BRAINS² TÜRKİYE

ROBOTICS PROGRAM

"Development of Vision, Strategy, Ecosystem and Market, through the International Comparison"

BIOTECHNOLOGY PROGRAM

ROBOTICS PROGRAM

ARTIFICIAL INTELLIGENCE PROGRAM

NANOTECHNOLOGY PROGRAM

SPACE PROGRAM

STRATEGIC SERVICES PROGRAM

TASAM **BGC**
Business and Government Consultancy
İş ve Devlet Danışmanlığı

TASAMWORLD
AKADEMİ VE İNOVASYON GRUBU
ACADEMY AND INNOVATION GROUP
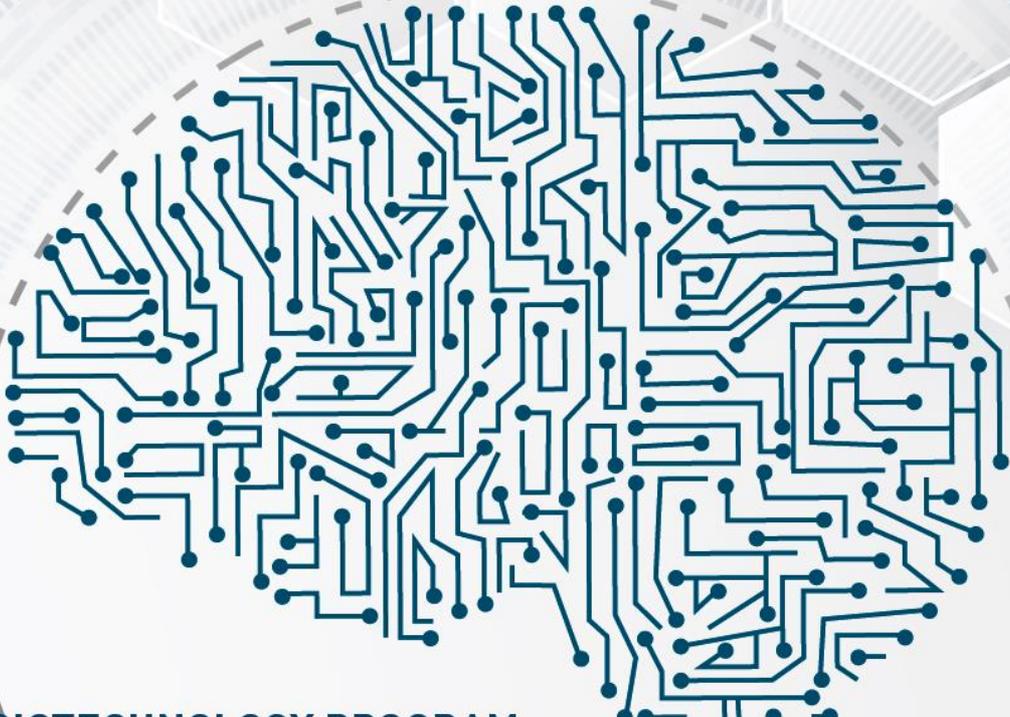
ROBOTICS PROGRAM

(**B**iotechnology | **R**obotics | **A**rtificial **I**ntelligence | **N**anotechnology | **S**pace | Strategic Services)

BRAINS² TÜRKİYE* ROBOTICS PROGRAM

"Development of Vision, Strategy, Ecosystem and Market, through the International Comparison"

----

* **BRAINS² TÜRKİYE** is a brand/initiative with multi-programs based in Turkey which develops market, ecosystem and capacity in the 'Biotechnology', '**Robotics**', 'Artificial Intelligence', 'Nanotechnology', 'Space' and 'Strategic Services' fields. The programs planned through identical visions and strategies for each main fields which transforms the new business models and multidimensional power distribution in the global economy, are implemented under the common title of **BRAINS² TÜRKİYE.**

VISION (DRAFT)

The science of robotics has been initiated as the automatic machines were designed by El-Cezeri and Ktesibius, who performed their studies beyond the age they lived. Currently, sophisticated machines which provide labor and value through software which manage them, are called as "robots". Beside the programmable, multi-axis, automatic controlled, fixed and mobile industrial robots which are used for multi-purposes in the industry; also the service robots which are used for different applications in various fields of our lives, lead to radical changes in simple facts regarding the safety and comfort of humans.

Robotics, which is the discipline towards the integration and application of scientific and technological developments on robots, and which continues to progress interactively all along the ages; is also a mutual working field for machinery, aircraft, space, electronics, computer and control engineering. Currently, in that field the education is provided from undergraduate level to the doctorate level in the university departments of Mechatronics in our country same like in the rest of the world.

Robots are classified depending on the axes tools, types, drive elements etc. More significantly, the production rate and quality have been increased through inducing the serial production as these robots has been started to be used in the electronics industry. The robots which perform placement, cutting, bonding, drilling, silicon application, measurement, test operations, quality control, packaging, sorting, loading, carrying, unloading etc. duties are used in many production processes in electronics, white appliances, food, furniture, automotive, chemistry, glass, metal, ceramics, paper and many more industrial sectors. In the working areas which are not suitable for human labor as performed at the underwater, radiation, space, etc. conditions, these operational remote control robotics which are for specific purpose, uses power transmission or radio frequency and requires high technology; constitute the foundations of this sector.

(Biotechnology | **Robotics** | Artificial Intelligence | Nanotechnology | Space | Strategic Services) **BRAINS² TÜRKIYE**

ROBOTICS PROGRAM

The Medical Robotics focuses to develop smart orthopedic prostheses with artificial tendon system which detect the commands of the brain through sensors and send power to the muscles gradually, and on the other hand it also focuses on surgery robots which enable surgeons to perform surgery operations on patients at different places through the systems which can be controlled by remote access.

In the software development field, it is very important to develop new algorithms through artificial intelligence research, coding and database query languages within the scope of intelligence and control systems. As it is not possible to reach the flexibility and skills of the human brain by using the currently available silicon technology; the biological and molecular systems are investigated. While the electronic and materials science cooperate together with medical science in order to ensure the system mimics the living tissues within the scope of cybernetic studies, in other words constructive architectural studies which focus on body and appearance; the constructive physics, hydraulic, pneumatic, machinery etc. basic science and engineering branches are also used in such studies. Anthropomorphic Robotics is a sub-branch of cybernetics, which focuses on hominoid and live-like robots. The first commercial outputs of related theoretical studies are the Robotic toys which include mechanical and electronic systems. The hobby of many people around the world can be focused on various fields of robotics depending on their interest areas. There are many national and international papers and competitions in this field. The robotic activities which are considered as a component of learning in STEM (Science, Technology, Engineering, and Mathematics) Education, are also used efficiently for out-of-school education. Even in the kindergartens the robotic coding lessons are delivered.

The "robotics technologies" will be one of the most profitable sectors undoubtedly in Industry 4.0 movement. Now, the robots shall undertake most critical functions in unmanned industrial production processes. While these smart machines which can be controlled or autonomously operated, provide significant benefits, inevitably the competition between the producers and developers of these robots shall be very tough. Hence, the global industry firms, entrepreneurs and mutual funds will give significant efforts to make new investments or acquisitions in this sector. The current number of service robots sold is higher than the number of industrial robots sold. The International Robotic Federation (IFR) reports that 6,7 million individual service robots and 59,706 professional robots were sold in 2016, in comparison with the sales volume of the industrial robots which was realized as 294,312, and 21,700 of these robots were co-robots. It is considered that if the rate of co-robots continues to increase so, which constitute 7% of the sales of industrial robots; co-robots will be very important for the future of industrial robotics. While the industrial robot sales was tripled in the Asian market and Australia in the past decade, as a significant driving force, it has increased only by 76% in Europe and America. On the other hand, the premises prefer co-robots which are more flexible than traditional industrial robots.

ROBOTICS PROGRAM

While the number of robots in the world was just 1.5 million in 2015, it has reached 2.5 million in 2019, and the Asian countries have highest number of robots. Robotization is a clear indicator of technological development of the countries. The leading countries of the world in robotization are S. Korea, Japan and Germany which have reached to the advanced level in the industry and have the giant global brands in all strategic sectors such as automotive. The robotization rate of the countries is calculated as ratio of number of robots per 10,000 production workers. Currently, Asia's rate is 550 in general while it is 18 for Turkey. The current number of industrial robots in our country is 8,000. It is predicted that the total production volume will increase by 50% until 2025 thanks to the robots which are designed to work in cooperation with the human in some jobs and fields, and also through going beyond the mechanical forms of the robots which will be used to automate jobs in many different fields, and this will contribute to the global economy nearly by 2 trillion dollars every year.

This new ecosystem, which is still considered in infancy period, currently offers a huge market on this scale - which has no matured competition and provides many new opportunities - as it creates new markets for SMEs, main contractors and technology companies, and continues to grow with the private sector initiative.

It is anticipated that the robots will be essential part of life in the following 10 years from production to home life, from security to agriculture; and the number of robots that help people through interaction will increase day by day. The usage areas of heavy industrial robots is limited, the usage of light robots increases in the health, search & rescue fields due to the developments in material technologies achieved within recent years. Robotic systems enable us to reduce production costs and achieve high quality standards; they also enable us to operate mental processes through software and machines. Hence, the number of companies which invest in robotics and automation technologies increases rapidly.

BRAINS² TÜRKİYE Robotics Program will analyze which Robotics fields would provide highest potential for future growth and which benefits can be gained from this growth by the Turkish Robotics sector, through considering Turkey's available strength and potential both in academic and industrial sectors.

Upon determining the industrial fields together with their sizes and scales as a result of the studies performed towards discovering the idle potential of Robotics industry in order to find the most reasonable and promising interests for the **National Robotics Sector** and to increase the efficiency of the private and public sector; such determined industrial fields shall be considered as the sectors which might have the strongest contribution to the competitiveness of the country, the efficiency of the economy and the welfare of the nation.

BRAINS² TÜRKİYE Robotics Program; aims to provide "Robotics Strategy" options to Turkey and to be one of the leading stakeholders in the field of Robotics in Turkey through asking the right persons ****** the right questions*******. The purpose of the program includes: "Connecting the global trends with local needs" through the contributions of Turkish experts; bringing the robotics experts in Turkey and to utilize the output of such meetings and knowledge for the benefit of the Country; preparing an environment for events to strengthen the connections between the expert community; **contributing Turkey's commercial position in the market which grows rapidly, determining the products which Turkish companies are capable to produce and which potential customers to which Turkish companies are capable to serve depending on the capability analysis and the potential of the markets, in order to contribute the Turkey's robotics capacity, ecosystem and market development.**

BRAINS² TÜRKİYE Robotics Program; will match the products and customers in accordance with the domestic and global position of the Turkish companies through analyzing the capabilities of the leading Turkish companies while finding answers regarding where our country should be positioned in that sector. Within the scope of this Program; the multidimensional specific studies and activities which comparatively examines the Robotics Strategies/documents and markets of the countries such as US, Russia, China, France, Germany and Japan, and in which the ideal strategy option for Turkey is presented shall be analyzed.

Main Theme

Development of Vision, Strategy, Ecosystem and Market through the International Comparison

Sub-Themes

Development/Inventory of Robotics R&D

Robotics Sources Ecosystem

Robotics Governance and Regulation

Robotics Human Resource

Robotics and Security

Sectorial Analysis and Classification of Global Robotics Market

Analysis of Leading Turkish Firms and Product Matching

Cooperation and Competition through International Comparison

Diplomacy of Robotics

(Biotechnology | Robotics | Artificial Intelligence | Nanotechnology | Space | Strategic Services) **BRAINS² TÜRKİYE**

ROBOTICS PROGRAM

STRATEGY (DRAFT)

To Develop Social Awareness towards Robotics

- To increase the awareness of youth about the professions of future and to forward them towards these professions

- To increase awareness about robotics

- To develop forecasting approaches for sub-branches of such professions

Planning the Workforces and Professions of Future

- Detailed assessment of the workforce and professions of future towards finding out the skills required for these professions

- To determine the professions for robotics industry and to plan alternative education and employment fields for the people who want to be qualified for this profession

- To develop the occupational skills of the people who will develop and support products/services by using the "Robotics" which will be needed by the labor market in the near future.

Focusing on the Use of Robotics in Defense and Security Fields

- To establish a center where institutions and individuals from all over the country can apply for the implementation of education and information activities towards "Robotics"

- As the center to be established will have a crucial importance for achieving the development in a better way, it shall be established as an institute where orienting and sector based trainings can be provided.

- To provide R&D funds and facilities for primary topics determined for researchers in this center which will be supported by the government or authorities.

Focusing on Usage of Robotics in Education

- To lead the establishment of a robotic-focused "data collection policy" for the stakeholders in education

- To contribute the development of products/services which will support the teachers at preparation, process and evaluation of Robotic-themed content during the teaching activities.

- To collect data about the individual learning for personalization of education on every aspect of the development of Robotics

TASAM BGC
Business and Government Consultancy
İş ve Devlet Danışmanlığı

TASAMWORLD
AKADEMİ VE İNOVASYON GRUBU
ACADEMY AND INNOVATION GROUP

ROBOTICS PROGRAM

To Arrange Trainings to Train Experts in Robotics

- To provide trainings in order to ensure development of products/services (for computer, electronics, machinery, biomedical engineers and information technology experts) by using robotics

- To provide trainings on topics for training assistant and intermediate personnel required for the development of tools and materials which will be used by the specialists in the sub-fields of robotics.

- To create awareness among the researchers in universities about Robotics applications

- To contribute arrangement of the curriculum to include sector-based use of robotics technology applications especially at the undergraduate degree of the universities.

- To provide trainings for researchers from different disciplines (health, education, fine arts, etc.) to ensure them to use Robotics technologies and outcomes in their researches.

- To arrange informative studies on robotics' application areas

- To provide trainings for entrepreneurs about the robotics applications

Sectorial Review and Classification of Global Robotics Market

- To divide the global robotics market into sectors, and to determine the market potential for the future through analyzing the related global markets and customers

- To analyze and classify the R&D, education, application, software, hardware, production, service etc. sub-sectors in the robotics market.

Health Services

Medical and pharmaceutical companies use robots with AI to perform various medical procedures, such as diagnoses, anesthesia and surgery. In some cases, these robots have better performance than doctors (like IBM's Watson). The robot caregivers which support the recovery of patients, are also being developed (for example, Robear which is designed by scientists of Sumitomo Rico Company in Japan, helps patients to recover their walking, etc. abilities). The sector is developing rapidly and the robot industry has already started to take a big share in the cake at many points in health services.

Agriculture

The robots are currently used agriculture industry, but new generation robots are designed for sensitive agriculture operations as such machines can process big data with new generation artificial intelligence and take advantage of low-cost sensors. Agricultural robots which operate with high efficiency can perform planting, watering, weeding etc. processes as they can be used also for fertilization, milk, flock, transportation processes. The agricultural robots will be able to work nearly with full autonomy, and the industry will continue to grow
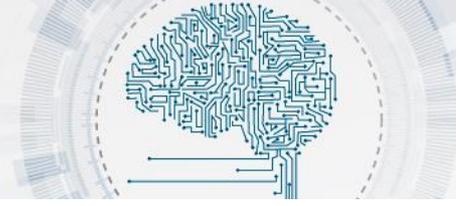
rapidly as the robot sensors and sophisticated learning abilities are improved. The agricultural robots have already created a significant impact on the labor force, and it will cause many jobs to be eliminated in the very near future, however this result will provide new opportunities in the programming and operation of the automated systems. This study will determine which of these opportunities would be benefited by Turkey and Turkish firms.

Industrial Production

In Canada and the USA, it was observed that the 13% of the job losses were caused by international trade but 85% of the job losses were caused by automation (5.6 million people) between 2000-2010. Production is the first sector which uses robots with artificial intelligence in assembly and packing the products for transportation. These robots are used to assemble complex items, including electronics, cars and home appliances. Furthermore, production output of these robots was increased significantly in recent years. Through this study, it will be determined where Turkey and Turkish companies will be located in this sector and which companies will lead the sector.

Military and Defense

This sector is one of the fastest growing sectors in this field. The developments and growths rates of this sector are very high, and the global turnover amount increases exponentially every year. The robots are currently used in many related sub-sectors (intelligence-surveillance-exploration, search-rescue, war support, mine clearance, disposal of explosive-ammo, and fire-fighting [especially on the navy side]).

Service

The best practices of the service sector are achieved in customer services and it is observed that many brands receive orders through the stands they have prepared for the sales of products and services. The tourism sector will also be one of the leading sectors in this field in the very near future. The use of robots in food preparation sub-sector is also growing rapidly.

Finance

The companies which provide various financial services prefer artificial intelligence in their systems in order to keep records of financial data which increases day by day. The robots are programmed with deep learning method that can use forecasting systems and market data to forecast stock exchange market trends and to manage funds more efficiently than humans. Furthermore, financial consulting is being more automated day by day through employing "robot consultants" which provide suggestions for simple financial problems. Automation has already begun to undertake some accounting tasks for recording logs, reconciling accounting books, performing transactions between companies and protecting accounting master data.

Transportation

Autonomous vehicles, metros and trains aren't a new concept anymore. It is expected that the most significant developments shall occur in road transportation and the leading trucks manufacturers have already started to design the vehicles of future. It is very crucial for Turkey to jump higher ranks in this sector as we consider its' potential.

Analysis of Turkish Companies that will Lead the Sector and Product Matching

- To determine in which sectors of this market Turkey would be a significant actor

- To determine the leading companies for these sectors

- To determine the competent universities and institutions regarding R&D studies towards these sectors

- To determine the required certificates and processes for the market

- To determine the products which can be produced by these companies

- To match the products and leading companies which are determined for these sectors

Informative Studies for Adaptation of the Robotics in the Social Life and Industry

----

** Right Persons

It is also very important for achieving the goal of this program to ask right questions as well as asking the right questions to the right people. It shall be ensured that the ecosystem shall include all stakeholders in order to analyze the global trends accurately and to determine the right options for Turkey. Therefore, it is a priority to ensure the inclusion of the representatives of the private sector, who create and experience this transformation, besides ensuring all stakeholders such as academicians, public and non-governmental organizations etc.

*** Right Questions

It is one of the most important steps of this Program to identify and ask the right questions. Targets of this program towards achieving "holistic and holistic results" and maintaining the focused approach, are highly dependent on asking the right questions.

- Does Turkey really need a Robotics strategy? If so, why?

- What should be the scale of Turkey's Robotics target? Should it compete globally or compete just with equivalent countries?

- How can we participate the international organizations' the policy building processes for Robotics and what kind of contributions can we provide?

- On which robotics areas should Turkey focus? Should it develop and extend robotics methods and their usages? Should it produce robotics products/services? Should it produce and commercialize software, hardware and materials used in robotics education? etc.

- What should Turkey aim for raising its' labor force? Should our education system train experts who develop Robotics products and services, or should it train people who will be employed in the ecosystem created by Robotics sector?

- If Robotics products and services will be developed, what should be done in order to proceed in compliance with national and international ethics and law and in order to establish required institutional infrastructures?

- What is the current situation of the products and services which are required to develop robotics software, hardware, materials in Turkey?

- In which critical sectors the robotics would increase the efficiency exponentially? Which steps should be taken if production and development studies are initiated towards these sectors?

- Which export markets should be targeted if Turkey produces robotics products and services?

- How to deal with prejudices and errors in the field of robotics? Is there a model about these issues which can be presented by Turkey for the world?

- Should it be considered in the Robotics strategy to develop policies for the sectors where the employment rates will decrease as the Robotics usage expands?

- How Robotics education would be delivered at universities? Through opening focused specific undergraduate departments or through adapting curriculum of the relevant faculties?