴ MOON (footnote 187), p. 408.

¹⁹⁵ NADJA GROSS/JACQUELINE GRESSEL, Kündigungen als Folge von Digitalisierung und Automatisierung, DB 2016, p. 2355 et seq.

prise inevitably involves staff restructuring measures. In this context, dismissals announced by the employer will play a central role. Every employer is entitled to technically reorganise its business structure with the sole aim of maximising profit. Employers are therefore able to change job profiles in line with requirements, to completely replace jobs by machines and to announce dismissals.¹⁹⁶ However, the validity of announced dismissals nevertheless depends on the employment law provisions. The question is raised whether the **dismissals are permissible** and whether **provisions on mass redundancies or the duty to provide a severance scheme** are applicable.

To date, there is no special protection from the **replacement of a human worker by robots** in Switzerland. However, it should be borne in mind that in a market where reputation is as valuable as capital, the replacement of humans by robots can also be assessed as a **reputation risk**.

In order to remain competitive in the long term, employers increasingly make the decision to automate processes in the enterprise and organise them digitally. Job profiles change and human workers are becoming completely dispensable in many areas. Digital specialist knowledge is becoming a key qualification. If job profiles diverge from existing job descriptions and/or employees cannot fulfil the changed higher expectations in spite of appropriate training and further training programmes offered, or if employees are no longer required, staff restructuring is inevitable. Work with exoskeletons on building sites will, for example, present new challenges for employees. Not every building worker will be capable of operating a robot. A building worker who should learn the necessary qualifications (e.g. the functions and operation of the exoskeleton) may take part in a workshop, but be unable to operate the exoskeleton, even after several attempts, and consequently be dismissed by the employer.

Is this a redundancy for operational and business reasons where the grounds for dismissal originate from the employer's sphere, or a dismissal on grounds of personal capability or conduct? If the dismissal by the employer must be classified as for business reasons,¹⁹⁷ it must be included in the calculation of the threshold figure for mass redundancies (Art. 335d para 1 Swiss Code of Obligations).

If managerial authority includes the right to instruct the learning of new qualifications, the primary reason for the dismissal is not the decision by the employer to automate his business, but the lack of suitability or the conduct of the employee himself or herself. Learning new qualifications made necessary by technical progress must be viewed as part of the performance owed. The decisive factor here is the occupational profile at the present time. In the sample case, learning the functions of an exoskeleton is still within the scope of the reasonable duty to learn. This then constitutes dismissal on grounds of personal capability. By contrast, compulsory redundancy for operational reasons involves such significant changes to occupational profiles that they become very different from the job description in the relevant contract of employment and consequently go beyond the originally agreed programme of duties, e.g. if the job requires programming capabilities after automation.

¹⁹⁶ As in GROSS/GRESSEL (footnote 195), p. 2355.

¹⁹⁷ WILDHABER Habil. (footnote 193), p. 279; GROSS/GRESSEL (footnote 195), p. 2355 et seq.

In addition, **severance payments** may be owed. In certain countries such as, for example, China or Mexico, employers must make severance payments in case of mass redundancies or business closures. In Mexico, a severance payment is explicitly owed in case employees become superfluous and are dismissed as a result of the integration of new technologies in the workplace.¹⁹⁸

Occupational retraining opportunities supported by the employer or the state, which must be offered to the dismissed employees, are also conceivable. Even if new jobs are created, it is challenging for the dismissed employees to switch to these new positions.¹⁹⁹ New technologies make different qualifications necessary. This means that employees have the incentive – or face the necessity to – adapt to the changing demand by further training or occupational retraining.²⁰⁰ It may no longer even be possible to perform simple auxiliary tasks in the future without knowledge of how to deal with network systems.

C. Conclusion

Progress in robotics and AI will change the workplace and employment law. If robots become colleagues and superiors, employers must keep a keen eye on employment law developments. Employers who carefully consider their duties and the practical realities of their workplace will then be well prepared to anticipate and find answers to the complex legal questions involved with the use of robotics and AI in the workplace.

The prevalence of robots means that legislative authorities will have to consider whether legal bases need adjustment or whether wholly new legal bases are required to reflect the effects of this development. In my view, caution should be exercised with the introduction of new statutes and regulations until their necessity becomes clear.²⁰¹ The consequences of robotics on the employment market should not be viewed in isolation from other phenomena such as migration, the ageing population or globalisation. However, robotics do not primarily determine what our future will look like. As politicians, entrepreneurs or employees, we have the choice. The route we choose depends on the extent of our investment in education, how we encourage firms to create new jobs and which social and tax policy we choose.²⁰² It will be important to make wise and future-oriented decisions.

¹⁹⁸ Littler Report 2014 (footnote 40), p. 11.

¹⁹⁹ Littler Report 2014 (footnote 40), p. 5.

²⁰⁰ Bloomberg, Will Robots Take All Our Blue-Collar Jobs?, 13.8.2013, <<http://www.bloomberg.com/news/2013-08-13/will-robots-take-allour-blue-collar-jobs-.html>>.

²⁰¹ E.C. AUSTIN, How to judge a ‘bot; why it’s covered, The Economist, 25.9.2014, <<http://www.economist.com/blogs/babbage/2014/09/robot-jurisprudence>> (“The concern for policymakers is creating a regulatory and legal environment that is broad enough to maintain legal and ethical norms but is not so proscriptive as to hamper innovation.”).

²⁰² ERIK BRYNJOLFSSON, Millionen Arbeitsplätze verschwinden, NZZ am Sonntag, 9.1.2016, <<http://www.nzz.ch/nzzas/nzz-am-sonntag/erik-brynjolfsson-millionen-arbeitsplaetze-verschwinden-ld.4065>>.