Advanced robotics

Robotics will impact all areas of our lives from intelligent manufacturing to healthcare, education and even companionship.

Robotics is a vast technology domain with a long history, mainly related to factory automation. Nevertheless, it has gained incredible momentum over recent years, catalyzed in part by disruptive innovations within many other related hardware and software technologies. More efficient compute power, ubiquitous connectivity, smarter / more precise sensors, and smart materials, combined with evolving AI and machine learning techniques, are all helping to bring robotics to a whole new level.

Advanced robots are becoming autonomous: able to make informed decisions about their own actions. They do not need to be caged off to execute their tasks (as they typically were in manufacturing plants), instead they will be on the roads as autonomous cars, in the air as drones, in workplaces as cobots (collaborative robots) and even in human bodies as artificial blood cells. We have already started to observe their early versions and prototypes today and these give us a glimpse of both the extraordinary potential and the significant challenges for humanity as we seek to appropriately incorporate robotics into the way we think, work and live.

Being part of the physical / digital journey

The current views that we have about robots are changing as the new era of advanced robotics starts to have an increasing impact on all sectors of human activity. They are transforming the way we work, move, produce, consume, live, care, and manage relationships. Over the next decade, technology will enable robots to become more intelligent and interconnected, filling the gaps in end-to-end supply and value chains with minimum human intervention. However, the question is still open as to whether it will be technological developments or societal dynamics that will be the greatest influencing factor on the future of robotics and automation. This question is one that will be explored and resolved over the coming years – it will address the known constraints in relation to the mass adoption of advanced robotics, which include: the impact on labor markets; ethical concerns over the acts of autonomous robots; and human-machine co-existence.

We believe that over the next couple of years there will be lots of innovative but somewhat parochial innovations in robotics solutions and services. They will tend to be optimized for given use cases, and built around particular sensor / actuator capabilities and intelligence. More general-purpose and high mobility solutions will not become mainstream until the current limitations of power / battery technology and sensor adaptability issues are addressed.

We are going to see a robotic "Cambrian" period with, for example: robotic receptionists welcoming people into the hotels, precision medical robots assisting surgeons in hospitals, nanobots analyzing tumors for adaptive cancer therapies, pet robots as companions for the elderly and lonely, swarms of drones patrolling factories and fighting forest fires, and autonomous garbage collectors cleaning streets at night.

The manufacturing sector will benefit from a new generation of industrial robots that incorporate intelligent features such as self-diagnostics, predictive analytics, collaboration and autonomy.

A significant portion of new robotics ventures are in the field of defense and military – investments in this area are expected to continue to grow steadily in the coming years. Despite the associated controversy and ethical concerns, autonomous or remote-operated robots are already an integral part of some armies.

Consumer robotics for specific functions like entertainment, security and household tasks are showing the highest revenue growth. Next-generation AI-based consumer robots will not only be targeted on physical tasks, but we can expect robotically enabled activities such as teaching and interacting with family members beginning to enter homes, with the objective of improving the quality of life. Human machine interaction is a domain of growing significance, since techniques like augmented reality interfaces or mood and behavior detection need to develop further for consumer robots to become truly successful.

Lastly, mobility services are one of the areas where we are going to see the earliest and most significant adoption. Millions of highly autonomous cars, trucks and buses will be on the road. Vehicle-to-vehicle communication networks will allow cars to sense and see one another and make properly contextualized responses. Remote-controlled cargo ships, aviation, and other flying objects are all on the roadmap of many major players in the transport and logistics business.

So what for business?

Robotics is not an isolated technology - at its heart, robotics is a part of the Internet of Things. Robots will be connected to processing centers and will arrange themselves in swarms to collaborate and co-operate. The rise of robots will bring a corresponding rise in related technologies such as HPC/cloud - important for balancing centralized processing with localized efficiency. Cybersecurity will need to address completely new and complex situations relating to challenges such as: establishing trust between mobile communicating robots, controlling the software updates of potentially dangerous machines, and the possible misuse of sensor information gathered by robots. Managed service providers, traditionally focused on applications and infrastructure, will need to expand their scope of activities to robotics management.

From a business perspective, companies must adapt and learn how to leverage advanced robotics to become more competitive and adaptable. The digital transformation era will further evolve to one where learning to successfully apply robotics to business activities will be crucial for the competitiveness of companies. Enterprises will need to be able to address multi-disciplinary areas like machine intelligence, mechatronics, energy, data science, ergonomics and networks, in order to resolve the inevitable talent crunch.

The impact of robotic adoption in labor markets can be huge. The low hanging fruit for automation will be repetitive, physical-activity based tasks, but other tasks such as data processing and retrieval will be affected too. Even in optimistic scenarios, millions of people will be affected by automation, however, it should not be forgotten that every new technology comes with its own opportunities to create new job areas that did not exist before.

Cultures which are more open to robots are expected to have a significant competitive advantage in the future.
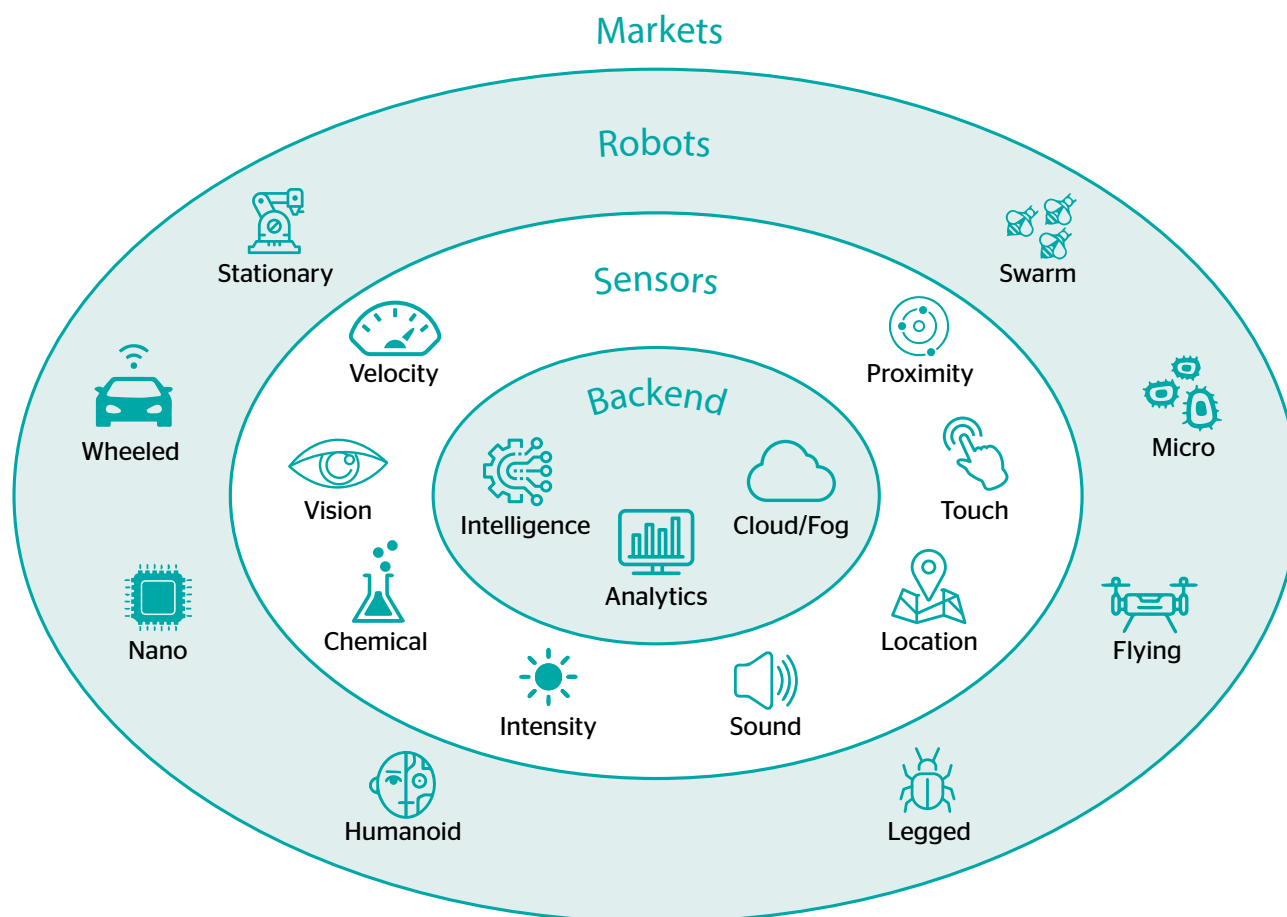

Figure 27 - The emerging advanced robotics landscape