



UNIVERSAL ROBOTS

WHITE PAPER

ROBOTS, COBOTS AND HUMAN LABOR

PUBLISHED BY UNIVERSAL ROBOTS



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INTRODUCTION

Robots have long captured the popular imagination, as reflected in their frequent appearance in literature, film and television and even popular music. Although the idea of human-like machines goes back much earlier, the term “robot” first appeared in a literary work: Karel Čapek’s science fiction play Rossum’s Universal Robots, from 1921.

In the play, the robots prove to be a menace to humanity, starting out as servants, but eventually staging a rebellion and killing off their human masters. It is typical of robots in art and popular culture that they are romanticized – either positively or negatively. Here, they are a menace. Elsewhere (Star Wars, WALL-E, etc.) they are benevolent, even heroic. In culture, robots seem to serve as a mirror image of ourselves, helping us define our capabilities and limitations as humans by comparing ourselves to them.

Today, however, robots are not just fictional characters. Real robots increasingly populate real factories, warehouses and all sorts of other places of business, where they share the work to be done in a day with human coworkers. As these robots become more commonplace, stories about them are appearing in all kinds of media with increasing frequency. Interestingly, these stories show the same tendency to romanticize – either positively or negatively – the role of robots in society and their impact on human beings.

While robots sometimes get good press for increasing productivity, helping smaller companies compete with larger rivals, and even enabling human workers to move from boring repetitive tasks to more interesting work, they are more often suspected – or directly accused – of “stealing” jobs from human workers.

This white paper will examine the relationship between robots – in particular, the collaborative robots (or “cobots”) that Universal Robots

(UR) produces – and human labor. Our intentions are to look at the “accusations” being leveled at robots today, provide a bit of a “reality check” by looking at the bigger picture, show how cobots differ from traditional industrial robots in their relationship to the human workforce, and then briefly mention some initiatives that we believe will help ensure that society reaps the maximum benefit from robotics-based automation.



DEFINITIONS

“Robot”

Universal Robots joins the IFR, of which we are a member, in supporting the International Organization for Standardisation (ISO) definition 8373 of a robot:

- An automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in industrial automation applications.
 - **Reprogrammable:** whose programmed motions or auxiliary functions may be changed without physical alterations.
 - **Multipurpose:** capable of being adapted to a different application with physical alterations.
 - **Physical alterations:** alteration of the mechanical structure or control system except for changes of programming cassettes, ROMs, etc.
 - **Axis:** direction used to specify the robot motion in a linear or rotary mode.
- A **service robot** is a robot that performs useful tasks for humans or equipment excluding industrial automation application. Note: The classification of a robot into industrial robot or service robot is done according to its intended application.
- A **personal service robot** or a **service robot for personal use** is a service robot used for a non-commercial task, usually by lay persons. Examples include domestic servant robot, automated wheelchair, personal mobility assist robot and pet exercising robot.
- A **professional service robot** or a **service robot for professional use** is a service robot used for a commercial task, usually operated by a properly trained operator. Examples include cleaning robot for public places, delivery robot in offices or hospitals, fire-fighting robot, rehabilitation robot and surgery robot in hospitals. In this context, an operator is a person designated to start, monitor and stop the intended operation of a robot or a robot system.¹

“Cobot”

Collaborative robots – or “cobots” – are a class of robots that, as the name suggests, are designed to collaborate with human workers. For Universal Robots, this means robots that:

- Comprise small-footprint robotic arms only.
- Are easy for ordinary operators to program and re-deploy.
- Serve as tools for operators, not devices that replace human workers.
- Enable companies to keep control of their automated processes.

While UR cobots are sometimes deployed in fully automated environments with no human workers, they are intended primarily for collaborative use, with cobot and operator working together to complete the assigned tasks.

Universal Robots does not produce traditional industrial robots.

“Universal robot”

In addition to producing cobots exclusively, Universal Robots designs its products to be universal (hence the company’s name). UR defines this term as: “Robots that enable different people in different countries working in different industries to automate different processes with different budgets and programming skills.

Although the term “universal robot” does not figure widely in this white paper, it is important to understand the concept, as the broad accessibility and usability of UR cobots underlies the company’s position on the relationship between robots, cobots and human labor.



THE ACCUSATION: ROBOTS ARE STEALING OUR JOBS!

“Evidence That Robots Are Winning the Race for American Jobs”² *The New York Times*

“Robots ‘could replace 250,000 UK public sector workers’”³ *The Guardian*

“Robots Could Steal 40% of U.S. Jobs by 2030”⁴ *Fortune*

“Will robots displace humans as motorised vehicles ousted horses?”⁵ *The Economist*

“After Robots Take Over Our Jobs, Then What?”⁶ *Forbes*

The headlines above, all of which appeared in the few months leading up to the publication of this white paper, provide a fair picture of the current scope and level of public concern about robots and jobs. The basic fear is that robots are replacing people as the world’s primary workforce, and that this will leave us humans with no obvious way to earn a living.

It is worth noting that the headlines quoted here all appeared in the “serious” press – widely respected news outlets such as The New York Times, The Economist and Forbes. These stories are normally based on studies published by university researchers. When other types of outlets pick up on the more serious reports, the tone can be more alarmist. Taken together, the worries expressed in such articles, the amount of coverage these worries are getting in the media, and the response by public officials (see “Enter the politicians” below) suggest that concern about robots taking jobs is both widespread and pronounced.

Not everyone agrees

Of course not everyone taking part in the public debate is a doomsayer. On the pro-robot side, authors frequently note that every new wave of automation – from the advent of

steam engines to the rise of computers – has led to fears that technology would “take over” and render human workers superfluous. Yet despite these fears, each new “industrial revolution” has resulted in net gains in job creation, not job losses. “Why should things be different this time?” many ask. Surely the urge to work and to create new types of work when old ones subside is part of human nature, and human workers will bounce back from robotic automation just as they always have before.

Enter the politicians

The “robotophobia” reflected in the headlines quoted above has not gone unnoticed by governments around the world. Calls for investments in education to prepare workers for tomorrow’s jobs are nothing new, but they have gained new currency as robots and their role in the labor market have gained more and more attention. In addition, new ideas such as the “citizen’s wage” are being discussed in some countries as a way to distribute the benefits of increasing automation more equitably in society. In some countries, there is even talk of an “income” tax on robots, with the revenue that is generated presumably being used to provide some form of compensation to the human workers the robots have replaced.

THE EVIDENCE: JOBS LOST, AND CREATED

Some jobs will go, but robotic automation is a net creator of jobs

Most studies of the effects of robot-based automation on human employment focus on limited geographical regions, like major manufacturing centers, and on labor-intensive industries that rely heavily on the type of workers that robots can easily replace. According to such studies, robots are likely to have a significant negative impact only on certain types of jobs. For example, as the use of robots in manufacturing and assembly work grows more common, these robots will inevitably replace human factory workers who perform monotonous, repetitive and strain-inducing jobs.

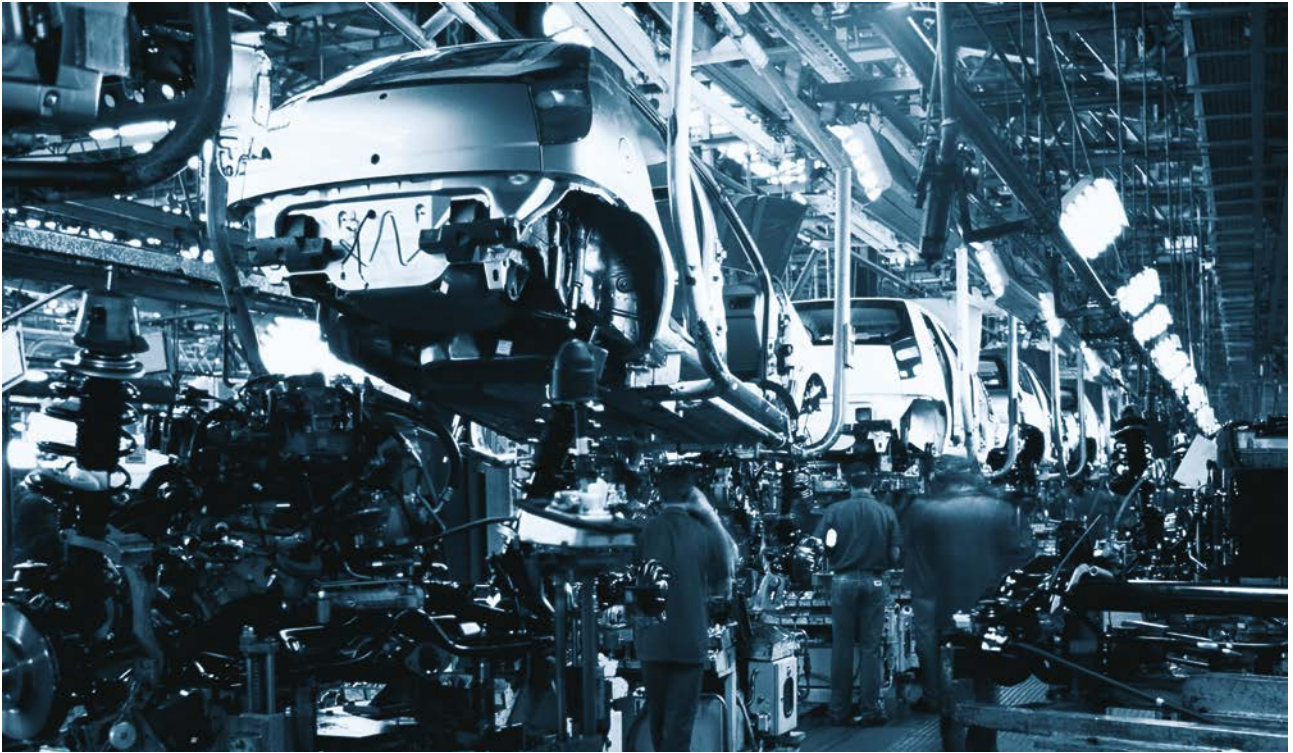
Yet if history is any guide, despite the loss of some jobs in certain areas, robots will eventually become a net creator of jobs – just as the mechanization via water and steam power, electricity-aided mass production and computerization all were. So even if robots put a certain number of assembly workers out of work, they will create more new – and higher paying – jobs in fields like programming. There will be more jobs, but these will be different from earlier jobs.

Universal Robots believes it makes more sense for governments to invest in micro-educational and other retraining programs designed to help workers adjust to changing technological environments than to artificially protect jobs that can be automated via an “income tax” on robots or other measures that would have a negative effect on overall productivity and competitiveness.

Robots create jobs by boosting competitiveness

Robots positively affect employment in another way, too. Wherever they are deployed, robots improve consistency of quality and consistency of flow – two parameters that help determine whether a company can competitively manufacture products for the global market. This applies everywhere, but is especially important in developing countries, where the old habit of growing via ever-more low-cost labor does not result in goods of a quality that is acceptable on world markets. It is also important for SMEs in all countries, where robots can help achieve the productivity and flexibility gains needed to compete with larger rivals. When companies are more competitive, they – and their suppliers and other inter-dependent businesses – grow, creating new jobs of all kinds.

By producing small-footprint, easy-to-program, flexible and affordable “cobots”, Universal Robots plays a vital role not just in making companies and societies more competitive, but in democratizing robots so that virtually any business anywhere can use robotic automation to become more competitive. It should be added that in high-cost countries, robots are enabling companies to “re-shore” parts of their operations previously outsourced to low-cost countries, bringing back jobs and/or creating new ones.



ROBOTS & COBOTS: THE RETURN OF THE HUMAN TOUCH

More and more robots will work together with humans

In contrast to the ominous-sounding headlines, recent studies suggest that less than 10% of jobs can be fully automated.⁹ The fact is, most jobs require uniquely human skills to perform, and in most cases robots just aren't up to the task. So this puts a natural cap on the number of jobs robots are likely to "steal" away from human workers.

What's more, there is evidence¹⁰ that demand for collaborative robots – or robots designed not to replace human workers, but to assist them – is growing faster than demand for traditional industrial robots, many of which really are designed to replace human workers. Universal Robots believes that this development will accelerate as trends such as mass personalization gain ground, and as global consumers

grow wealthier and continue asserting their preference for products that display a "human touch" in the form of advanced process knowledge that robots cannot obtain. These trends are part of the reason why BIS Research projects that the market for collaborative robots will reach some \$2 billion by 2021.¹¹

None of this means there is no place for completely automated, "workerless" factories in the world. On the contrary, these types of "Industry 4.0" environments will play a vital role in certain types of manufacturing and other processes for a very long time to come. But because that role will always be limited, and because the demand for products made with a human touch will continue to rise, we expect a much lower negative impact on employment than what the prophets of doom are predicting.



CONCLUSION

Promote the use of cobots and retrain workers to use them

Robots, and cobots in particular, create more and often better-paying jobs than they replace, improve productivity and increase competitiveness – all excellent reasons for policymakers to promote the use of robots and to avoid erecting barriers to their adoption.

Adopting new technologies can cause disruptions locally, when, for example, a factory suddenly needs assembly line workers who can program and use cobots in their work. The

solution to problems such as this, however, is not to dissuade companies from investing in great technologies (via a “tax” on robots, for instance), but to invest in upgrading employee skills through retraining and other educational initiatives.

Of course education costs money, and the financing must come from somewhere. But securing this financing through taxing or otherwise increasing the cost of robots – and thus negating the considerable financial benefits they deliver – is not a sensible option.



LEARN MORE

To find out more about Universal Robots, cobots and our impact on labor and employment, please visit our website or contact us by email.

www.universal-robots.com
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NOTES

- 1) *The Impact of Robots on Productivity, Employment and Jobs: A positioning paper by the International Federation of Robotics, April 2017.*
- 2) https://www.nytimes.com/2017/03/28/upshot/evidence-that-robots-are-winning-the-race-for-american-jobs.html?_r=0.
- 3) <https://www.theguardian.com/technology/2017/feb/06/robots-could-replace-250000-uk-public-sector-workers>.
- 4) <http://fortune.com/2017/03/24/pwc-robots-jobs-study/>.
- 5) <http://www.economist.com/news/business-and-finance/21719761-probably-not-humans-have-lot-learn-equine-experience-will-robots>.
- 6) <https://www.forbes.com/sites/michaelbernack/2017/04/11/after-robots-take-over-our-jobs-then-what/#1bc930f12065>.
- 7) *For example, the NYT article was based on “Robots and Jobs: Evidence from US Labor Markets,” a study by respected economists Daron Acemoglu and Pascual Restrepo. NBER Working Paper No. 23285, March 2017.*
- 8) *See, for example, the focus on “commuting zones” in Daron Acemoglu and Pascual Restrepo. NBER Working Paper No. 23285, March 2017. <https://economics.mit.edu/files/12763>.*
- 9) *Arntz, Melanie, Terry Gregory, and Ulrich Zierahn. 2016. *The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis*. OECD Social, Employment and Migration Working Paper No. 189, Paris: OECD Publishing.*
- 10) *Whereas the market for robots as a whole is expected to grow by 11.5% annually through 2021 (Daron Acemoglu and Pascual Restrepo. NBER Working Paper No. 23285, March 2017. See <https://economics.mit.edu/files/12763>), the market for collaborative robots is expected to grow by 60.3% from 2016 to 2021 (Global Collaborative Robots Market, 2017–2021. Technavio.com).*
- 11) *BIS Research. 2016. “Global Collaborative Robot Hardware Market, Analysis & Forecast, 2016–2021.”*