

37th Conference of Rectors and Presidents of European Universities of Technology

The University Role in Developing Innovation Ecosystems

September 14th-15th, 2018



crp

Day 2: Section I: Universities' Roles in Innovation Ecosystems: Examples and Experiences 1

Stanislav Kmet

Roles of the Technical University of Kosice (TUKE) in Innovation Ecosystem: Examples and Experiences

Challenges for universities ...

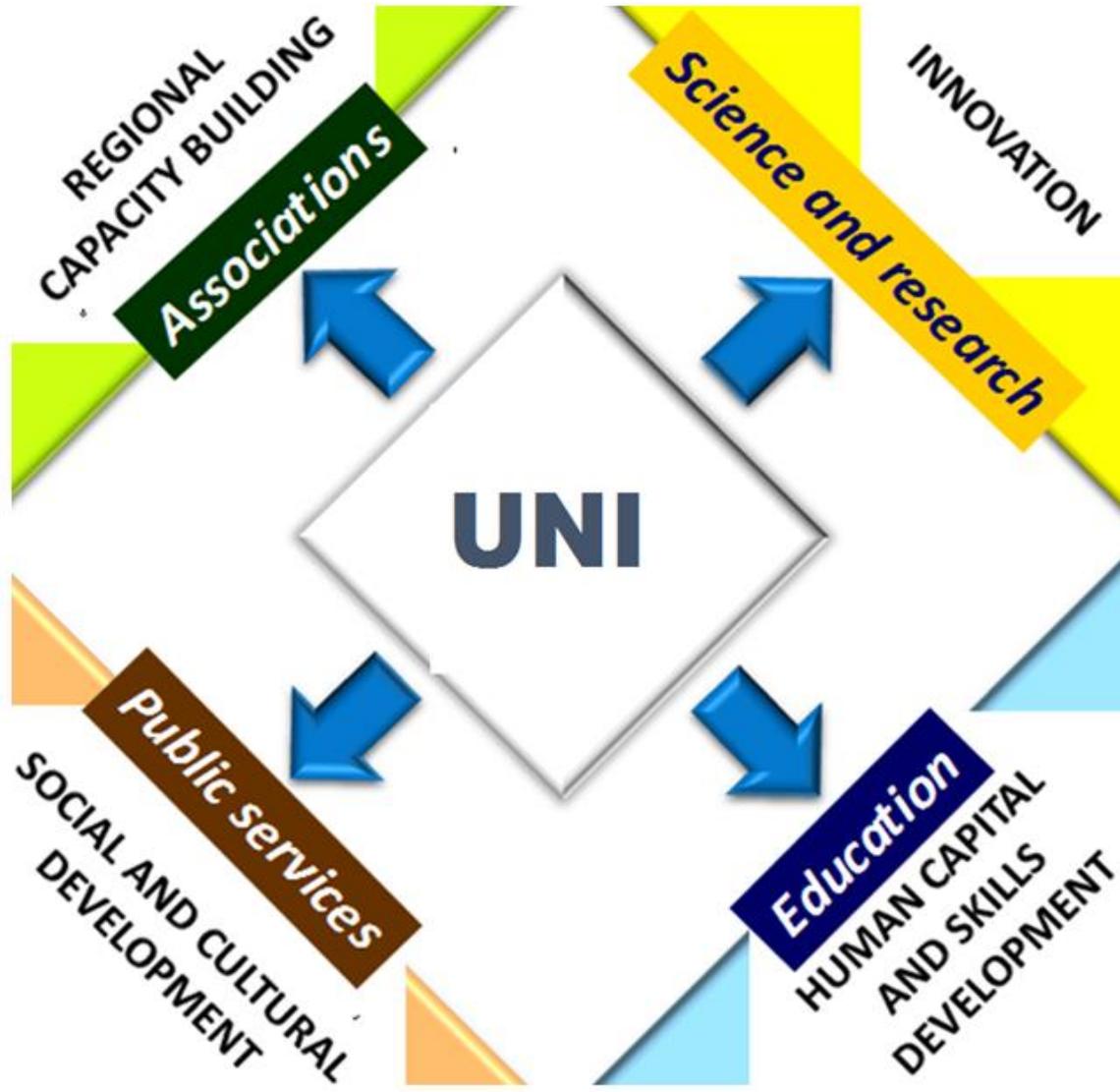
How can we provide leadership in an ecosystem context ?

▶ TUKE creates a unique multi-disciplinary institution capable of benefiting from the synergies generated by the combination of diverse disciplines and approaches.

▶ **Research excellence** is considered a critical factor to attract business collaboration with the university.

▶ TUKE university and its knowledge serves the city, region and country.

TUKE is a strong player (**leader**) in a creation of Innovation Ecosystem (9 faculties, including Faculty of Arts, Economy and Aeronautics)

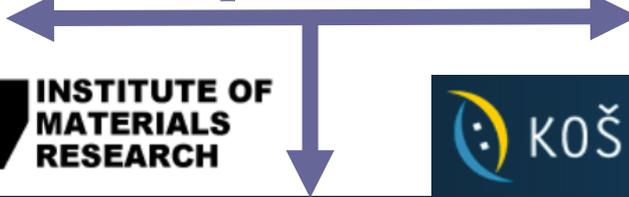




INSTITUTE OF MATERIALS RESEARCH

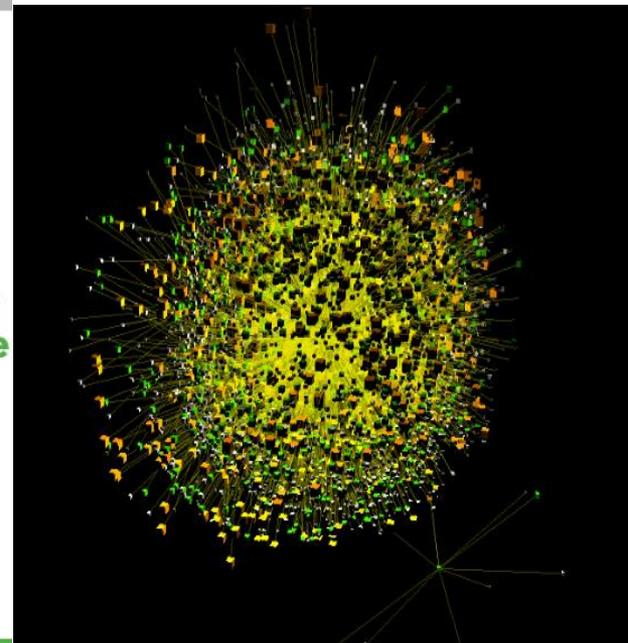
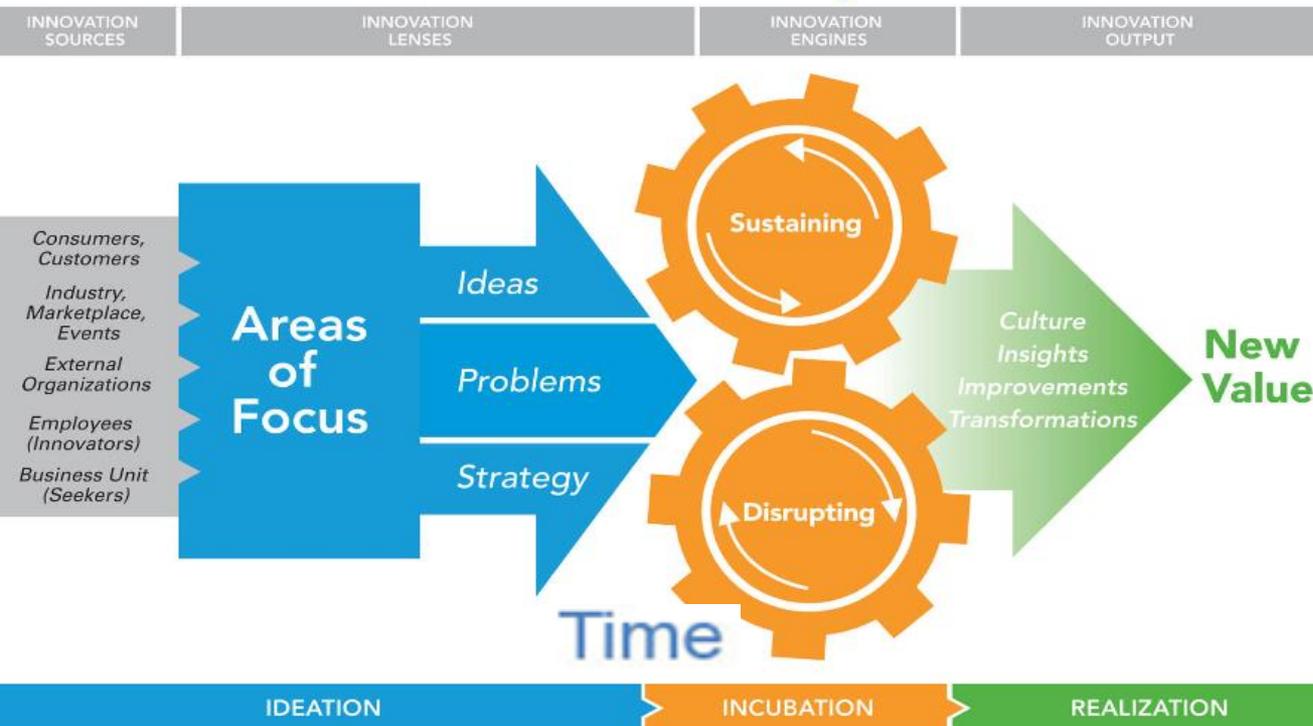


Cooperation

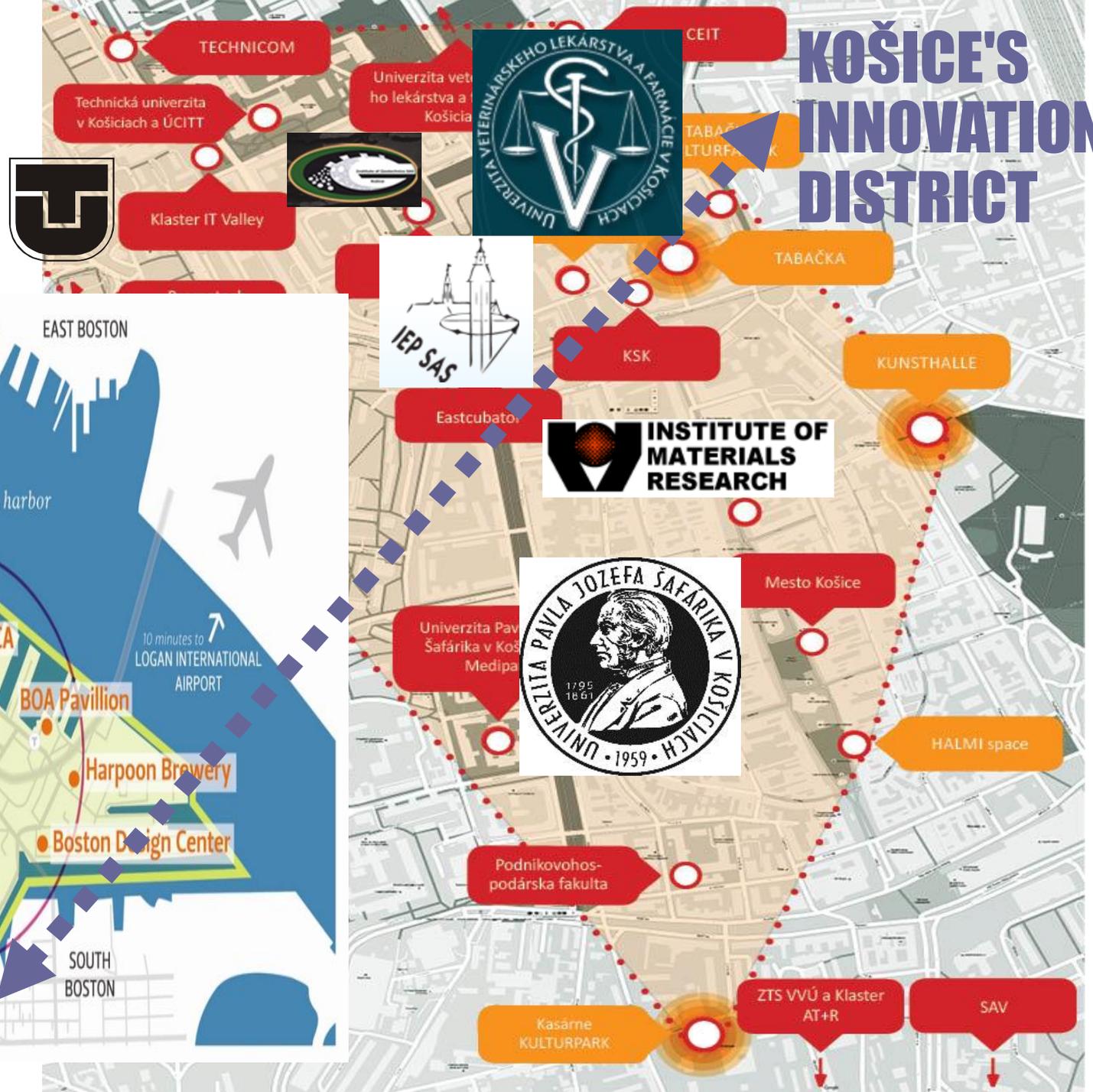


A strong role of TUKE within Regional Innovation Strategy *in accordance with* National and Regional Research and Innovation Strategy for Smart Specialisation

Innovation Ecosystem



KOŠICE'S INNOVATION DISTRICT

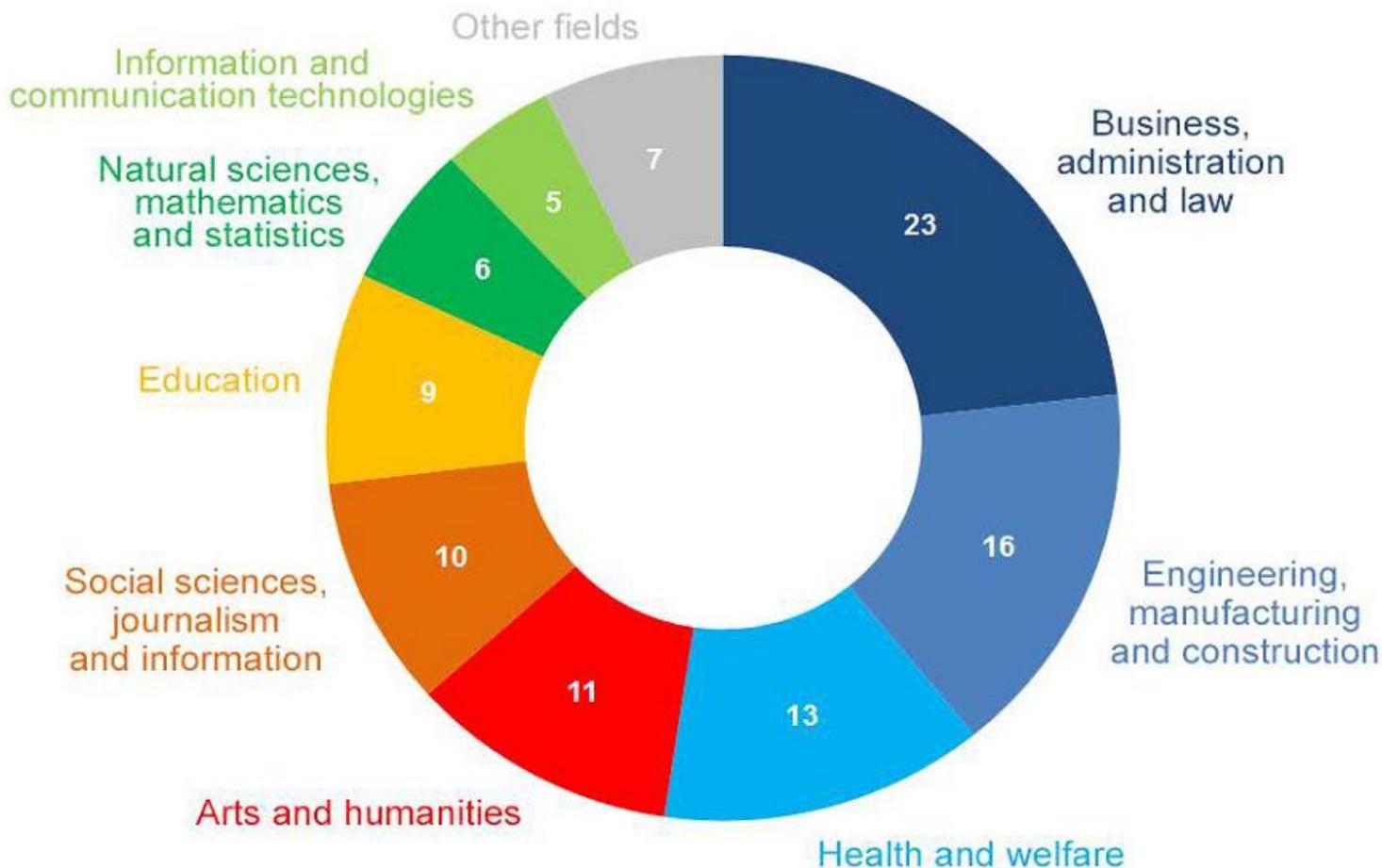




What do young adults study?

What kind of study is the greatest interest?

The universities in Košice offer all the required courses.



Mission

By means of the mutual cooperation of all stakeholders using internal innovation potential and available financial resources **to achieve prosperity** of the Košice region

Pillars of Regional Innovation Strategy (RIS 2016+)

Excellence in research and development

Commercialization of research and innovation

Support of innovative business and promising sectors

Quality human resources for increased innovation performance of the region



PAVOL JOZEF ŠAFÁRIK UNIVERSITY IN KOŠICE

SLOVAK ACADEMY OF SCIENCES



UNIVERSITY OF VETERINARY MEDICINE
AND PHARMACY IN KOŠICE



Technical University
of Košice

Challenges for universities ...

How can governments best support us and our partners ?

- ▶ Increase investment in basic and applied research.
- ▶ The government must work with industry to better understand the scientific and technical demands to next-generation solutions, and **fund research that directly relates to solving most essential needs of the country.**
- ▶ Invest in commercialization (**patent costs**, technology transfer operations).

▶ Invest in education by **strengthening required study fields.**

- Innovation comes from people.
- The student component of university research programs is essential.
- A unique strength of research universities is our graduates.
- They understand the innovations of today so well that they will continue developing the innovations of tomorrow.

IMPORTANT

Impact of the university to the city of Košice

MinebeaMitsumi
Passion to Create Value through Difference

MinebeaMitsumi
Passion to Create Value through Difference

MinebeaMitsumi company from Japan builds its largest factory in Europe in Košice.

For over 1000 employees and 100 researchers.

Zdroj: TASR/František Iván



The concrete result of „policy synergy“ at national, regional, local city and, last but not least, TUKE university level.

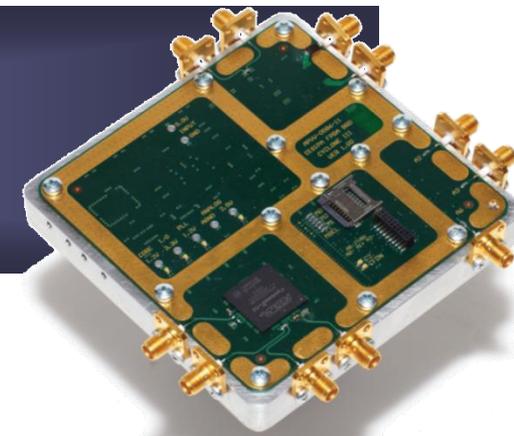
Challenges for universities ...

Governmental supports:

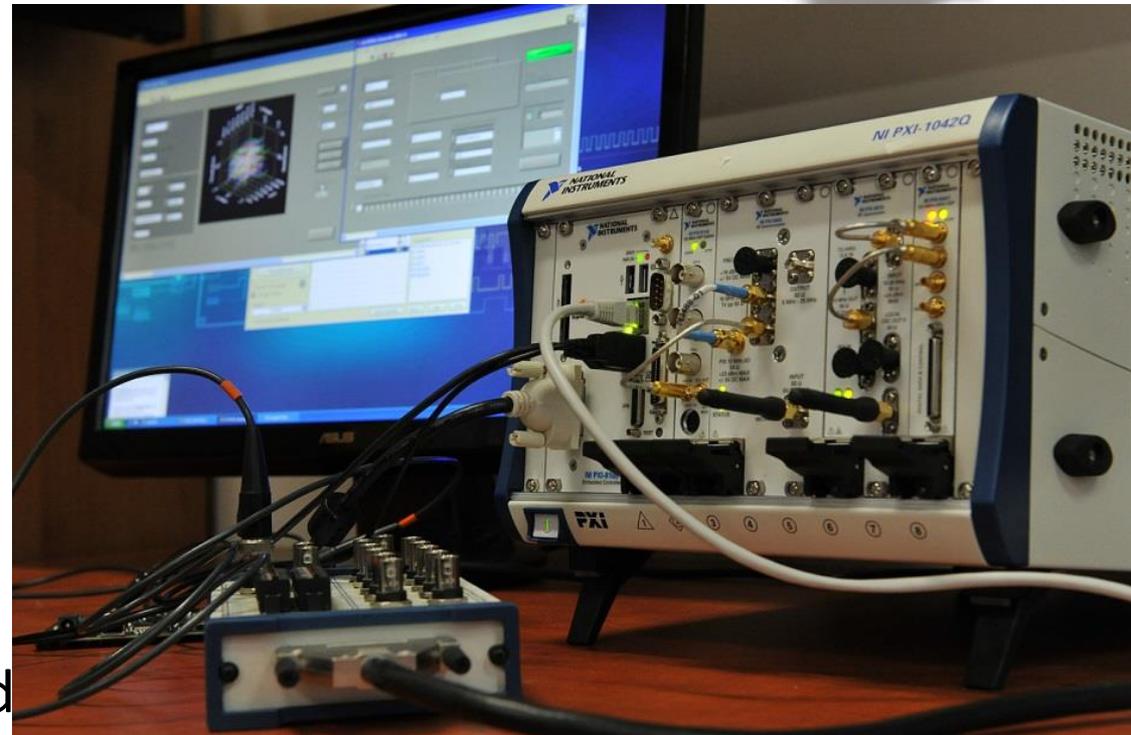
Top Scientific Teams

▶ Selection based on the strong criteria

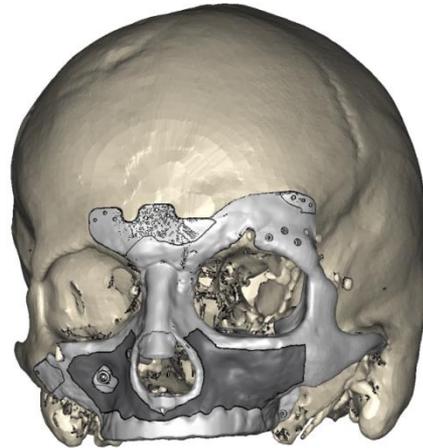
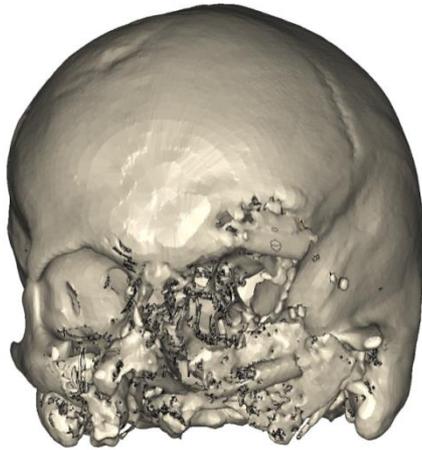
Research team for electronic systems



- Compressed sensing and non-orthogonal signal decomposition
- Real-time dynamic spectrum distribution in the cognitive networks
- TRUE random number generators on FPGAs (patented)
- Lead free solders for applications in power and high frequency electronics



Top Scientific Teams



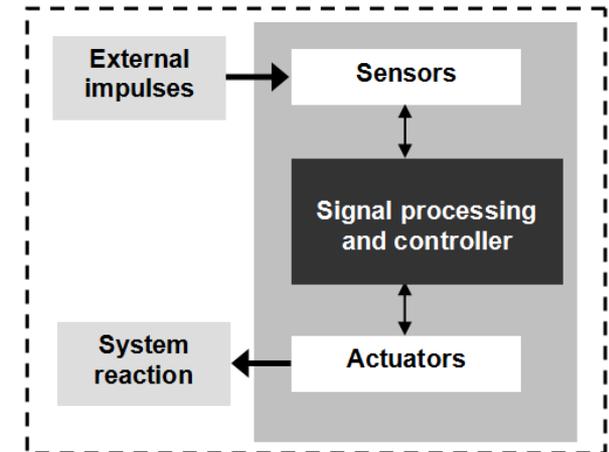
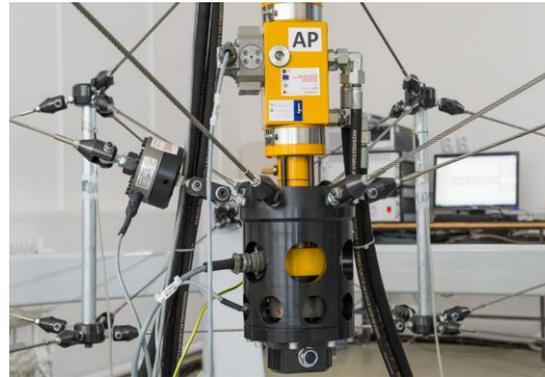
- Design of individual implants using medical DICOM data
- Design, biomechanical simulations and testing of serial implants
- Additive manufacturing and a 3D printing of individual implants
- Measurement, verification and validation of produced implants

Top Scientific Teams

Faculty of Civil Engineering

A scientific team for computational and experimental analysis of adaptive structures

Why adaptive structures: *Are able to resist to the extreme loads*



Adaptive system – basic principle



Chameleon:
a Natural
Adaptive
System

Top Scientific Teams

Challenges for universities ...

How to best integrate university missions in education, research and innovation ?

▶ Recruit top-notch entrepreneurs.

- Entrepreneurs identify opportunities and introduce valuable application targets, contribute directly to the **growth of start-up companies** and improving the odds of success.

Challenges for universities ...

▶ Provide postdoctoral opportunities.

- In the effort to move innovative discoveries to market (**commercializing research**), universities should find ways to retain the graduate students after they complete their degree.
- New “post-docs” can help take technology the last-mile, to the point where it can be transferred. Retaining these new graduates is often essential to sustaining the momentum of an emerging start-up.
- One way to do this is through Structural Funds of EU: **Long-term Strategic Research Projects.**

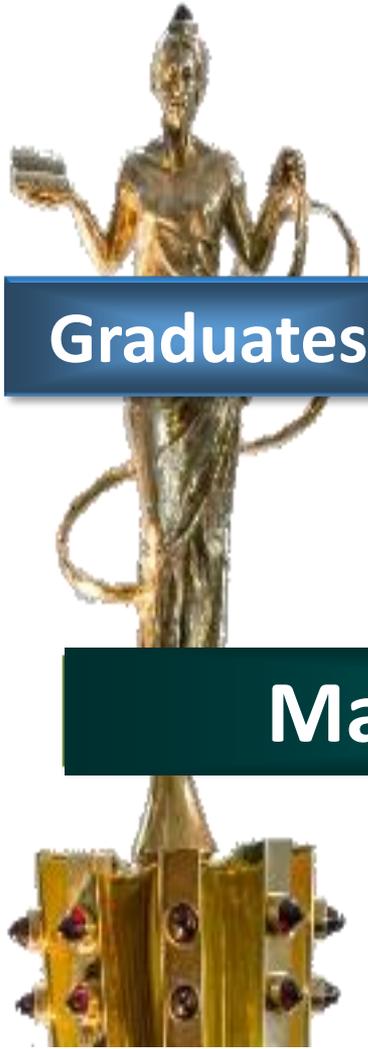
Education

Knowledges



Learning

R&D



Graduates

**Transfer
of technologies**

Knowledge

Solutions

Know-how

Patents

Expertises

Projects

Market – practice, guidance, courses

Third mission

IMPORTANT

New economic roles, determinants and engagement modes of universities 1 (Courtesy: Uyarra, E.*)

MODEL	KNOWLEDGE FACTORY	RELATIONAL UNIVERSITY
Main role of universities	Production of scientific knowledge	Exchange of knowledge
Main partners – beneficiaries	High-tech firms located in proximity to universities	Large manufacturing firms
Key factors influencing impact	Research intensity	Structural factors (size of firm, sector, age, R&D intensity)

*Uyarra, E.: Conceptualizing the regional roles of universities, implications and contradictions. *European Planning Studies* 18.8, 2010, 1227-1246.

New economic roles, determinants and engagement modes of universities 2 (Courtesy: Uyarra, E.*)

MODEL	ENTREPRENEURIAL UNIVERSITY	SYSTEMATIC UNIVERSITY
Main role of universities	Active commercialization role	Boundary-spanning role
Main partners – beneficiaries	Large manufacturing firms Spin-off firms	Regional clusters Regional SMEs
Key factors influencing impact	Organizational structures / forms	Regional system configuration <u>Regional policy</u>

*Uyarra, E.: Conceptualizing the regional roles of universities, implications and contradictions. *European Planning Studies* 18.8, 2010, 1227-1246.

New economic roles, determinants and engagement modes of universities 3 (Courtesy: Uyarra, E.*)

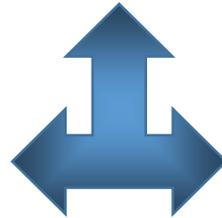
MODEL	ENGAGED UNIVERSITY
Main role of universities	Developmental role
Main partners – beneficiaries	Regional stakeholders
Key factors influencing impact	Number and synergies between universities

*Uyarra, E.: Conceptualizing the regional roles of universities, implications and contradictions. *European Planning Studies* 18.8, 2010, 1227-1246.

New economic roles

- **Universities can decide about their role and engagement, not a „one size fits all“ approach (research university, or other model... primary educational institutions)**

University as Knowledge Factory



**Co-location of firms and universities
Increased funding for research**

Positive consequences: A rapid increase of the number of publications in the databases WoS, Scopus, Current Contents ...

Challenges for universities ...

How to be organised: University structures and processes supporting innovation

▶ Creation of Science parks and research centres

▶ The **USP Technicom**, founded by TUKE, is an ecosystem for acceleration of technology transfer, innovation and business support.

Challenges for universities ...

- ▶ The **USP** creates the space to support
 - the implementation of applied R&D,
 - ensures the transfer of R&D results to economic and social practices, and
 - supports the establishment and development of companies that utilize the outputs of the R&D in innovative products, goods and services.

Entrepreneurial university: The TECHNICOM University Science Park, MEDIPARK, PROMATECH, activities for active commercialisation and spin-off firms



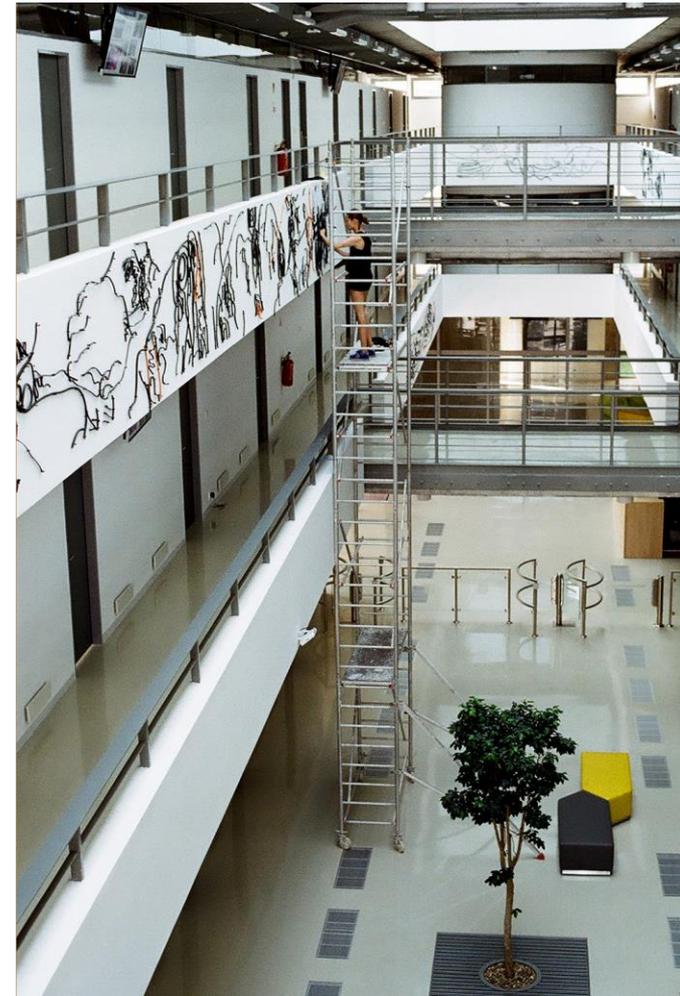
TECHNICOM University Science Park with

UCITT - University Centre for Innovation, Technology Transfer and Protection of Intellectual Property Rights

**UNIVERZITNÝ VEDECKÝ PARK
TECHNICOM**

The image shows the exterior of a modern building with a glass facade. In the foreground, a large white sign with dark, raised lettering reads "UNIVERZITNÝ VEDECKÝ PARK" and "TECHNICOM". To the right of the sign, a set of stairs with a metal railing leads up to the building's entrance. Several people in business attire are walking on the stairs and on the paved area in front of the building. The sky is overcast.

Connection of science with art in the environment for innovative ideas (it is really what we need = **non-traditional approaches**)





STARTUP CENTRE

VISIT OF THE PRESIDENT OF THE SLOVAK REPUBLIC



EXAMPLES
OF CURRENT
STARTUPS



Technická univerzita v Košiciach
Univerzita vedecký park Technopol

STARTUP centrum

Startup centrum TUKE predstavuje

CHARGEBRELLA

Chargebrella je unikátne zariadenie v podobe dotáčníka, ktorého potaňovaná technológia premenia teplo na elektrickú energiu. Technológia využíva tepelnú energiu slnka alebo iného tepelného zdroja vďaka, ktorej dokáže nabíjať batérie mobilných zariadení. Parabolka odnáša slnku ok okčianov pred dažďom, na po jej obrátení k slnku, slnku slnku ako koncentrátor tepelnej časti slnečného žiarenia priamo do ruky a tým zabezpečí nabitie.

© 2016 Chargebrella s.r.o. | www.chargebrella.com | +380 97 200 12 12

Technická univerzita v Košiciach
Univerzita vedecký park Technopol

STARTUP centrum

Startup centrum TUKE predstavuje

VARIM

Varim sa zameriava na automatickú prípravu, hohových jedl. Systém Varim sa postará o prípravu nadjopov, polievok, zlietok a pod. Je vhodný pre stacionárni, firmy, nemocnice, interné, sociálne zariadenia. Varným systémom komunikuje s užívateľom cez dotykový displej alebo časť sms, aplikáciu či internet. Stačí do systému vložiť vybrané potraviny, zvolí recept, nastaví čas a Varim sa postará o prípravu čerstvých a chuťných jedl.

© 2016 Varim s.r.o. | www.varim.sk | +380 97 200 12 12

Technická univerzita v Košiciach
Univerzita vedecký park Technopol

STARTUP centrum

Startup centrum TUKE predstavuje

HONEYLOG

HoneyLOG honeylog je systém založený na pasciach pre účelnicov (honeylogoch), ktorých cieľom je prilákať účelnicov a získať o ktorých môže byť informácia, hohma však cieľ účelnicu, postup pri úroku a použité nástroje. Systém zberá rôzne stávaný a honeylogov a pomocou korelácie týchto údajov, poskytuje rôzne štatistiky a detailnejšie analýzy. HoneyLOG sa zameriava na troje a štracie podniky, ktoré si nemôžu dovoliť hohvávať pre väčší skupen bezpečnosti.

© 2016 HoneyLOG s.r.o. | www.honeylog.sk | +380 97 200 12 12

Technická univerzita v Košiciach
Univerzita vedecký park Technopol

STARTUP centrum

Startup centrum TUKE predstavuje

EMOMIME

Emomime je inteligentná digitálna postava vo výkladoch obchodov, ktorá analyzuje okoloobčidných ľudí. Na základe tejto analýzy (pozície, vek, typ ošechána a emócie) Emomime vyberá svoje správanie, aby získal pozornosť ľudí a prilákal ich dnu do obchodu používajúce štie sa štrajkujúca umelý inteligenciou. Obchodové a "plug and play" riešenie obchodní jednoducho zpopli. Emomime transformuje výklad na emóciu židliok a navrháva staromódne štatistické figúrny.

© 2016 Emomime s.r.o. | www.emomime.com | +380 97 200 12 12

Innovation & Technology Transfer

Relational university: Bi-directional knowledge sharing between companies and TUKE

RWE
The energy to lead



U. S. Steel Košice, s.r.o.
A Subsidiary of United States Steel

Teko
TEPLÁREŇ KOŠICE

GETRAG



IBM



ABB

embraco POWER IN.
CHANGE ON.

CISCO

SLOVALCO

T-Systems



at&t



**ŽELEZIARNE
PODBREZOVÁ**

- T-Systems Slovakia – about 20 tailored courses,
- VW Slovakia: „Eng-A“, Internships, labs, etc.,
- US Steel Kosice Internships,
- RWE – TUKE agreement about PhD support,
- CISCO Academy program,
- Embraco - about 40 courses, etc.



Systemic university: boundary-spanning role, involved in IT Valley regional cluster established in 2007, triple helix

Košice IT Valley

Association Founding Members:

- ▶ Universities (TUKE, UPJŠ)
- ▶ Košice Self-governing Region
- ▶ ICT Companies (T-Systems, NESS, Siemens PSE, VSE IT, Cisco, ST, Microsoft)

At present: over 50 members



● **The aim was:**
Enhancing the attractiveness of East Slovakia Region and others

Challenges for universities ...

Creations of:

University research centres

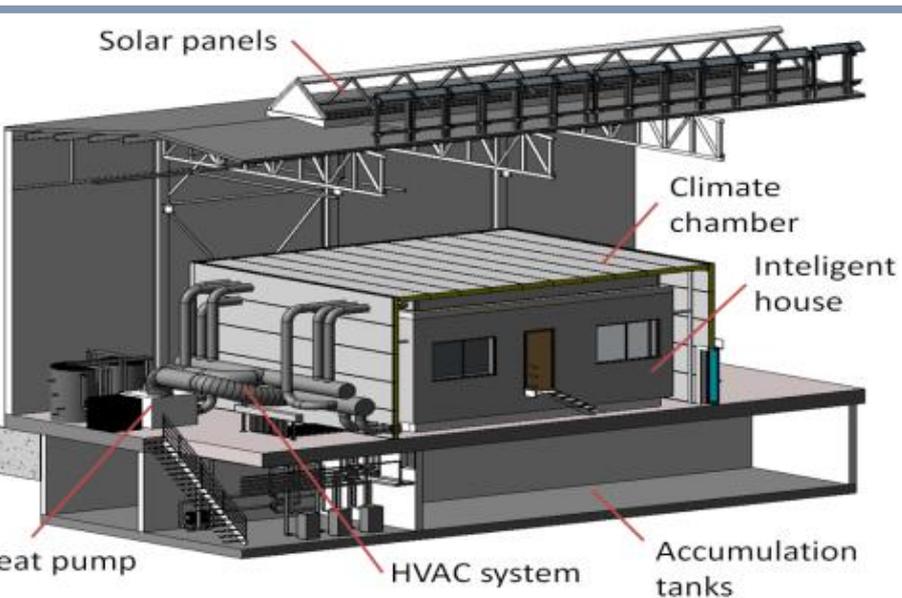
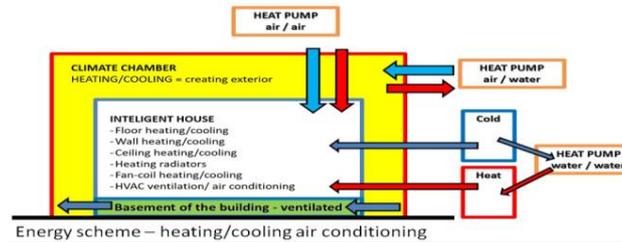
- **Multi- and Inter- disciplinary research teams for complex solution of difficult problems**

Center for an Efficient Integration of Renewable Energy Sources



Specific activities of the Center

- biomass
- hydrogen
- solar energy
- geothermal resources
- effective integration of renewable energy sources
- Intelligent low energy house



visualization of climate chamber and intelligent house



University Institutes

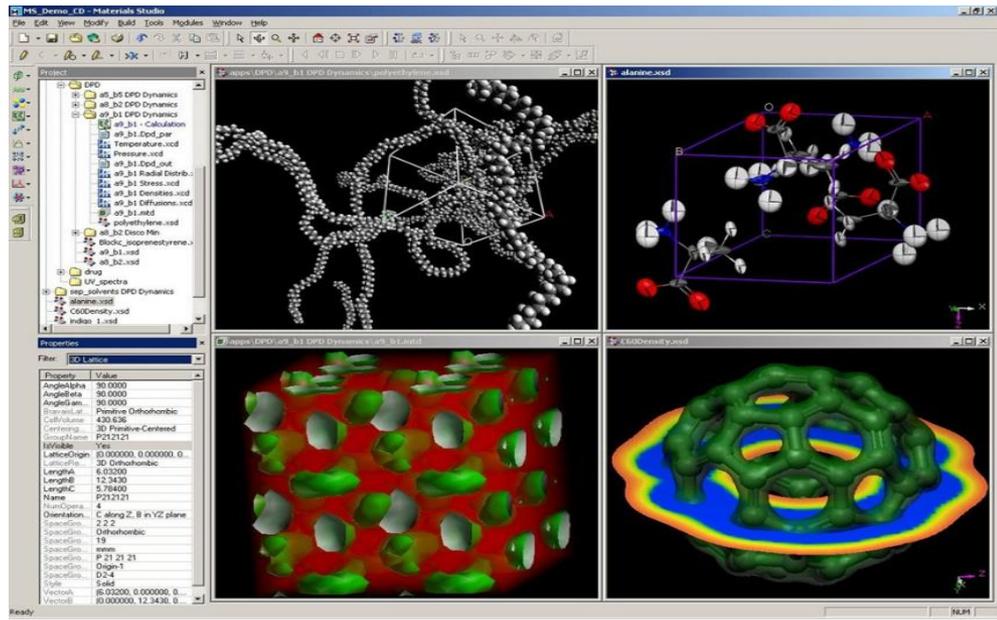
Center of Advanced Visualisation

- **Research and development of new communication tools and cannels in the education, culture and art.**



University Institutes

... and other institutes at the TUKE ...



University Institutes

Supporting activities and programmes

Mobility through

ERASMUS +



- More intensive use for example in the preparatory phase.

Challenges for universities ...

How to combine basic and applied research towards innovation

▶ **University spin-offs** are an important tool in transforming fundamental scientific results into radical innovations and play an essential role in the evolution and renewal of the economy.

- **Faster process from TRL 1 to TRL 9**
(Technology Readiness Levels)

The new Framework Program for Research and Innovation 2021-2027 will be named **Horizon Europe** and a budget of almost € 100 billion Euros



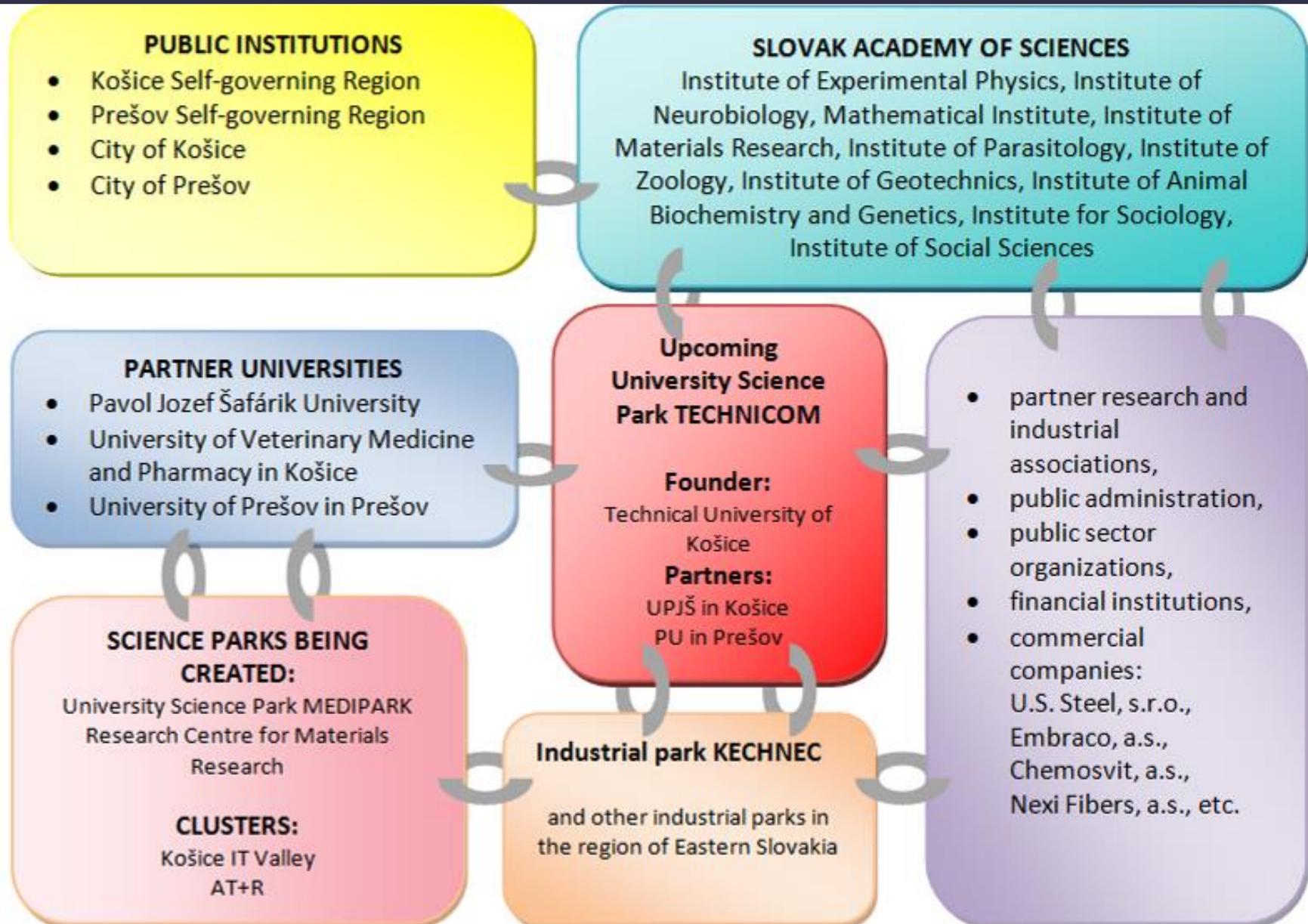
Allocation of more funding for **collaborative research projects and frontier research** (i.e., research at lower TRLs), as this would propel stronger links between innovation, research and education.

Intensification of multidisciplinary

Innovative, multidisciplinary approaches need not only deeper links between Science, Technology, Engineering and Mathematics (**STEM**) and Social Sciences and Humanities (**SSH**) disciplines,

The goal is **KOŠICE – Science City**

Concept of innovation partnership in Eastern Slovakia



Challenges for universities ...

How do we build on international experience of innovation ecosystems ?

▶ The USP TECHNICOM provides the foundation for **international cooperation**, development of strategic partnerships, and provides the space for sharing of international experience of innovation ecosystems.

Challenges for universities ...

- ▶ Since 2014, the USP Technicom has been an active member of the **International Association of Science Parks (IASP)**, the world's largest organization in the field.
- The IASP develops expert, information, consulting and project contacts with the community of scientific parks in the world.



IASP

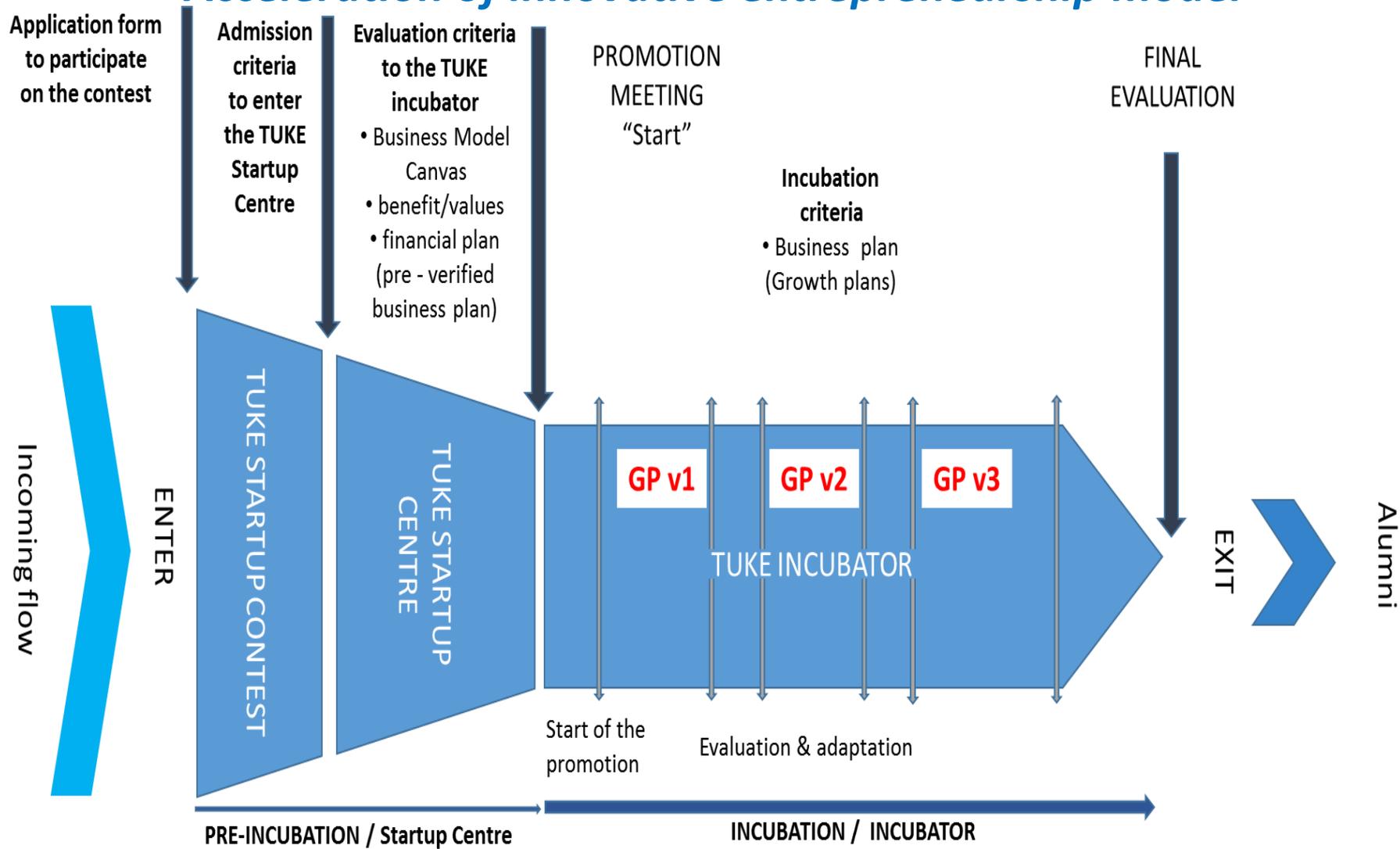
International Association of Science Parks
and Areas of Innovation

linking the best

- ▶ International experiences were obtained, through the close cooperation with the **Swedish company SAAB** and one of **the most successful incubators in Sweden - LEAD**, which was launched by the **Linköping University**.

Based on this collaboration the **successful innovation acceleration** model was introduced in the structure of USP Technicom - see Fig.

Acceleration of innovative entrepreneurship model



Cooperation with Swedish incubator LEAD

Challenges for universities ...

How do get value by linking across innovation ecosystems ?

► It is the USP Technicom ecosystem that will enable the **interconnection of innovative ecosystems** and the utilization of their valuable experience.

- The cooperation with **European Institute of Innovation and Technology (EIT)** in Budapest is now being established.

Continuing cooperation of universities from various countries

Collaboration among regions should be reinforced by means of **existing platforms** across Europe and our regions.



EIT Climate-KIC →
EIT Digital →
EIT Food →
EIT Health →
EIT InnoEnergy →
EIT Raw Materials →

Here are **some examples** of getting value by linking across innovation ecosystems:

Regional Innovation Schemes



EIT RawMaterials

Developing raw materials into a major strength for Europe.



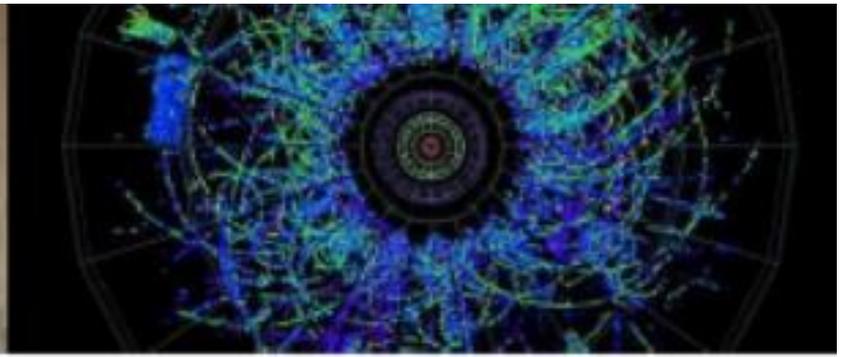
Regional Center Košice
EIT RawMaterials Hub

Regional Innovation Schemes



Innovation for climate action



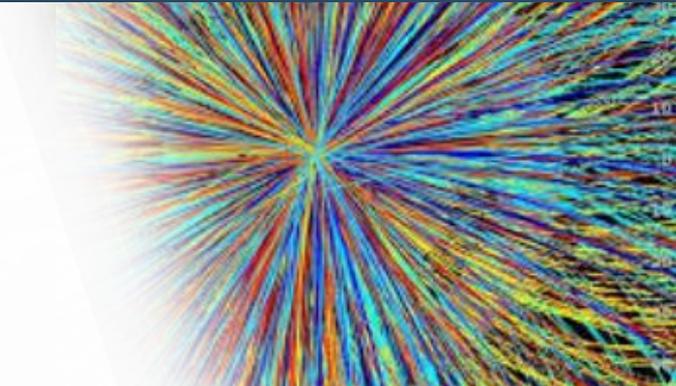


European Organization for Nuclear Research

CERN



...but also many other collaborations in various areas...



Challenges for universities ...

How do we develop a new generation of impactful and excellent researchers?

► Increasing excellence and acceleration in scientific and research activity can be achieved only in the way that is common and proven in those **countries where the best science is being realized**, especially in the USA, England, Germany, France and others.

Czechs received 23 ERC grants, Slovaks one



European
Research
Council

Challenges for universities ...

- Future scientists should get the **best education**,
- they should be chosen **from among the best students**,
- they should have **features** that are **clearly linked to the needs of scientific work** (even the cleverest person may not be suited for scientific work at all),
- they should have the ability to **become relatively quick self-dependent**,
- to set up **own research teams** and
- to produce own **quality scientific work**.

G.B. Shaw: „We are made wise not by the recollection of our past, but by the responsibility for our future “.

Results of the cooperation – popularisation of technical disciplines for young people



Universities should reflect on the entire education process, from early childhood education to lifelong learning.

An attractive environment for young people from primary and secondary schools

**Steel
PARK**
creative factory



KOŠICE2013
EURÓPSKE HLAVNÉ MESTO KULTÚRY



The Research Excellence Framework (REF)

as a traditional system for the evaluation of research, development and other creative activities of university staff

- We make effort to be...

REF2014
Research Excellence Framework

The research of **154**
UK universities was assessed



They made **1,911** submissions including:

- **52,061** academic staff
- **191,150** research outputs
- **6,975** impact case studies

The **overall quality** of submissions was judged, on average to be:

★★★★ 30% world-leading (4*)

★★★ 46% internationally excellent (3*)

★★ 20% recognised internationally (2*)

★ 3% recognised nationally (1*)

Exempla trahunt – Examples attract:

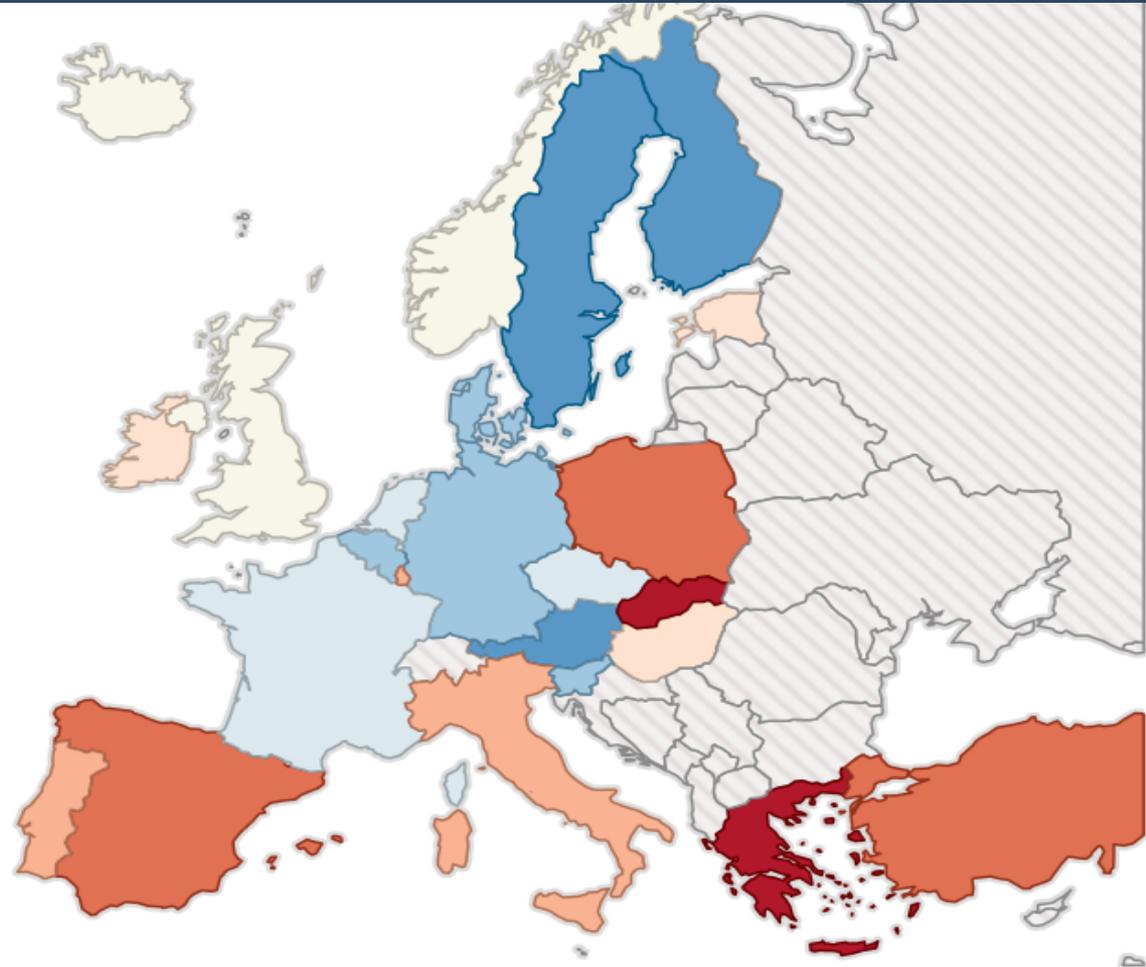
Universities should include the following elements:

- ethically grounded research,
- teaching based on educational aims founded on **critical reflection, values and knowledge** including traditional wisdom and indigenous knowledge (not only skills and competences), and
- the inclusion of **national and international** dimensions.

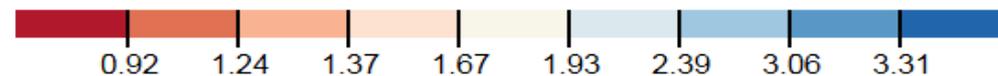
Secure optimal wage conditions for the young researchers.

Science costs as a percentage of gross domestic product (2014)

Source: [OECD](#) [Get the data](#)



Red is least White is an average Blue is the most



We do believe that
it will be better →

Košice is and will be a historical place



**... with the creative elements and of course
with the creative young people**

New cultural infrastructure



and events



KONSTANČE
KOŠICE



Košice: UNESCO creative city of media arts



PRIORITY

PRIORITIES

How to inspire,
to motivate,
to guide?

**How to stabilize
young people in the region?**

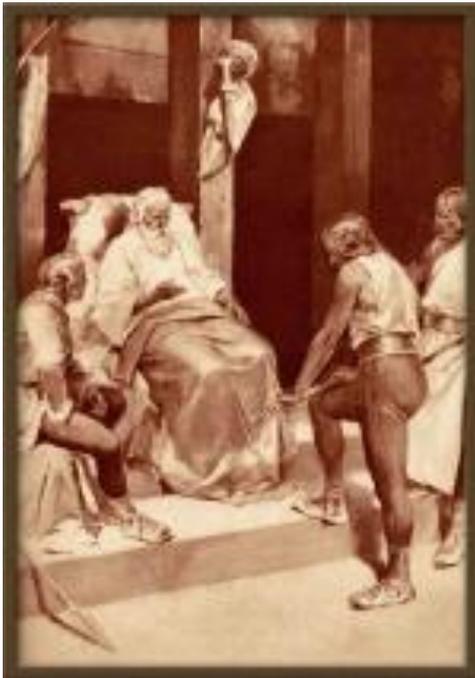
They need added values ...
... we try to create them.

How to make the innovation ecosystem sustainable and robust

Svatopluk vision

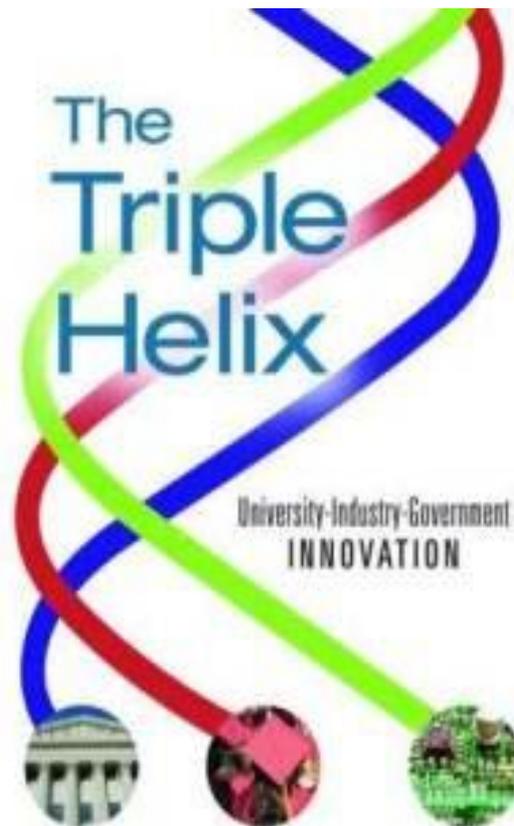
The legend about three wands

The legend about power of unity



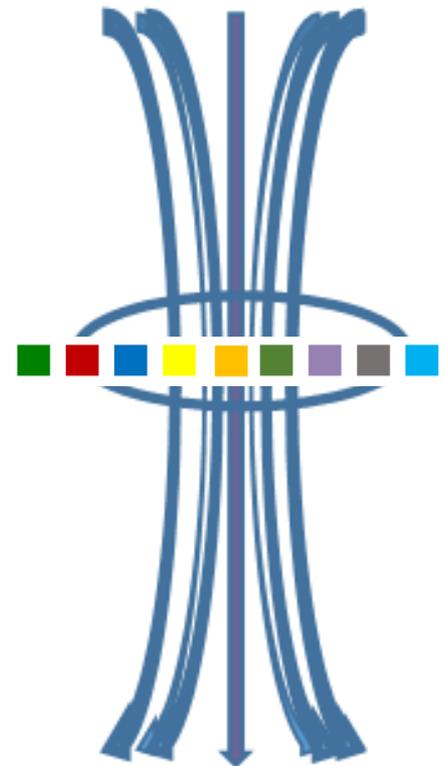
Svatopluk, prince of Great Moravia

EU vision



TUKE vision

The Multi Helix – Many wands



How to make the innovation ecosystem sustainable and robust

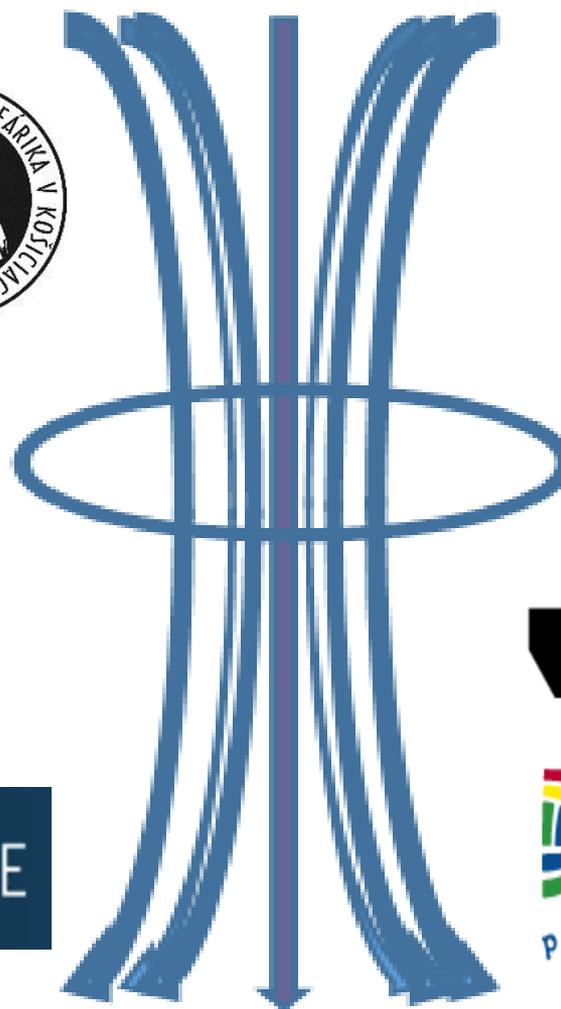
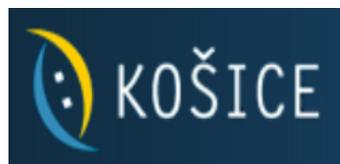
Universities, Institutes of SAS together with industrial companies, city and region of Košice vision



... and many others ...

UPJŠ
TUKE

UVMaP
SAS



... and of course with a significant support of regional and national public policies ...

... and of course with a significant support of regional and national public policies ...

... and of course with a significant support of regional and national public policies ...

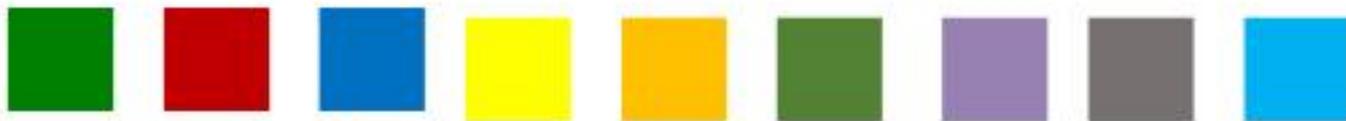
... and of course with a significant support of regional and national public policies ...

... and of course with a significant support of regional and national public policies ...

... and of course with a significant support of regional and national public policies ...

... and of course with a significant support of regional and national public policies ...





Thank you for your kind attention !