# TWENTY-SECOND SESSION OF THE COMMISSION ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT (CSTD)

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**Submitted by**

**Turkey**

## Smart Production Systems Technology Roadmap of Turkey

With the aim to define strategic objectives and technological steps towards digitalisation of industry in Turkey, TUBITAK has coordinated the development of "Smart Production Systems Technology Roadmap", to which all sectoral stakeholders have participated and contributed in 2016.

Within the scope of the roadmap, 8 technology areas, namely Big Data and Cloud Computing, Digitalization, Cybersecurity, Internet of Things (IoT), Sensor Technologies, Additive Manufacturing, Advanced Robotics, Advanced Automation and Control Technologies are defined as critical for directing the research, technological development and innovation activities. 10 strategic objectives and 29 critical products have also been determined for Turkey, to fully localise the digitalisation process which is inevitable for maintaining competitiveness in the future.
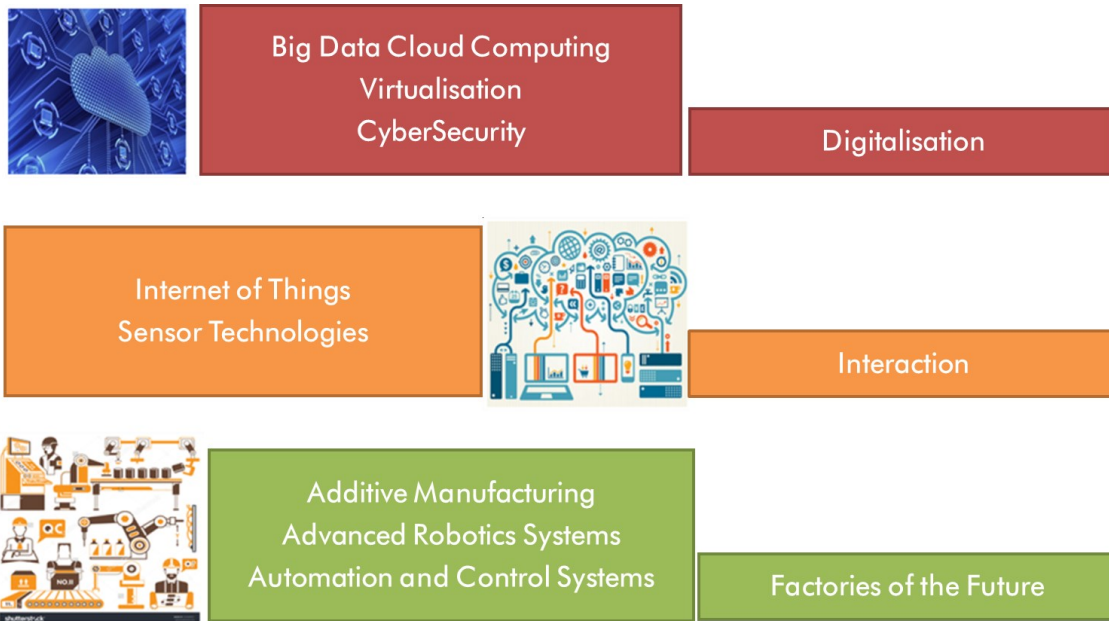


The technology roadmap is comprised of a multi-layered structure, defining the technologies, strategic objectives, critical products, national and international R&D projects and industrial/sectoral applications in 3 different technology groups of "Digitalisation", "Interaction" and "Factories of the Future".
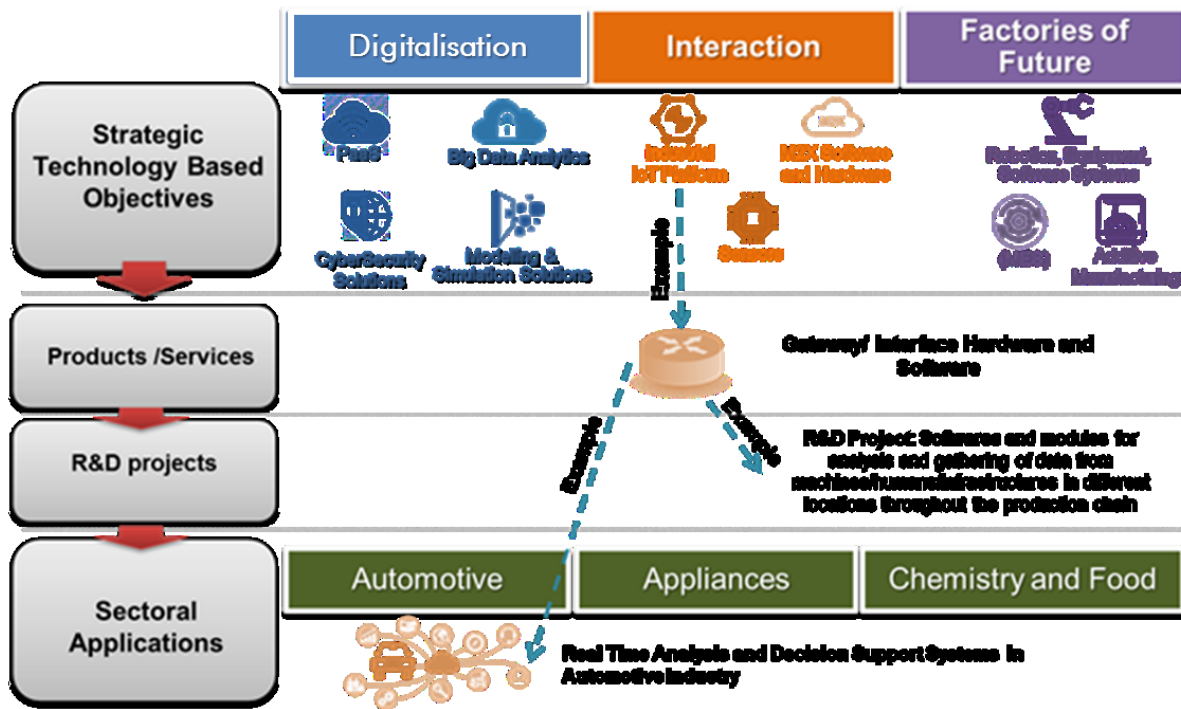
Structure of the Multi-Layered Smart Production Systems Technology Roadmap

The strategic objectives and critical products/technologies are as follows:

- Development of algorithms and applications for secure, smart and scalable end-to-end cloud service platform, which also enables and predictive maintenance of data: Service Development Platform, Tools for Predictive Analytics, End-to-End Devices and Operating Systems

- Development of cyber security solutions for Industry 4.0: Session Boarder Controller for Classified Networks, Flexible and User Friendly Identity Validation Technologies, Network Infrastructure for Industry 4.0, which is programmable and able to make autonomous decisions for cyber security, Application of Current Technologies to Industry 4.0 Devices

- Simulation, modelling and virtualization technologies for Industry 4.0: Compatible With Real Time Data Flows From The Physical Environment, Integrated and Multi-layered Simulation and Analysis Methodologies

- Establishment of interoperable, secure and reliable industrial IoT digital platform and development of high added value smart service applications: Industrial IoT Platform, Gateway/Intermodal Hardware & Software, Software & Hardware for Device and Machine Interfaces

- Development of Software and/or Hardware for Machine-to-Machine, Machine-to-Human, Machine-to-Infrastructure Communication: Innovative M2X Software &

Hardware, Applications for Real-Time Routing, Smart Sensor Monitoring Interfaces and Algorithms

- Development of physical, chemical, biological, optic, micro-nano sensors for industrial use; smart actuators; industrial, wireless, digital sensor networks; machine vision, image processing, innovative sensor applications; sensors resistant to extreme conditions: MEMS/NEMS for Sensor Applications, Industrial, Wireless, Dynamic, Distributed Sensor Networks, Machine Vision, Image and video Processing Technologies

- Development of smart manufacturing robots, equipment, software and executive systems which are competitive in global markets with respect to technology and costs, easily accessible by SMEs.: Servo and Linear Servo Motor, Robot Controller, Mechanical Components

- Development of raw materials, production machines and required software and automation systems for additive manufacturing: Additive Manufacturing Machines, Additive Manufacturing Materials, Additive Manufacturing Software

- Development of smart manufacturing execution system and components, as well as required middleware technologies: Middleware Technologies, Smart (Dynamic and Adaptive) Manufacturing Execution Systems and Components

TUBITAK has been publishing calls for RDI projects on digitalisation within its mission oriented support programmes. In the scope of the bottom-up support programs, TUBITAK has funded nearly 3500 R&D projects with a budget of 1.6 Billion TRY (2018 fixed prices) since 2012. TUBITAK will continue to publish numerous calls on critical digital technologies, based on Smart Manufacturing Systems Technology Roadmap, in the upcoming years. Moreover in 2019, TUBITAK plans to develop "Artificial Intelligence Technology Roadmap"