**Denmark Is Driven to Lead European Robotics**

**The world's 114th largest country is preparing to make a big impact in global robotics.**

By John Edwards

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Denmark is famous for being the home of Hamlet, *The Little Mermaid*, and Lego. The nation is also working hard to become known for its thriving European robotics industry.

The country currently hosts a substantial robotics base, including world-class manufacturers and academic programs. Denmark hosts a large number of full-scale test facilities and has a long tradition of developing solutions for complex processes in close collaboration with end users.

Denmark has also become an almost ideal place for testing, developing, and marketing next-generation robot and [drone technologies](http://m.roboticsbusinessreview.com/article/american_drone_expert_heads_to_denmark_to_advance_uas_technology), according to Ministry of Foreign Affairs spokesman Søren Tranberg Hansen.

In addition, Denmark’s location and infrastructure help make it an excellent hub for robotics developers worldwide looking to reach into nearby Nordic nations as well as the rest of Europe, Hansen added.

**Education underpins robotics prowess**

For a nation with approximately 5.7 million people, Denmark has a rich robotics education infrastructure. For example, [Aalborg University operates a robotics program](http://www.en.aau.dk/education/bachelor/robotics) that’s active in three major fields: manipulators, actuators, and sensors.

The school, which has campuses in Aalborg, Esbjerg, and Copenhagen, also offers a cross-disciplinary bachelor’s engineering program in robotics that draws on a number of related fields, such as automation, production, electronics and IT, media technology, and health technology. It also offers a master’s degree program in control and automation.

The University of Southern Denmark in Odense offers a [master’s program in robot systems](http://www.sdu.dk/en/Uddannelse/Kandidat/Robotteknologi.aspx) that allows students to choose one of two specializations: advanced robotics technology or unmanned aerial systems technology.

The school also works closely with Danish businesses on various robotics and related technologies.

Denmark’s largest and most influential robotics research institution is the [Danish Technological Institute](http://www.dti.dk/services/robot-technology/about-dti/23617,6) (DTI), which focuses on developing, applying, and transferring robotic technologies to industry and society.

**DTI develops touchless control**DTI researchers are particularly interested in exploring human-machine interaction and communications. They have also developed a [motion-sensor technology called Leap](http://www.dti.dk/services/new-sensor-technology-touchless-robot-control/36801) that permits completely touchless interactions between people and robots.

Leap is a compact device that uses a stereo camera to recognize hand movements via infrared light. It enables physical gestures to be instantly translated into robot commands.

In some situations, touching a control panel is undesirable, since it might causes contamination or inconvenience the user in some way, noted Malene Tofvesen Nibe, a DTI design engineer and consultant. Leap is designed to make robot operation entirely hands-free.

“This will, for example, will be an advantage in sterile areas,” she said.

In another project, DTI researchers have designed software that allows a robot to visually locate screw holes in an object and then physically fasten screws in those locations.

The [Screwdriving CoWorker](http://www.dti.dk/services/reap-extra-productivity-with-a-screwdriving-robot/36800) lets the robot do the repetitive task and leaves the operator to do the work that is difficult to automate.

The idea for automating the screwing process actually originates from the manufacturers themselves, because Danish businesses can use up to 50 percent of their operator time on tightening screws, according to Søren Peter Johansen, a product manager at DTI.

The Screwdriving CoWorker is designed for easy integration into to existing production processes.

Since the robot uses ordinary human tools, adopters only need to 3D-print a fitting that allows the robot to hold onto existing devices such as screwdrivers.

Besides handling non-routine tasks, employees are needed to teach the Scewdriving CoWorker where to find the screw holes so that the robot can eventually find the locations by itself.

“I believe this kind of technology has reached a price level where businesses should consider looking into it, as it can increase the productivity of their production lines,” Johansen said.

**UR finds success with cobots**

Denmark’s greatest robotics success story to date is [Universal Robots A/S](http://www.roboticsbusinessreview.com/company/universal_robots). The privately held startup, launched in 2005, is a pioneer in the field of collaborative robots, or “cobots.”

UR has experienced rapid growth since it first products were sold in 2009. In 2014, the Danish company’s sales reached $38 million, a 70 percent improvement over 2013.

Universal Robots was sold last year to Teradyne Inc., a publicly traded supplier of electronic testing equipment, [for $285 million in cash](http://www.roboticsbusinessreview.com/article/teradyne_buys_co_robot_maker_universal_robots_for_285m) and $65 million in options.

Teradyne has more 3,900 employees and a market value of $4.37 billion. The North Reading, Mass.-based company’s product line didn’t include anything robotic prior to the purchase.

Despite the sale, Universal Robots is continuing production in Denmark. UR recently moved into a larger factory in Odense, approximately 100 miles east of Copenhagen. The [new 130,000-sq.-ft. production facility](http://www.roboticsbusinessreview.com/article/universal_robots_expanding_production_capacity) was established to allow the company to keep pace with growing sales.

Universal Robots’ network of integrators and distributors now totals nearly 200. After having sold more than 7,000 co-bots, the company ranked No. 25 on the *MIT Technology Review*‘s 2015 list of the world’s 50 “smartest companies.”

Universal Robots’ continuing goal is to make robot technology accessible to a wide range of small and midsized enterprises.

The company specializes in simple, flexible, and affordable collaborative robot arms: dubbed UR3, [UR5, and UR10](http://www.roboticsbusinessreview.com/article/universal_robots_shows_3rd_generation_ur5_ur10_industrial_robots) (reflecting their maximum payloads in kilos).

Workers can collaborate with the robots in close proximity on assembly lines with no safety guarding.

The cobots are designed to be easy to program. An initial setup can be completed in under an hour, according to the company.

The systems are also designed to move easily from point to point within a production facility, enabling uses in multiple applications. Flexible 360-degree joint rotation enables operation in confined spaces. The collaborative robots can be mounted on floors, ceilings, or walls as needed.

Universal Robots’ newest [UR3 robots are designed](http://www.roboticsbusinessreview.com/article/universal_does_it_again_with_the_ur3_tabletop_robot) to handle payloads of up to 3 kilograms (6.6 lb.) for close-up work in scientific, pharmaceutical, agriculture, and electronics facilities.

Potential tasks include the mounting of small objects, as well as gluing, screwing, operating tools, soldering, and painting. Infinite rotation is possible for screwing and drilling applications.

**MiR grows on mobility**

[Mobile Industrial Robots ApS](http://mobile-industrial-robots.com/en/) (MiR) designs and builds mobile robots for use in manufacturing and healthcare facilities.

The Odense-based company’s flagship MiR100, a mobile robot targeted at internal transport and logistics applications, is designed to optimize operational workflows, freeing staff resources and allowing adopters to increase productivity while reducing costs.

An internal location system allows the robot to either identify its driving area and surroundings or import 3D drawings of the building layout. MiR100 can be operated via a smartphone, tablet, or PC.

MiR founder Niels Jul Jacobsen quit his university job to become a full-time entrepreneur. A local business angel invested in MiR, and the company grew from just three part-time employees to 12 full-time employees in less than a year.

**Blue Ocean commercializes Danish robotics**

Another important Danish robotics industry player is Blue Ocean Robotics ApS, an Odense-based company that works to commercialize cutting-edge academic projects by connecting researchers with global businesses.

[Blue Ocean](http://www.blue-ocean-robotics.com/) says it invests resources and capital into a carefully selected portfolio of robotic projects. The company incubates and takes the lead on Danish robotics projects to further develop, commercialize, and introduce promising new technologies to worldwide markets.

When the timing is right, Blue Ocean sells, licenses, or spins out the project’s intellectual property rights. Thereafter, Blue Ocean continues its relationship with the developer, functioning as a closely interconnected strategic partner.

With a total of 90 staff members, Blue Ocean operates subsidiaries in Lithuania, Hong Kong, Sweden, Germany, and the U.S. Additional subsidiaries are planned for Norway, Benelux, and Australia.

The company also has sales partners in Europe, Asia, and the U.S. Blue Ocean claims that it has secured funding for seven robotics projects as of December 2015 and has reported an annual growth of approximately 120 percent.

Blue Ocean is a co-sponsor [of RoboBusiness Europe](http://www.roboticsbusinessreview.com/article/robobusiness_europe_is_reborn/) along with EH Publishing and *Robotics Business Review*.

**Odense positions itself as a startup hub**

Denmark has the sixth highest robot density in the world, and [Odense has positioned itself](http://www.roboticsbusinessreview.com/article/odense_europes_gateway_to_robotics/) as the nation’s robot hotspot. The city is currently home to more than 70 robot and automation companies with a combined workforce of over 1,800 people.

Helping to keep Odense at the center of the Danish robotics industry is the [Odense Robotics Startup Hub](http://www.odenserobotics.dk/odense-robotics-startup-hub-a-training-program-for-robot-entrepreneurs/) (ORSH), an organization established to give promising developers an affordable way of testing, designing, and ultimately marketing their products.

Universal Robots, Blue Ocean, and MiR were all incubated at the ORSH.

Requirements for joining the hub are minimal. No prototype is required—only an idea and a dream. Once accepted, a startup has up to 24 months to prove itself.

During that time, the hub provides free office and development/testing facilities, meeting rooms, and a cafeteria. It also gives startups the use of on-site robots and robotic components, as well as access to support and advice from the DTI.

In addition, the ORSH provides robotics startups help with their business plans and strategies, plus access to investor capital.

The ORSH recently opened a 2,000-square-meter (21,500-sq.-ft.) incubator facility dedicated to creating successful startups.

**Size matters not for European robotics**

Don’t let Denmark’s relatively small size fool you. The nation is committed to playing a major part in the global and European robotics revolution.

“New fields of use for robot technology are constantly explored in Denmark, ranging from robotics for the healthcare sector, agricultural sector, and industrial sector,” Hansen observed. “Danes have the most positive attitude towards the use of robotics in the EU and are highly ranked in international benchmarks of technological readiness.”

More on Danish Robotics:

* [New Drone Center in Denmark Sparks Inspiration for Growing Industry](http://www.roboticsbusinessreview.com/article/new_drone_center_in_denmark_sparks_inspiration_for_growing_industry)
* [Danes Open to Automation as Much of Europe Sours](http://www.roboticsbusinessreview.com/article/denmark_open_to_automation_as_much_of_europe_sours/)
* [5 Reasons to Attend RoboBusiness Europe This Year](http://www.roboticsbusinessreview.com/article/5_reasons_to_attend_robobusiness_europe_this_year)
* [Universal Robots Hails First ISO Cobot Spec](http://www.roboticsbusinessreview.com/article/universal_robots_hails_first_iso_cobot_spec)
* [Denmark Invests in Industrial Automation, Robotics Education](http://www.roboticsbusinessreview.com/article/denmark_invests_in_industrial_automation_robotics_education/)