



KANS

Knowledge Application and
Notion for Society

Let's Do it Together

2021

KANS

COMPETITION FIELDS

The competition is held in five different areas. Any scientific and technological achievement in the form of Idea, Proof of Concept, Prototype, MVP, or New Product is acceptable.

About KANS 2021

The Mustafa^(pbuh) Science and Technology Foundation has established a scientific competition called KANS: Knowledge Application and Notion for Society. This competition has been staged with the aim of bouncing ideas around in academic community to address the problems of the Islamic world in different areas; such as Water, Environment & Energy; Health & MedTech; ICT; Transportation; Economics, Banking & Finance; etc. Scholars, researchers, innovators, university students, and professors under 45 years of age are encouraged to submit their scientific and technological ideas and achievements in the form of a 5 minutes video presentation.

Economics Banking & Finance

Any theory, idea, or solution which solves major challenges in economics, banking & finance; including resource distribution, poverty eradication, wealth inequality, new methods of financing, Islamic banking and finance, etc.

Energy, Water & Environment

Any idea, proof of concept, prototype, MVP, or new product which solves a challenge in water, energy & environment sector or help increase the productivity of available resources.

Information & Communication Technology

Any idea, proof of concept, prototype, MVP, or new product in emerging trends of ICT; such as AI, IOT, AR, VR, Big Data, Block Chain, etc.

Health & Med-Tech

Any idea & proof of concept which solves challenges in the health sector; or prototype, MVP, & new product which offers new solutions in the field of medical technology.

Transportation

Any idea & proof of concept which solves the transportation challenges such as sustainability, integrated management, transit-oriented development, high-frequency transit networks, etc; or prototype, MVP, and new product which offers new solutions in the field of transportation technologies & emerging trends.

2021 Special Field: Mining and Mineral Industries

Idea, proof of concept, prototype, MVP, or new product which solve challenges in mining industries or help increase the productivity of mineral resources.



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KANS Pavilions

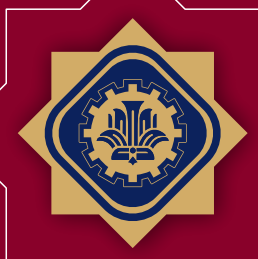
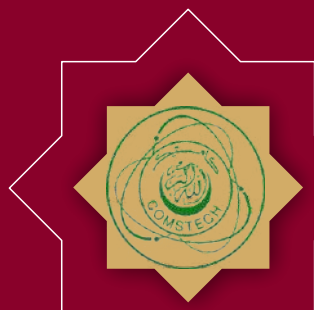
“Pavilions” are national or international scientific institutions from different Islamic countries which declare their local challenges and invite young scientists and innovators from all over Islamic world to answer the challenges. In other words, pavilions are seekers and young scientist are solvers. Hence KANS is not only a competition but also a marketplace, in which scholars and innovators may find an overseas customer for their idea, prototype, MVP, or new product. To view the challenges declared by international institutions, see the next pages.

Awards & Benefits:

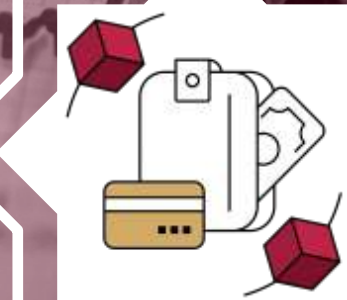
A) Top six winners will receive:

- ◆ KANS Medal & a Plaque of appreciation
- ◆ 30-grams Gold Insignia
- ◆ Sabbatical worth 2000\$
- ◆ Special privileges for benefiting from MSTF networking platforms: STEP & EISA.

B) Every solution for challenges declared by international institutes, will be handed over to related institute in order to cooperate and commercialize the solution, if desired.



Economics Banking & Finance



ECO 1

Subject: Contract and Money Transfer Based on Blockchain Technology

One of the companies' strategies to circumvent cruel sanctions is to use blockchain technology and cryptocurrency. Although blockchain technology and cryptocurrency have greatly helped companies to do business and international trade, there are still many challenges along the way. In particular, contractual obligations are deprived of requirements such as judicial support and bank letters of credit. One alternative is to use smart contract technology on a blockchain platform. This solution also faces challenges. The first challenge is the legal solution in Iran and abroad to convert the base cryptocurrency into the official currency of the country. Another is fluctuations in the exchange rate against the dollar for base cryptocurrencies, and ultimately the security and confidentiality of contracts. From a practical point of view, a system that can implement a smart contract solution quickly and reliably for buyers and sellers can help apply this technology and provide the opportunity to attract capital and outsourcing. Therefore, the following challenges must be addressed in using smart contracts to trade and attract international capital:

The Challenge: Legal requirements of countries, exchange rate, the confidentiality of contract and institution supervising the proper performance of work



Islamic Network on Science
and Technology Parks

ECO 2

Subject: Iran Natural Gas Subsidy Reform Model

In different countries, to facilitate the access of energy to the low-income groups of the society, energy subsidies are granted in various ways, hidden in the carrier price (hidden subsidies) or cash. Subsidizing the carrier not only does not ensure a fair distribution of income to the community but also upsets the balance of supply and demand in the energy market, reduces investment, threatens energy security, low energy efficiency, and environmental damage.

In Iran, the natural gas carrier has the highest share (39%) of the total subsidy of \$ 50 billion. These subsidies have led to low productivity and significant energy losses. Low gas prices have reduced investment and increased the accumulated debt of energy companies (affiliated with the Ministry of Oil). The central part is the debt of 60 billion dollars of the National Iranian Oil Company and 100 thousand billion tomans of the gas company resulting from this issue.

To reform the subsidy system, various methods such as "liberalization of gas prices to export prices," "creating an organized market by allocating quotas to each citizen," "increasing prices for high-consumption consumers," and "floating pricing based on consumption" can be Is an offer.



Research Institute for Science
Technology and Industry
Policy

The Challenge: What is the appropriate model for equitable redistribution of natural gas subsidies so that the revenue model of the subsidiaries of the Ministry of Oil is also improved?

In answering this question, various considerations must be taken into account; Includes: multiplier difference in consumption of domestic and commercial sectors in hot and cold seasons; Existence of hot and cold climates in the country with different price levels; Most of the natural gas subsidies are in the form of fuel for the power plant, and the two carriers of gas and electricity can be substituted in consumption; The sudden rise in the price of natural gas increases the cost of electricity, steel, cement, and other manufacturing industries.

ECO3



Research Institute for Science
Technology and Industry
Policy

Subject: Private Sector Participation in Financing the Knowledge-Based Economy

Providing sustainable and appropriate financial resources to achieve a knowledge-based economy, ranging from basic research to innovation and market entry, is inevitable. An examination of the state of the government in terms of funding, costs, and responsibilities show that the government alone cannot fund the necessary research chain for innovation. On the other hand, the inefficiency of the resource allocation system in this area has caused the same limited resources not to have the necessary effectiveness, and practically only a small part of GDP (about 2%) is allocated to this area.

One solution to the above problem is to expand private sector participation in financing the knowledge-based economy. According to UNESCO, in Iran, only about a quarter of these costs are covered by the private sector, while in the Islamic countries of Turkey and Malaysia is 56%.

The Challenge: Expanding private sector participation, especially large enterprises, in financing the knowledge-based economy chain from research to innovation

ECO4



Research Institute for Science
Technology and Industry
Policy

Subject: Livelihood for the Poor who are Unable to Work

With the victory of the Islamic Revolution, supporting the poor was at the forefront of the plans of the newly established Islamic Republic of Iran. In this regard, various government institutions and charities were formed to achieve this goal.

One of the most important strategies of government charities has been to help create sustainable employment and eliminate their need for direct financial assistance. However, a significant number of clients are unable to work and engage in economic activities. For example, half of the 4 million people covered by one of these institutions are unable to engage in economic activity for physical or social reasons. This has led to a lot of spending from the public budget and attracting public donations in various ways to support these groups in the form of stipends. However, the government support for these people is so small that it is not enough to provide a minimal livelihood.

The Challenge: Innovative Solutions for Providing a Minimal Livelihood for the Poor who unable to work; without putting pressure on the public budget

ECO5



Research Institute for Science
Technology and Industry
Policy

Subject: Brain Drain and Human Capital Migration Governance in Islamic Countries

The migration of human capital, the exodus of the elite and the educated is recognized as one of the significant development challenges in the population and labor market facing many developing countries. This has been a problem in Islamic countries to a large extent, and most of these countries are among the countries that send human capital to developed countries. So that the continuous loss of human capital and the lack of compensation for this lack due to the lack of recruitment of alternative forces from other countries can face many severe problems in the medium- and long-term Islamic countries sending human capital.

But the point that can be considered in the meantime is that a group of countries at the same level of development or have regional socio-economic commonalities have undertaken policy and management measures of regional coordination. For example, the member states of the European Union or the region of Southeast Asia aim to manage the international flows of migration and migration of human capital, take policies, establish harmonized management and legal frameworks to face the growing challenges of unbalanced and irregular capital migration. Humans, and in particular threats, have become opportunities in the field of migration. Therefore, significant achievements have been achieved from this policy framework and joint action at the regional level in the face of the challenge of human capital migration for these countries.

The Challenge: At the level of Islamic countries, despite regional proximity, economic interactions, and abundant cultural and social commonalities, unfortunately, the lack of such a policy framework and joint action in migration and transfer of human capital has led to significant material and spiritual damage. Accordingly, what suggestions and solutions can be proposed to achieve this policy framework and joint action?

ECO6



Research Institute for Science
Technology and Industry
Policy

Subject: Energy Carrier Subsidies

Demand-side energy subsidies are very common in many developing countries. Petroleum product subsidies are very large in certain cases, especially in some major oil-exporting countries, like Iran. These subsidies that result from underpricing, causes excessive losses .

While subsidies can have a few benefits in terms of support for the poor, they also carry costs. These include fiscal costs and effects on the balance of payments, growth, and externalities. In particular, in economies with large energy consumption, extra demand for energy induced by the lower consumer prices can work against energy security and have global effects through increased GHG emissions from the combustion of fossil fuels and possibly higher prices for widely traded forms of energy. It is important that governments design their subsidy scheme so as to achieve the desired benefits with the lowest overall costs.

The Challenge: In Iran, the volume of energy subsidies is very high. In addition to all the problems caused by the high volume of energy subsidies, the lack of optimal supply of resources for these subsidies has led to budget deficits and inflation. What is the optimal way to target energy subsidies in Iran?

Economics Banking & Finance

ECO7



Research Institute for Science
Technology and Industry
Policy

Subject: Fighting Corruption

Corruption has a disproportionate impact on society which is most severe on the poor and most vulnerable group of population, increasing costs and reducing access to services, including health, education and justice. Corruption erodes trust in government and undermines the social contracts. This is a global concern, but particularly in contexts of fragility and violence, as corruption fuels and perpetuates the inequalities and discontent that lead to fragility, violent extremism, and conflict.

Corruption comes in different forms. It might impact service delivery, such as when an official asks for bribes to perform routine services. Corruption might unfairly determine the winners of government contracts, with awards favoring friends, relatives, or business associates of government officials. Or it might come in the form of state capture, distorting how institutions work and who controls them, a form of corruption that is often the costliest in terms of overall economic impact. All types of corruption are important and tackling all of them is critical to achieve progress and sustainable change.

The Challenge: What are prerequisites to building an effective anticorruption approach? Which mechanisms are required to fight corruption?

ECO8



Research Institute for Science
Technology and Industry
Policy

Subject: Stabilization and Reduction of Inflation

A low and stable inflation rate improves well-being of population. This is manifested in various ways: A low inflation rate promotes the efficient use of productive resources, reduces uncertainty and fosters investment. This also, prevents arbitrary redistribution of income and wealth, which particularly affect the poorest sectors of society, with the result that wage earners and retired people have fewer mechanisms to protect themselves against the inflationary erosion of their income. For this reasons, price stability is commonly regarded as the single most important macro-economic objective.

Inflation must be controlled by the Central Bank by Monetary policy, but dominance of Fiscal Policy is a powerful obstacle for this .

The Challenge: Iran as an oil producing economy has been suffering from high inflation for many years. This natural resource is one of the main factors which increase instability of inflation. What is the most effective way to lower and stabilize inflation in Iran?

ECO9



Research Institute for Science
Technology and Industry
Policy

Subject: Non-Inflationary Poverty Reduction

Social protection is an important approach towards reduction of poverty and multidimensional deprivation. This approach looks for the processes, policies and interventions which mitigate the risks and constraints that poor and vulnerable people face; which will make them less insecure and less poor, and more able to participate in economic growth.

The most common types of social protection are Labor market interventions, Social insurance and Social assistance that all of these methods are used to reduce poverty. One of the most important factors in social protection programs is the way it is financed. It is important to choose a financing method that, while supportive, does not lead to budget deficits and inflation; because inflation itself exacerbates poverty.

The Challenge: A method of social protection and reducing poverty in Iran that is not based on inflation.

Economics Banking & Finance

ECO 10



Pakistan National Science &
Technology Park

Subject: Documentation of Economy

Documentation of economy is vital for micro / macroeconomic planning, socio-economic development and for accelerating the gross domestic product (GDP) growth of a country. According to reports, the undocumented economy in Pakistan accounts for 35-50 percent of the total economy, approximately \$85 billion in money terms.

The Challenge: Tackle undocumented economy as a structural weakness of Pakistan economy

ECO 11



Pakistan National Science &
Technology Park

Subject: Transparency in Monetary Transactions

The lack of transparency in monetary transactions is a major concern around the world. It causes adverse effects on financial sector institutions that are critical for economic growth. Moreover, decreases credibility of the economy in the external environment.

The Challenge: Tackle the lack of transparency in Pakistan's financial sector.

ECO 12



Universal Scientific Education
and Research Network

Subject: Job Opportunities Created by the COVID-19 Pandemic

With the rapid growth of remote working, e-commerce, and social media jobs during the pandemic, companies probably demand a lower number of in-person jobs after the crisis, as it leads to requiring less office space and lower salary of remote jobs. It may have advantages such as eliminating geographical borders for employment but may result in eliminating some work opportunities and lower salaries for the same jobs.

The Challenge: How this job transition may occur during the future years, and how to overcome the unemployment of the old employees?

Economics Banking & Finance

ECO 13



Resalat Qard Al-Hasan Bank

Subject: Barriers of digital banking

As Resalat Qard Al-Hasan Bank is the first branch-free bank all throughout the world of Islam, one of the major concerns borne by this Bank is elimination of infrastructural and legal barriers aimed at promotion of digital banking and facilitation of this route in banking system. According to field studies carried out in Resalat Qard Al-Hasan Bank, the most important barrier to develop digital banking is state infrastructural and legal obstacles in the field of digital banking. Amongst these, legal vacuums for online identity verifications, e-signatures, and online commercial deeds are more conspicuous. Furthermore, elimination of infrastructural and legal barriers intended to digitalize all banking processes in Resalat Qard Al-Hasan Bank is of paramount importance for which practical solutions appear to be required.

The Challenge: Solutions to accelerate the process of digitalization of Resalat Qard Al-Hasan Bank processes, including in-person authentication, electronic signature, etc.

ECO 14



University of Central Punjab

Subject: Digital Economy and Small Scale Businesses in Pakistan

Small medium enterprises (SMEs) in Pakistan are facing a set of unique external challenges comprised of poor security conditions, undocumented financial operations, and surge in property theft crimes such as cash snatching crimes, burglary, and even robberies. SMEs heavily rely on day-to-day transactions that involve cash management operations. However, surge in these crimes have put pressure on SMEs to incorporate new innovative solutions towards their operational management activities. Fintech inclusion in Pakistan presents greater opportunities to SMEs to explore and adapt Fintech-based solutions for their cash management operations. Similarly, Fintech also presents greater opportunity for SMEs to develop technical competencies which aid towards their inclusion in document economy of Pakistan.

The Challenge: Fintech solutions for cash management operations in Pakistan's SMEs

Energy, Water & Environment



EW E 1



Pars Oil

Subject: Desulfurization of «Group I Base Oils» in a Different Way From Hydrogenation Methods

In Iran, the production of groups II to IV base oils is not usual and manufacturers are concentrated to produce group I base oils which are classified as less than 90 percent saturates, greater than 0.03 percent sulfur and with a viscosity-index range of 80 to 120.

Depending on the characteristics of the lube cut as the feed of refineries, the sulfur content in group I base oils is ranging from 5000 to 15000 ppm. The presence of sulfur based heteroaromatic and unsaturated compounds in this type of base oils not only reduces their oxidation stability and corrosion inhibition performance, but also affects the environment destructively.

The Challenge: Desulphurization of Group I base oils from maximum 10000 ppm to less than 300 ppm

Limitations: Due to the proximity of Pars Oil Refinery to the metropolis of Tehran and subsequently safety considerations and air pollution issues, furthermore, limited useful space of the refinery the creation of desulfurization plant based on hydrogenation processes, construction of hydrogen generator units and towers to burn sulphurated hydrogen gases are not desirable.

EW E 2



Commission on Science and
Technology for Sustainable
Development in the South

Subject: Plastic and Micro-plastic Pollution in Pakistan

In today's world, plastic is an essential raw material. Since their invention in the 1930s, plastics have become ubiquitous in the manufacture of everyday products. Plastic and Micro-plastics are particularly problematic and could pose big threats. Micro-plastic are either released directly into the environment or formed by the degradation of larger plastic debris. Once enter the environment microplastics could pose serious threat to aquatic and terrestrial ecosystems. In Pakistan the freshwater and marine water ecosystem receive huge amount of microplastic which is not only deteriorating the quality of water but also affecting the aquatic life.

The challenge: How to reduce the microplastic pollution in water bodies in Pakistan?

Energy, Water & Environment

EW E3



Commission on Science and
Technology for Sustainable
Development in the South

Subject: E-waste Pollution in Pakistan

Electronic products viz such as mobile phones, capacitors, wires, computers, television sets, transformers, and cables at the end of their lives are known as electronic and electric waste (e-waste). E-waste or electronic waste is created when an electronic product is discarded after the end of its useful life. The rapid expansion of technology means that a very large amount of e-waste is created every minute. Massive accumulation of these devices has generated major public health concerns due to the presence of toxic chemicals in them. Many of these electronic products contain inorganic and organic toxic chemicals to which humans may be exposed during both the recycling and disposal phases of these devices if suitable precautions are not taken. Informal processing of e-waste in developing countries can lead to adverse human health effects and environmental pollution.

The challenge: What are the sustainable solutions to manage the e-waste pollution in Pakistan?

EW E4



Islamic Network on Science
and Technology Parks

Subject: Rehabilitation of Anzali Wetland and Repulsion of Invasive Species

Anzali Wetland is the habitat of many species of aquatic animals, birds, plants, and one of the valuable ecosystems of the world. In recent years, what is considered a severe threat to Anzali Wetland and has exposed its life to destruction and drying is the invasive species of water hyacinth. Although in recent years, agencies from government agencies and the private sector have collected water hyacinth, but these measures not only did not help to improve the situation, but the fragmented plant began to move on the surface of the water and in addition to the wetland, it has also polluted the port.

The rapid growth of this native Amazon plant and the 20 to 30 years of its rhizome in the environment has caused Anzali International Wetland and most of the water areas of the province to deal with this ominous phenomenon.

The Challenge: Collect, remove and prevent the growth and spread of water hyacinth in Anzali Wetland

EW E5



Islamic Network on Science
and Technology Parks

Subject: Recycling and Burying Waste in Saravan Site and Eliminating Unpleasant Odors

Today, recycling and landfilling municipal waste is one of the significant environmental problems and challenges. Landfills are so widespread these days that litter, odors, and leachate have polluted water, soil, and the environment. In recent years, the problem has become more widespread in many areas, including Gilan province, which faces a population density and lack of suitable spaces for landfilling.

As today the Saravan region of Rasht with towering trees as one of the natural and unique beauties has become one of the landfills and a severe challenge in this province; A mountain of garbage with a height of more than 80 meters with an unpleasant odor and waste leachates that have entered the surface waters and streams, and has also been intensified by rainfall.

The Challenge: Recycling of waste and reducing the inflow of garbage to the Saravan site, preventing the release of unpleasant odors, preventing the production of leachate, or preventing the entry of leachate into surface waters

Energy, Water & Environment

EW6



Sultan Qaboos University

Subject: PV Panel Temperature Mitigation

Solar energy technology is among the most widely known renewable energy technologies and its market is currently growing due to its popularity and the need to establish sustainable energy solutions worldwide. One of the known technologies in the solar energy sector is the photovoltaic (PV) cell, or else known as the solar cell. These devices can convert sunlight to electricity which can power many applications depending on the size of installation and the components used in the system. Photovoltaics are usually purchased as a unit (combining multiple cells) which is referred to as a module. When the operating cell temperature of these modules increase above 25 °C their performance tend to drop, or according to their temperature coefficient. In some cases, the efficient of the PV module will decrease by 0.4% for every degree centigrade increase more than 25 °C. This issue is a cause for a drop in the performance of the PV module and its lifetime.

The Challenge: A cost-effective solution to reduce the operating cell temperature of PV modules.

EW7



Sultan Qaboos University

Subject: Dust Impact on PV Panel

Solar cells (or photovoltaic – PV - cells) are semi-conductor devices which convert solar irradiance into DC electric current. The output of these cells is dependent on many factors but mainly on the solar irradiance. Thus, to ensure solar cells receive most of the solar irradiance they are positioned carefully and installed at an appropriate tilt angle to maximize their exposure to the sun. Some issues may arise due to the location of installation such as shading, high ambient temperature and dust accumulation. In the Middle East dust is a known problem that affect solar cell devices. As the dust deposition on a PV module increases, the power output of the PV and its efficiency will decrease. Moreover, the smaller the dust particles are the more output power drop will occur. In recent years many researchers studied the types of dust that affect PV module in different locations and their characteristics. This problem is prominent in Middle East which also exhibits high ambient temperatures and relative humidity which also impact the dust deposition.

The challenge: an efficient solution to minimize dust accumulation on PV modules, particularly those installed in the Middle East.

EW8



Sultan Qaboos University

Subject: Hybrid Micro-Systems for Rural Areas

The shortage of energy resources and inefficient technologies are among the reasons for the energy crisis in many rural areas in developing countries. It is important to develop renewable energy technologies that are cost-effective, efficient, and decentralized to improve the energy situation in rural areas. Given that the majority of the populations in rural areas are impoverished, it is incumbent upon the research community to propose technologies that not only meet their energy needs but also must be acceptable to their sociocultural and economic situation. It is also necessary for the technologies to be sustainable and environmentally friendly. Thus, hybrid renewable energy systems are an excellent choice. These systems combine the output of different renewable energy resources, contain energy generators and energy storage systems. They can also be utilized in grid-connected mode, isolated from the grid or for other purposes. The designed system must be made depending on the resources available for the selected rural areas such as micro-dam reservoirs in areas with water bodies, wind turbine generators for areas with high wind speed, solar panels for areas with high irradiation. Moreover, the system must be designed to accommodate the rigid environment of these areas and protected from the surrounding atmosphere.

The challenge: A hybrid renewable energy micro-system that is technically efficient, cost-effective, environmentally friendly and sustainable for long term use for a particular area or areas in the Middle East.

Energy, Water & Environment

EWE9



UNESCO Chair on
Communication
of Science and Technology

Subject: Water Crisis, Crisis Communication, and Risk Communication

Any idea or innovation in the field of:

- Resolving cultural, social, ethnic and local disputes over water
- Resolving national, regional, international disputes over water
- Using social capital to solve the water crisis
- Public health management in water crisis
- Uprisings and social and historical movements revolve around the water problem
- Water crisis management in the context of climate change
- Media policymaking and planning in the water crises

EWE10



UNESCO Chair on
Communication
of Science and Technology

Subject: The Issue of Water and Intercultural Relations

Any idea or innovation in the field of:

- The role-playing of cultural factors (cultural commonalities, minorities, and ethnicities, etc.) in resolving water crises
- Promoting the culture of water production and consumption in traditional and modern structures

EWE11



UNESCO Chair on
Communication
of Science and Technology

Subject: Governance, Organizational and Institutional Relations on the Water Issues

Any idea and innovation in the field of:

- Water resources restoration methods
- Water demand and consumption management and public and specialized training
- Managing conflict of interest between local communities and governance decisions

Energy, Water & Environment

WE12



Pakistan National Science & Technology Park

Subject: Low Crop Yields Due to Salination Issues

Soil salinity is one of the major issues in the agriculture sector of Pakistan where approximately 6.30 million hectares of land are salt-affected. This is due to the poor irrigation practices and drainage systems that have led to accumulation of salts in the soil in concentrations, which are harmful to the crops.

The Challenge: Cost-effective solutions to change the irrigation method of agricultural lands and solve the problem of salt and salinity accumulation in the soil

WE13



Pakistan National Science & Technology Park

Subject: Renewable Energy Solutions

Pakistan has excellent renewable energy resources such as wind and solar. However, exploitation of these resources has so far expanded slightly, accounting for a small share of Pakistan's total energy production.

The Challenge: Strategies and solutions to increase the share of renewable energy in Pakistan's energy production

WE14



Pakistan National Science & Technology Park

Subject: Low Agricultural Yields

Pakistan's agriculture is a high-risk, low-input enterprise for resource-poor farmers, who frequently use poor quality seed, inadequate and imbalanced fertilizers, and poor crop management practices. Consequently, crop yields are much below their demonstrated achievable potentials.

The Challenge: Improving the economy of agriculture, by modifying inputs and increasing overall productivity

Energy, Water & Environment

EW15



World Science Federation

Subject: Eco-Friendly Cement

Cement is a crucial mineral that has become an essential element in constructing houses, roads, highways, embankments, etc., during the last century. This industry has undergone many changes during different periods and has been able to produce quality products. However, production of one ton of cement can emit up to 1,000 pounds of carbon dioxide. Due to the many applications of this critical industrial material, it has become the third-largest emitter of carbon monoxide in the world. In this situation, it is necessary to produce newer products using new technologies such as nanotechnology and producing fewer greenhouse gases. As an example of such innovations in the cement industry, we can mention nanocomposites in which less cement is used, but they show more resistance than ordinary cement compounds.

The Challenge: New methods for producing cement with better mechanical and chemical properties and creating fewer greenhouse gases in their production process

EW16



Universal Scientific Education
and Research Network

Subject: Dust Problem in Iran

From the first days of the summer of 2009, Iran sank under a curtain of dust with the appearance of an unpleasant phenomenon called fine dust. Dust particles are dry and airborne particles that contain dust and smoke and give the sky a foggy appearance. The sources of dust are industrial and factory pollutants, car traffic, forest fires, desert expansion, plowing the land in dry climates, and so on. The dust phenomenon usually covers a thickness of less than one kilometer, but the dust storm in the summer of 2009 passed through the high mountains of Zagros and even the soaring Alborz Mountain range and affected the shores of the Caspian Sea in Gilan and has been for years. Iran faces this phenomenon every summer.

In Iran, the main source of fine dust is the drying deserts and swamps of Iraq, whose soil and sand come to Iran through the north wind. This wind lasts from June to September and is formed from the northwest of the Middle East and goes to the Persian Gulf and reaches the surface of open waters. The three countries of Iran, Iraq and Saudi Arabia jointly sprayed all the lands in a certain season of the year. Mulch is a sticky petroleum product that is used to stabilize quicksand in desert areas. The Iraq war has caused this to be forgotten, resulting in an increase in dust storms in Khuzestan, western Iran, and eventually in almost all of Iran. Heating and warming the whole area, destroying plants and living organisms, high cost, the need for advanced technology and difficult preparation steps, seems more and more necessary.

The Challenge: A sustainable, environmentally friendly and cost-effective solution to combat and permanently solve the dust problem.

Energy, Water & Environment

EW E17



Pakistan National Science &
Technology Park

Subject: Unavailability of Clean Drinking Water

Amid the rising population and climate change, the availability of fresh water is becoming worrisome in Pakistan, which may face absolute water scarcity by 2040.

Currently unavailability of safe drinking water deprives almost two-thirds of over 200 million Pakistanis of potable water and leads to the highest number of deaths in the country. A fundamental and definitive solution to this problem requires long-term solutions. But in the short term, effective and cost-effective solutions are needed.

The Challenge: cost-effective solutions for local drinking water supply.

EW E18



University of Central Punjab

Subject: High consumption of non-degradable chemical fertilizers and pesticides in Pakistan

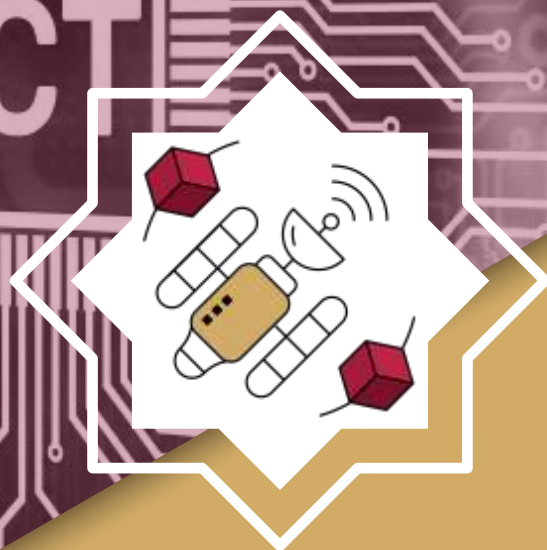
Agriculture sector of Pakistan is the backbone of economy which contributes 18.9% to GDP and absorbs 43.2% of labor force. Moreover, approximately, 22.1 million hectares of land are cultivated annually to feed the mass population of the country. Therefore, Pakistan imports agricultural chemicals, pesticides, and fertilizers valuing \$3.24b annually to meet the production demands and to keep the crops safe from biotic and abiotic threats. These imports are not only a huge economic burden but also jeopardize farmers and consumers livelihood. Chemicals from fertilizers integrate into food chain and are reported carcinogens and disease-causing agents. Moreover, being non-biodegradable, pesticides and fertilizers significantly damage the soil architecture. Biodegradable pesticides and fertilizers based on plant growth-promoting microbes are eco-friendly and healthy substitutes of this challenge. Biofertilizers and pesticides do not accumulate in soil, do not portray health challenges, and can be manufactured at local industries minimizing the huge economic burden of chemical imports for agriculture sector.

The Challenge: Minimizing the consumption of non-degradable chemical fertilizers and pesticides & replacing them with biodegradable alternatives.

Information & Communication Technology

INFORMATION
AND TELECOMMUNIC
TECHNOLOGY

ICT



ICT 1

Subject: The Implementation of Digital Technologies and Innovations in Addressing Global Warming

From the first days of the summer of 2009, Iran sank under a curtain of dust with the appearance of an unpleasant phenomenon called fine dust. Dust particles are dry and airborne particles that contain dust and smoke and give the sky a foggy appearance. The sources of dust are industrial and factory pollutants, car traffic, forest fires, desert expansion, plowing the land in dry climates, and so on. The dust phenomenon usually covers a thickness of less than one kilometer, but the dust storm in the summer of 2009 passed through the high mountains of Zagros and even the soaring Alborz Mountain range and affected the shores of the Caspian Sea in Gilan and has been for years. Iran faces this phenomenon every summer.

In Iran, the main source of fine dust is the drying deserts and swamps of Iraq, whose soil and sand come to Iran through the north wind. This wind lasts from June to September and is formed from the northwest of the Middle East and goes to the Persian Gulf and reaches the surface of open waters. The three countries of Iran, Iraq and Saudi Arabia jointly sprayed all the lands in a certain season of the year. Mulch is a sticky petroleum product that is used to stabilize quicksand in desert areas. The Iraq war has caused this to be forgotten, resulting in an increase in dust storms in Khuzestan, western Iran, and eventually in almost all of Iran. Heating and warming the whole area, destroying plants and living organisms, high cost, the need for advanced technology and difficult preparation steps, seems more and more necessary.

The Challenge: A sustainable, environmentally friendly and cost-effective solution to combat and permanently solve the dust problem.



Irancell

Information & Communication Technology

ICT 2



Pakistan National Science & Technology Park

Subject: Internet Coverage & Quality

Despite the growth of internet usage in Pakistan, a large part of the population is deprived of internet services. Moreover, internet quality is not up to the mark in many areas. In order to promote e-democracy and strengthen country's economy, holistic solutions are required to turn the digital divide into digital inclusion.

The Challenge: A Holistic solution for digital inclusion.

ICT 3



Pakistan National Science & Technology Park

Subject: Cyber Security

With increasing adoption of internet across Pakistan, the country needs to be prepared to meet all future cyber threats to public and private institutions and it must ensure safe and secure use of information and communication technologies in the region.

The Challenge: Cyber security solutions in Pakistan

ICT 4



Universal Scientific Education and Research Network

Subject: Ethical Issues Related to AI

In recent years, research projects in the field of artificial intelligence in research centers around the world are expanding dramatically at a very high rate.

The competition of scientific and research centers to advance this research in various branches of science, including medicine, engineering, etc., has accelerated the progress of research in this field.

Due to this issue, determining and setting precise criteria and methods to assess how and to what extent the development of artificial intelligence in various branches of health and treatment and medicine is necessary more than ever.

Given that at present a specific global organization does not directly and continuously monitor ethical standards in research related to artificial intelligence, in the first step it is necessary to set ethical standards and in the second step how to apply them in artificial intelligence research centers.

The Challenge: What criteria for ethics should be considered in artificial intelligence research in the field of healthcare and medical technologies? Given these criteria, how can this research be monitored around the world?

Information & Communication Technology

ICT 5



Subject: Pakistan's digital industry dependence on foreign suppliers

There is no significant design, manufacturing or production of microprocessors in Pakistan, and the country is dependent on imports to meet almost all of its needs for silicon chips and microprocessors. This shortcoming, in addition to placing a heavy burden on foreign exchange reserves and the trade balance, makes Pakistan's digital economy entirely dependent on foreign actors. At present, although the assembly of advanced microelectronics components has started on a small scale, Pakistan still needs to develop from the ground up in chip and microprocessor industry.

The Challenge: Strategies for localizing the digital industry and enhancing the capabilities of Pakistani domestic manufacturers in the field of chips and microprocessors

Organisation of Islamic
Cooperation's (OIC) Standing
Committee on Scientific and
Technological Cooperation

ICT 6



Subject: Governance in Pakistan using digital solutions

The concept of digital governance seems very complicated in a system like Pakistan where government departments are handling information manually or those who happened to be digitized are still not connected with any centralized digital hub under one platform.

It is also inconvenient to run systems in silos, not digitizing transactions at each point of service and not using the valuable insights (driven by the system). Having system-driven insights could bring a lot of change in managing simple functions like deciding on releasing funds for promoting education or strengthening healthcare or spending tons of money on infrastructure like roads, metro buses or investing in citizen facing government services or analyzing the future expense.

The Challenge: Improving the efficiency of the governance system in Pakistan through digital solutions

Organisation of Islamic
Cooperation's (OIC) Standing
Committee on Scientific and
Technological Cooperation

Health & Med-Tech



HTC1



Commission on Science and
Technology for Sustainable
Development in the South

Subject: Emerging Issues of Antibiotics and Antimicrobial Resistance Genes in Pakistan

Overuse of antibiotics has caused the emergence of antibiotic resistant bacteria (ARBs) and antibiotic-resistance genes (ARGs) which are threatening the health of humans, animals, and the environment. Pakistan - a highly populated country with 70% population living in rural areas, is heavily dependent on agriculture activities. Overprescribing or unregulated use of antibiotics has been noted in both humans and animals in Pakistan. Reports suggested that 71% of infections in newborns in Pakistan are due to ARBs. Up to 95% of the adult population living in India and Pakistan carries bacteria resistant to β -lactam – one of the most common antibiotics that includes penicillin and cephalosporin. Despite the volume of antibiotics used in Pakistan, little information is available regarding the ARGs spread and management. For better management of antibiotics use, ARBs and ARGs, knowledge about their occurrence, abundance, and diversity is important.

The challenge:

- Establishing spatiotemporal variations of antibiotics and antibiotic resistance determinants,
 - Identifying potential mechanisms for transfer of ARGs from livestock farms to clinics,
 - Characterizing fate of antibiotics in the soil environments with varying microbial communities,
- Identifying simple but key intervention strategies that can be adapted in Pakistan to reduce the burden of ARGs.

Health & Med-Tech

HTC2



Islamic Network on Science
and Technology Parks

Subject: Sterilization of Closed Spaces at the Same Time With the Presence of People During the Corona Outbreak

The coronavirus outbreak with very high transmission power, primarily through the air and penetration into the respiratory tract, has had many consequences and complications. The economic downturn and the closure of some businesses have been among the implications of the Coronavirus epidemic, which has caused severe damage to the economies of the countries involved, including Iran. Meanwhile, the service sector, especially services provided indoors and in confined spaces, has suffered the most closures and, consequently, the most economic losses. In addition, despite vaccinations and the reopening of public places, and the reactivation of businesses, with the spread of new and mutated strains of the virus with higher transmission rates, the closure of companies and the application of strict health laws are out of the question. Therefore, to prevent the closure and economic losses of businesses operating in closed spaces and confined spaces, the following challenge must be addressed:

The Challenge: Disinfection and sterilization of the space using modern technologies at the same time with the presence of people and also with the least risk to the health of the people present

HTC3



Pakistan National Science &
Technology Park

Subject: Inability to Eradicate Polio

Polio remains endemic in two countries, one of them being Pakistan. Therefore, poliovirus transmission needs to be interrupted in order to eradicate the risk of importation of polio, especially for vulnerable countries with weak public health and immunization services.

The Challenge: Interrupting the transmission of poliovirus.

HTC4



Pakistan National Science &
Technology Park

Subject: Provision of Healthcare in Remote Areas

Staff absenteeism and long distances to health facilities limit access to health facilities in many of the rural areas. Implementing a system to improve health services in rural areas is inevitable.

The Challenge: A system to improve service delivery in rural areas

Health & Med-Tech

HTC5



Pakistan National Science & Technology Park

Subject: Focusing on Curative Healthcare instead of preventive

Healthcare system mainly focus on curative efforts such as increasing number of health facilities, laboratories, ambulances and modern equipment. Focus needs to be shifted on covering cultural and environmental determinants to prevent disease rather than only the treatment of disease.

The Challenge: Strategies for preventive medical care

HTC6



Universal Scientific Education and Research Network

Subject: Depressive Disorders

By spanning the world's history we firstly, witness the key role of communicable diseases in taking the lives of people. Hopefully, with the help of sanitation and vaccination, we were able to decrease the effects of these diseases. But unfortunately, the impact of communicable diseases has shown up next as the leading causes of mortality and morbidity. This problem appeared as a result of lifestyle changes, and it's somewhat solvable with lifestyle modification too.

Now the main problem is that mental health issues are taking the place of these two causes as the world moves more towards technology! One might think what Japan, as one of the strongest world economies, has the highest amounts of suicide? Mental health issues and, on the top major depressive disorder is really winning the race, and in the upcoming years, it will be the leading cause of mortality and morbidity.

The Challenge: ChaWhy is this happening? How could we stop it and rescue the world from this hidden ghost?

HTC7



International Center for Chemical and Biological Sciences

Subject: Artificial Intelligence and Brain Tumor Imaging

The first step in treating patients with brain tumor is to remove as much of the mass as possible through surgery. A sample of tumor mass examined during surgery not only helps to precisely diagnose the tumor, but also aid in defining the margins between healthy and tumor brain tissue. The intraoperative diagnosis is essential for providing safe and effective care during cancer surgery. Nonetheless, intraoperative pathology analysis takes time, including sample processing, staining, and analysis by a pathologist, and during this time the surgeon and patient both have to wait for the results. A new study shows that a process that combines an advanced imaging technology and artificial intelligence (AI) can precisely identify brain tumors in less than 3 minutes during the surgery. The approach is able to accurately distinguish tumor tissue from healthy tissues. Optical imaging and AI are making brain tumor diagnosis quicker and more accurate. Computers are trained to "see" the patterns of disease hidden in cells and tissues. The remarkable use of computer-generated AI is quickly providing neurosurgeons with valuable, real-time information about the type of brain tumor, while the patient is still on the operating table. In operating room, faster also means more affordable. The researchers are also using an AI algorithm called a deep convolutional neural network to learn the characteristics of the 10 most common types of brain cancer and predict diagnosis. Thus, today neurosurgeons can leave the operation theatre with assertiveness than before about their patient's brain tumor diagnosis because this application of AI allow them to quickly see diagnostic tissue and tumor margins in near-real time. This means neuropathologists can review the images without the need for a pathology lab, eliminating the long wait time.

The Challenge: How can Artificial Intelligence Speeds Brain Tumor Diagnosis?

HTC8



International Center for
Chemical and
Biological Sciences

Subject: Artificial Intelligence and Retinopathy

The figure of individuals with age-related ophthalmic diseases is on the rise, and considered as a central cause of vision loss in the elderly age group. Cataract is still the key cause of visual impairment and blindness worldwide, but other age-associated ophthalmic diseases, including AMD, diabetic retinopathy (DR), and glaucoma, are not much less in developed countries. According to World Health Organization (WHO) most recent published report, approx. 2.2 billion people have a near or distance vision impairment, globally. The majority of people with vision impairment and blindness are over the age of 50 years; however, vision loss can affect people of all ages. The use of AI in various fields of medicine holds promise for massive screening program and perhaps helps in establishing a diagnosis with high sensitivity and specificity. The technology is not very new, and its application is expanding in various subspecialty of ophthalmology. The capacity to build complex computing to execute pattern recognition of different vision threatening conditions by developing intricate relationship based on providing image data and then evaluating it with performance standards. Unfortunately, the existing technology fail to detect associated multiple conditions for instance glaucoma and AMD, while screening for a particular serious sight-threatening condition such as DR. Considering the overwhelming incidences of various sight-threatening disorders, such as AMD, glaucoma, and cataract, with age, massive AI technology-based screening program is required with high accuracy to delay or prevent blindness in susceptible individuals. An algorithm is needed to involve deep learning (DL) and add decision-making capability in the technology. The required software must be highly proficient in distinguishing all the necessary parameters of AMD, glaucoma, and cataract while screening process, and make proficient diagnosis in a cost effective manner. In addition, the technology facilitate ophthalmologist in monitoring respond to treatment with great accuracy.

The Challenge: How can Artificial Intelligence (AI) technology help in the screening and diagnosis of vision threatening conditions in various age groups?

HTC9



Organisation of Islamic
Cooperation's (OIC) Standing
Committee on Scientific and
Technological Cooperation

Subject: Growing population and lack of adequate health facilities in Pakistan

Pakistan's healthcare system faces numerous problems, limitations and contradictions. Lack of health care facilities in rural areas and expensive surgical and medical services are important causes of health decline in Pakistan. Lack of resources, inequality, inadequate and untrained human resources, structural mismanagement and gender inequality are other problems of Pakistan's health system. Currently, 78% of the population still pays for health care out of pocket. With the increase in population and the spread of poverty, these conditions have intensified and access to cheap and high-quality health facilities in rural and urban areas has become impossible for many people. Inadequate transportation network in rural areas doubles the challenge.

The Challenge: Innovative solutions to address Pakistan's health sector challenges

ECO 10



Subject: Early Detection of Covid-19 in Pakistan Prior to Surfacing of Major Symptoms

Having tools for a quick diagnosis of cases is essential to: identify, isolate and treat affected patients and thus contribute to mitigating the spread of the disease.

Currently, there are 2 different types of diagnostic tests that provide information on the different phases that a patient infected by SARS-CoV2 may encounter:

Test that detects the presence of virus in the patient, called Direct tests.

Test that shows that a patient has been infected through antibodies that he has created against the virus, called Indirect tests. Due to rapid change in sequence of viruses there is need to:

The Challenge: Formulate more efficient detection and early diagnosis techniques to minimize the consequences and death rates.

ECO 11



Subject: Adaptation of Medical Technologies and Understanding Dynamic Shifts in Consumer Behavior

Variety of challenges have risen due to the unprecedented challenges associated with Covid-19 pandemic. Extended lockdowns, shortage of medical supplies, logistical challenges and lack of infection testing equipment have restricted the access for those seeking medical consultation and diagnosis. In turn, this phenomenon has also increased the self-medication behavior in public and often lead to dire consequences due to inappropriate or absence of diagnosis from medical professionals. On the other hand, lack of protective equipment have also impaired the ability of medical professionals to perform thorough diagnosis to those seeking health consultation for even marginal health related issues.

The Challenge: Integrating medical technological solutions, into the mainstream of medical consultation processes and developing standard operating procedures (SOPs) for the purpose of diagnosis, monitoring and treatment of diseases.

Transportation



TRS 1

Subject: High Traffic

Population growth, migration of larger population to urban centers, increased motorization, and shortage of public mass transit are some of the most common reasons for heavy traffic flows. Aside from the latest flurry of activity in the public transit area, boosted by mega bus rapid transit (BRT) or metro bus projects, as well as startups like Airlift and Swvl, Pakistani cities have long suffered from a lack of public means of transport. This has led to a rise in the usage of rickshaws, QINGQIs, and motorcycles, and also resulted in a massive increase in car purchases until recently.

The Challenge: Strategies to solve the high traffic problem in Pakistan's major cities.



Pakistan National Science & Technology Park

TRS 2

Subject: Road Safety Concerns

Road safety is a major concern in Pakistan. This is even a major public health issue. It is estimated that every five minutes someone is killed or badly injured in a road traffic crash.

The Challenge: An improved system for traffic management with an efficient mechanism for accident compensation.



Pakistan National Science & Technology Park

Transportation

TRS3



Pakistan National Science &
Technology Park

Subject: Tourism Sector Mobility Issues

Pakistan's tourism industry currently faces the challenge of undeveloped routes and hospitality as well as lack of basic facilities for the tourist in many areas. Mobility issues need to be resolved in order to boost tourism in the

The Challenge: Effective solutions to improve transportation services and move tourists within and between cities.

TRS 4



Organisation of Islamic
Cooperation's (OIC) Standing
Committee on Scientific and
Technological Cooperation

Subject: Infrastructural shortcomings in Pakistan's transportation system

The concept of digital governance seems very complicated in a system like Pakistan where government departments are handling information manually or those who happened to be digitized are still not connected with any centralized digital hub under one platform.

It is also inconvenient to run systems in silos, not digitizing transactions at each point of service and not using the valuable insights (driven by the system). Having system-driven insights could bring a lot of change in managing simple functions like deciding on releasing funds for promoting education or strengthening healthcare or spending tons of money on infrastructure like roads, metro buses or investing in citizen facing government services or analyzing the future expense.

The Challenge: Improving the efficiency of the governance system in Pakistan through digital solutions

2021 Special Field: Mining and Mineral Industries



M&M 1



Zarrin Industrial
& Mining Group

Subject: Reduction of iron in the production process of nepheline syenite concentrate.

The nepheline syenite mineral is processed in a concentrate factory and its iron is reduced. Iron is considered as a pollutant and reducing its amount leads to an increase in the added value of the final product.

In this way, we have reached operational technologies to reduce the grade of iron and other pollutants. Our challenge is to achieve the executive method in the factory in reducing the grade to 0.05 percentage is technically and economically justified.

The challenge: New operational technology, reduction of iron grade to 0.05%, constant oxide content

M&M 2



Zarrin Industrial
& Mining Group

Subject: Extraction and separation of rare earth elements from their concentrate with apatite base

Extraction and separation of rare earth elements from their concentrate with apatite base. Concentrate of rare earth elements with apatite concentrate base contains 30% of LREE, HREE and MREE that have gained the knowledge of its technology. Also we have even reached the separation of Cerium, Lanthanum and Neodymium.

The challenge: Isolation and extraction of other rare earth elements in concentrate by a method applicable in semi-industrial and industrial scale

M&M 3



Zarrin Industrial
& Mining Group

Subject: Conversion of calcium sulfate as a by-product to the grade of gypsum as construction materials.

Calcium sulfate is a byproduct of the most with the sulfuric acid chemical processes.

In many cases, this product is turned into a dry cake with high purity in the factory after separation, filtration and washing.

Despite its high purity and gypsum phase conversion, it cannot be used as a construction material.

Therefore, many industries face large volumes of acidic waste depots that have high environmental accumulation costs.

The challenge: Inventing a method for converting process gypsum to construction gypsum with technical and economic justification on an industrial scale

M&M 4



Zarrin Industrial
& Mining Group

Subject: Accurate measurement of lithium and bromine in various types of brine, extraction and separation methods on an industrial scale.

the brine contains salts of alkali and alkaline earth metals.

The concentration of calcium, sodium, potassium and magnesium cations is ten thousand times that of lithium.

In the existing measurement methods, we encounter cationic interference for lithium, and on the other hand, it is very difficult to separate this valuable element in low concentrations with the presence of the above cations.

The challenge: Build a correct measuring device without interference on ppb scale

(Except for ICP-OES device of Jena Analytical Company)

Also, an economic method of separation on a semi-industrial scale that has the necessary technical and economic justification

M&M 5



Zarrin Industrial
& Mining Group

Subject: Enrichment of low - grade hematite ore tailings in plant scale

Access to hematite mines for the production of concentrate above 60% is based on domestic and foreign market demand in previous years in Iran.

In this way, the lack of use of advanced machines and methods has led to the accumulation of numerous depots called tailing.

With increasing market demand and shortage of hematite reserves, hematite accumulation tailing is considered as a secondary source of iron on which many mining operations have been performed.

These sources have a lower grade than concentrate and can be converted to concentrate by acquiring new high-grade technologies.

These resources are economically justified and reduce environmental problems.

The challenge: Inventing mechanical processing methods with technical and economic justification on a semi-industrial and industrial scale

◆ Message From the Head of KANS 2021

In the second round of the KANS scientific competition I invite every young professor, university student, and innovator under 45 years of age to participate in this competition by submitting his/her scientific achievements or solutions for challenges declared by international scientific institutions. I wish more success to Islamic world in scientific cooperation.



◆ About Mustafa^(pbuh) Science and Technology Foundation (MSTF):

Laying emphasis on the development of science and technology in the Islamic World by adopting a nonprofit approach and maintaining full independence in achieving its goals, revering the Holy Prophet^(pbuh) and following Islamic teachings, the Mustafa^(pbuh) Science and Technology Foundation (MSTF) has been established.

Mustafa Foundation has started its activities by facilitating collaborations, networking, accreditation and discourse between the Islamic countries in the field of science and new technologies and forming contiguous chain of knowledge and wealth.

KANS

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