

# ENTER THE ROBOTS ARE YOU PREPARED?

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**Torben Waage**

Partner

Mobile: +45 40 61 08 86

Direct: +45 38 77 45 60

tw@kromannreumert.com



**Rebecca Overgaard Andersen**

Assistant attorney

Mobile: +45 20 19 74 77

Direct: +45 38 77 32 20

rea@kromannreumert.com

# ENTER THE ROBOTS

## Are you prepared?

Robotics holds an enormous potential and cannot but transform the dynamics of businesses across the globe. Both in terms of the manufacturing of new products and services and the structures and processes within organisations. Although we have yet seen no more than a fraction of its full potential, businesses may well begin organisational adjustments in preparation for the robot technology we know is coming - and here, management has a central role to play.

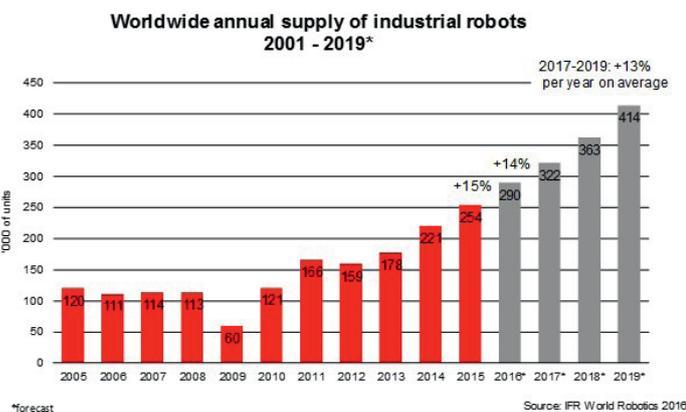
## Take a proactive leadership approach: Use the potential

Executives should take a proactive approach and work exploratively with the new technology. The set of operational advice we offer in the following will help you address the subject of robot technology and place it firmly and high on the executive agenda. Robotics is here, and it is not going away. Your competitive edge will depend on your level of preparedness. Kromann Reumert recommends that, as a minimum, you take the following measures:

1. Map your internal and external processes and tasks to identify candidates for easy automation.
2. Be curious. Stay attentive and on the lookout for new robots and robot-technology systems offering easily-applicable functions of relevance to your business.
3. Implement and re-define current jobs and work processes. Restructure your organisation.
4. Check what the legal requirements are and will be in the future, and see where you stand in terms of compliance when introducing new robot technologies.

This edition of Insight is built around these four pieces of advice, intended as a blueprint to follow towards implementing new robot technologies. Before elaborating our advice and recommendations, however, we set out to introduce the world of robotics to you, offering a brief account of developments so far and of the potential benefits of robotics in the future.

## 1.4 million industrial robots between 2016 and 2019



## What exactly is robotics?

Robots is a widely-encompassing term, spanning from physical robots performing manual labour to virtual robots with artificial intelligence capabilities allowing them to use learning, reasoning and problem-solving to do cognitive tasks.

Robots are classified as either *industrial robots* or *service robots*, with industrial robots being used in the production and distribution of goods. Service robots, much harder to define, are often identified as robots performing tasks for humans or equipment - but not in the production and distribution of goods. Service robots can be further categorized as either *personal* or *professional* robots, depending on use. Personal robots are for personal use (say, a vacuum cleaner, or a robot for use in the care of elderly people), and of course professional robots are for professional use (e.g. space, rescue, delivery, or surgical robots).

## Development and growth potential

As a science and engineering field, robotics is advancing very fast. The latest figures from the International Federation of Robotics ("IFR") have annual global sales of industrial robots in 2015 at an all-time high of 254,748 units. This level of sales is 59 per cent above the average sales in 2010-2015, cf. IFR: "[Executive Summary World Robotics 2016 Industrial Robots](#)". The IFR on this background estimates the worldwide number of industrial robots active in manufacturing in 2019 to be 2.6 million, one million more than in 2015.

As for *service robots*, the IFR, in its "[Executive Summary World Robotics 2016 Service Robots](#)", set global sales of private service robots in 2015 at 5.4 million units, up 16 per cent from 2014, and sales of *professional* service robots at 25 per cent more in 2015 compared to 2014. This is indication of a world-wide automation trend.

Robotics is attracting huge investments in Denmark and abroad. In 2015, venture capital (VC) investments in robot technology startups doubled to an impressive USD 587 million according to a study by CB Insight, "[Robots R'Us: Funding and Deal Activity to Robotics See New Highs in 2015](#)" published 23 March 2016, and Time "[Will Robots in the Workplace Destroy Our Future?](#)" published 31 March 2016. This level of investment is a clear sign that we may expect to see the advance of robot technology accelerate as VC-funded enterprises of this sort continue to grow. For proof that robotics is an attractive investment object one needs only look at the sale in May 2015 of Danish company Universal Robots, a producer of collaborative robots, to the US company Teradyne for USD 350 million.

# How to get your company to share in the benefits of robotics

Identify processes and work tasks

Be curious about new technology

Implement changes in your organisation

Learn what the statutory requirements are

## 1. Map you internal and external processes and tasks to identify candidates for easy automation

Your primary responsibility as a manager is to identify the areas and processes within your organisation that stand to benefit from better use of robot technology.

### Robots at work - which job types will be taken over?

As it happens, robots at the workplace are nothing new: traditional industrial robots have long been buzzing away in the production halls of factories and many other kinds of businesses, taking over dangerous or physically demanding work.

In the years to come, however, we will be seeing robot technology redefining many more kinds of work, disrupting our labour market in a whole new way. A number of foreign and Danish studies have attempted to designate which job types are particularly prone to automation and thus have a high risk of being replaced by robots in full or in part. According to a 2013 study by Frey & Osborne, 47 per cent of US employment is in the high-risk category.

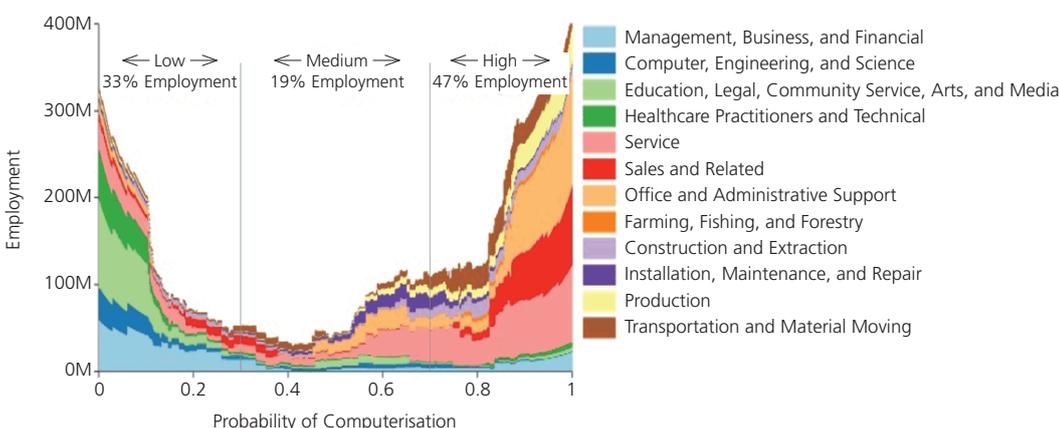
In the short-term perspective, we will see an automation or computerisation of low-paying jobs with routine or administrative functions.

In the longer term, robots will be able to perform more complex tasks and will, in theory, leave all industries and job types susceptible to automation also on cognitive and non-routine job functions.

An example of what may be in store in the field of computerisation of knowledge work is the IBM supercomputer *Watson*, capable of generating hypotheses and reading and analysing huge amounts of data in a matter of seconds, then to come up with a well-founded answer. This kind of advisory technology has already given us *Ross*, a robot lawyer put to commercial use in US law firms to perform legal investigations, due diligence on company transactions, etc. The technology has also spread to the healthcare sector, with supercomputers already proposing diagnoses and treatment forms.

Conversely, jobs requiring a high degree of social and creative intelligence will be less susceptible to automation. Top executives, for example, and job functions in education, culture and media are unlikely to be replaced by robots anytime soon. This is not to say, however, that these job types will forever be immune to robotics and computerisation. Even now we are seeing examples of robot journalists or robots serving as assistant teachers in schools. But for people holding jobs with these more knowledge-oriented functions, it is more a question of considering how the technology can be applied to aid them in what they do. Executive focus should be on the continuous adjustment and optimisation of the organisation and the processes within it.

To address these concerns you need to be inquisitive and curious when it comes to robotics, which leads us to step two.



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## 2. Be curious, stay attentive and on the lookout for new robots and robot-technology systems offering easily-applicable functions

As an executive, the way in which you view robotics makes all the difference. You should be open, your curiosity always underpinned by a positive approach to the implementation of robot technology in your organisation, seeing possibilities rather than threats.

### Job loss or job creation?

Unpredictable as the effects of robotics on the labour market may be, there are generally two overall schools of thought on the subject: One projects a pessimistic prognosis in which entire jobs and industries are computerised, jobs are lost, and unemployment soars. This notion, however, has been widely criticised, recently by [OECD](#) and McKinsey, arguing that to focus on entire jobs and industries is misguided on the short and medium term because even jobs and industries in the high-risk category contains functions that are notoriously difficult to automate.

Focus should rather be on individual job tasks. According to McKinsey's "[Four fundamentals of workplace automation](#)" of November 2015 and "[Where machines could replace humans - and where they can't \(yet\)](#)" of July 2016, up to 45 per cent of currently human work tasks in America could be automated by adapting currently demonstrated technologies, meaning that about 60 per cent of occupations could have 30 per cent or more of their constituent activities automated. For example, 20 per cent of a CEO's activities could be automated using existing technology and 43 per cent of activities in the financial sector could be automated. This is not least because of the huge automation potential within data collection and data processing/analysis.

Building on this perspective, the OECD therefore argues in a new study "[The Risk of Automation for Jobs in OECD Countries](#)" published in May 2016 that only 9 per cent of jobs in OECD countries can be very easily automated and that we should not translate that into a loss of jobs. Employees, so the argument goes, will adjust quite naturally by switching to other work tasks, and the technological changes will create new jobs in and of themselves as productivity rises and as the demand for people able to programme, train, maintain and repair new technology goes up.

### Current new use of technology

A much-talked-about area for the application of robotics today, and one which is already or will very shortly be commercially available, is the use of robots in transportation. Robots in this area include flying robots (drones, for example) and driving robots (like couriers and cars).

**Airborne drones** have already been put into use and offer a wealth of possible applications of interest across many sectors. For example, drones can be used in journalism, to facilitate Internet and telecommunication in inaccessible or hostile environments, firefighting and rescue operations, surveillance, marketing, agriculture, etc. This has made the market for civil drones one of nearly explosive growth, with the European Commission predicting that in the next decade or so the drone industry may grow to be as valuable as 10 per cent of the aviation industry, i.e. an annual EUR 15bn, see the Danish Transport Authority's publication "[The Governing of Civil Drones - Report by an Interdisciplinary Group](#)" of March 2015 (side 14) and the Commission's "[Press Release: European Commission calls for tough standards to regulate civil drones](#)" from April 2014.

**Self-driving delivery bots** delivering packages and food are already a commercial reality in cities in England, Germany and Switzerland. The company behind the active robot, Starship Technologies, estimates that the delivery market in the US and Europe today is a market with sales ranging from USD 1,000-2,000bn.

**Self-driving cars** have long been anticipated, but not until recently have we seen direct collaboration between Google and a car manufacturer, the Fiat/Chrysler group. A fleet of some 100 self-driving minivans will be released onto American roads in 2017.

In order for a company's management to foster equally successful innovation, whether in the form of physical products or structural change, the key element is how it is implemented in the company's organisation and culture.

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### 3. Implement and re-define current jobs and work processes. Restructure your organisation.

With the onslaught of automation, there can be no doubt that we will see a disappearance of certain tasks no longer needed. The result will be a release of resources no longer tied up on those tasks, leaving employees free to focus on more valuable and meaningful production. Focus will shift to a greater extent to tasks requiring creative and social intelligence, critical-reflective competencies, and the ability to integrate ideas and thinking across fields. For companies, concrete examples might be (i) computerising the identification of special sales techniques like cross selling, thus giving sales personnel more time to interact with customers and optimise offers, or (ii) leaving financial analyses of customers to computers, thus allowing financial advisors to spend more time understanding customers' needs and explaining creative solutions, see McKinsey: "[Four fundamentals of workplace automation](#)", November 2015. That said, new structural changes through the implementation of robot technology is likely to also stir anxieties and resistance - for fear of job losses, not least. This is a factor that executives must acknowledge and address.

#### Challenges for management:

##### Structural changes to the organisation

The management of every company faces a new challenge, namely that of *re-defining* the company's structure and identifying new job tasks and job processes for its employees. It will require the retraining of employees. And it is a necessary management priority if the business is to realise the full automation potential. McKinsey argues that *the ability to staff, manage and lead increasingly automated organisations will become an important competitive differentiator*.

Of course, exactly *what* must be done and *when* differ from one industry to the next, depending on a variety of factors such as the existing amount of regulation, the amount of resources invested, and the willingness to make decisions.

#### New executive title: 'Chief Robotics Officer'

Another aspect of automation that needs to be addressed at an executive level is the question of managerial responsibility when robots enter the workplace. A study by Myria Research predicts 60 per cent of companies in sectors where robots and automation will play an important role, e.g. production, logistics, healthcare and energy, will employ a Chief Robotics Officer, or CRO, by 2025. Among the tasks of the CRO will be to address emerging technologies and operational challenges in relation to robot-human collaboration.

#### Resisting change

At the same time, management should not overlook the fact that the above examples of strategic and operational measures may have the derived effect that employees worry that they may soon find themselves out of a job. It is important to not brush these concerns aside: any successful implementation of robot technology requires flexible employees willing to embrace change wholeheartedly.

In any case, before changing the structure and properly implementing robotics and automation into an organisation, it will be helpful to uncover if and to what degree the organisation will be subject to statutory regulations.

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## 4. Check what the legal requirements are and will be in the future, and see where you stand in terms of compliance when introducing new robot technologies

To realise the full potential of robotics, a suitable legal and regulatory framework is required. This sort of *robotlaw* framework is still far from established on an international, European, or even national level. The field of robotics is full of uncertainties, and it takes time to sort out what legal challenges and problems it poses and then what the adequate response should be.

### The legal take on robotics: RoboLaw

On the *EU* level, there is today considerable support and funding for projects on robotics, which now total over a hundred. For *EU Funded Projects*, please see [here](#). It is somewhat surprising, therefore, that we have seen so little from the EU in terms of proposed legislation to regulate the area. The EU's RoboLaw project and the establishment by the Legal Affairs Committee of a working group on robotics are examples of initiatives taken to analyse the challenges and potential of robot technology to produce a set of input in the form of recommendations which may then serve as the basis of future regulation on the area. See, for example, the working group's "[Draft Report](#)" of 31 May 2016 to the EU Commission with recommendations for civil law rules on robotics. We may expect to have the final version sometime in early 2017, see [this interview](#).

The aim is to achieve a balanced set of rules: too much regulation will kill innovation, and too little will leave manufacturers, consumers, persons injured, and insurance companies with uncertainty and unpredictability.

When it comes to robotlaw, one of the most important questions to ask is, first, how much robot technology is already covered by or challenging existing rules and, second, what is the new legislation that we do not have, but should have? The following describes some of the overall legal themes and issues that robotics raises.

### IP Rights

One area in which robotics is already regulated - to some degree, at least - is IP law, which offers copyright, trademark and patent protection for robots. According to the Danish Technological Institute, the patenting of robot technology for industrial robots *tripled* globally in the years 2010-2013, an indication both of a marked growth in robot technology and of the usefulness and applicability of the existing rules and regulations on robots. This although IP law does not explicitly regulate robots. As technologies evolve, however, we may find there is a need to expand or reduce IP protection, depending on the specific

type of robot. This will bring us to an ethical and moral discussion of whether artificial intelligence should be patentable.

Another related and as yet legally undecided point is whether robots are themselves capable of producing works and inventions eligible for IP protection. And if they are, should we then accept the notion of robots as independent rights holders? It can seem pointless to award legal rights of that kind to robots.

### Quality and security requirements

Today already, certain industrial robots are covered by regulation such as the ISO 10218, which, among other things, prescribes specific security measures to protect the users of industrial robots. Characteristically, industrial robots are used in a controlled and structured environment by a person trained in the use of them for a *specific* task, and the security measures are directly relating to the machine function.

*Service robots*, by contrast, are often used under much less structured conditions and for a variety of tasks, and the security typically depends on the interaction between human and robot. As service robots become more and more common in hospitals, private homes, stores, etc., we can expect that there will be in these areas a new and more appropriate regulation of security issues.

A much-talked-about example is driverless cars, which cannot but spawn new, specific rules on a variety of issues - from technical standards and inspections to driver's licence and traffic rules.

### Legal liability for the acts or omissions of robots

An important difficulty associated with the advance of robotics is that of identifying 'who did it' - who is the tortfeasor? Suppose a driverless car runs somebody over, or suppose a surgical robot causes injury or harm, whether because it has been hacked, suffers a malfunction, or simply fails to do the operation the way a human doctor would. Who is responsible?

Our current legal system does not yet recognise robots as entities with the capacity to act, and so a robot cannot be held accountable for any damage it may have caused. Therefore, chances are that any liability in damages will fall on the owner or operator of the robot for having failed to apply due diligence or on the manufacturer of the robot under product liability rules. In relation to product liability, determining whether robots do in fact qualify as 'products', thus activating the

rules on product liability, becomes essential. And that is a question to which no clearcut answer can be given as long as the definition of a robot is blurred, as it is today, where, in principle, it may encompass both hardware and software, may be manned or unmanned, etc., see Andrea Bertolini of the University of Pisa, in her presentation entitled *“Liability and Risk Management in Robotics”* given at a hearing in the European Parliament on 21 June 2016. See the [full hearing](#) and summary of the [main points](#).

As robots grow to be more autonomous, develop the ability to learn and, given time, even to display emotional responses, our rules on liability may have to change altogether, addressing also the question of robots’ ‘capacity to act’.

#### **Protection of personal data**

Robots will also increase the amount of collection and dissemination of data, thereby potentially falling under the rules on secure processing of personal data. The rules, however, will likely require a certain amount of adjustment to adequately address concerns in relation to robots since it will not always be clear on whose behalf and for what purpose robot processing of personal data takes place. This will be especially relevant in the case of autonomous robots. There will be an uncertainty as to how, in practice, manufacturers and users of robots are to comply with data protection rules.

These problems have already become more than hypothetical, with the advent of drones collecting and recording personal data for later use, e.g. for control purposes. Authorities’ and corporations’ use of surveillance drones to scan large areas raises a number of concrete questions, e.g. in relation to the principle of proportionality. Here, there is a substantial risk that the data collected will include personal data of no actual relevance to the purpose of the collection, e.g. information about persons happening to be on areas close to the ones that the surveillance is for. See Peter Blume, [“Droner og persondataret \(Drones and data protection law\)”](#) in *Juristen*, no. 1, 2015 page 5.

#### **Danish legislation already in place for certain ‘robots’**

On a national level, however, concrete steps towards a regulation of robots have been made already. Most recently on 1 July 2016 with the adoption of the “Act on outer space activities” and (a bit closer to home) of rules in the Danish Aviation Act to govern the use of small civil drones.

The new regulation of small civil drones, i.e. drones weighing a maximum of 25 kg and flying at altitudes no higher than 150 metres, is directed at a very wide group of users, covering both professional and private use. It is relevant, therefore, for the reporter doing a video-shoot for a TV programme, for municipal authorities monitoring nature and the environment, and for private individuals who fly drones for fun. The rules prescribe operational criteria for where small civil drones may fly and lay down the required competencies of the ope-

erator as well as the liability of the operator. They also seek to address new issues of concern pertaining to personal safety, privacy rights, and public safety (anti-terrorism, smuggling, etc.) The rules, it must be expected, will have to be adjusted and updated as the technology advances and when, probably in about three years’ time, EU rules on the subject are in place. An indication that the rules are intended to follow the technology can be seen, for example, by the stated intention that drones for professional use in urban areas must have an electronic ID (a *“licence plate”*) as soon as it becomes technically feasible.

## **Kromann Reumert’s advice**

The four pieces of advice in this edition of Insight are suggested steps in a process towards implementing new robot technologies into your organisation. Use them as a rough guide into this dynamic and fast-developing area that places increasing demands on businesses to stay updated and prepared for change.

Kromann Reumert keeps a keen eye on the growth of robot technologies and, knowing the current law and the direction of future regulations, can help your company identify and meet the new legal challenges you may encounter as you incorporate new robot technology into your organisation.

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### **COPENHAGEN**

SUNDKROGSGADE 5  
DK-2100 KØBENHAVN Ø

### **AARHUS**

RÅDHUSPLADSEN 3  
DK-8000 AARHUS C

### **LONDON**

65 ST. PAUL'S CHURCHYARD  
LONDON EC4M 8AB

### **LAWFIRM**

WWW.KROMANNREUMERT.COM  
TEL +45 70 12 12 11