TRANSFER TECHNOLÓGIÍ bulletin

SPACE INDUSTRY. A NEW WORLD WHERE SCIENCE MEETS PRACTICE

EXIT FROM AN ACADEMIC SPIN-OFF COMPANY PREVENTION, PREVENTION, PREVENTION!

PLANNING FOR SHARED INNOVATIVE ACTIVITY THE EVOLVING ROLE OF MATERIAL TRANSFER AGREEMENTS

1/2025

MINISTERSTVO ŠKOLSTVA, VÝSKUMU, VÝVOJA A MLÁDEŽE SLOVENSKEJ REPUBLIKY

CENTRUM VEDECKO-TECHNICKÝCH INFORMÁCIÍ SR

CENTRUM TRANSFERU TECHNOLÓGIÍ SR

NCTSR NÁRODNÉ CENTRUM TRANSFERU TECHNOLÓGIÍ SR

CHRÁŇTE A KOMERČNE ZHODNOŤTE VÝSLEDKY VÝSKUMU VYTVORENÉ VO VEDECKOVÝSKUMNEJ INŠTITÚCII

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- založenie spin-off spoločností.

VŠETKY NAŠE SLUŽBY SÚ POSKYTOVANÉ BEZPLATNE

KONTAKT

Centrum transferu technológií pri CVTI SR
Lamačská cesta 8A
840 05 Bratislava

ctt@cvtisr.sk
+421 2 692 531 09
www.nptt.cvtisr.sk

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Adresa redakcie:
Lamačská cesta 8A,
840 05 Bratislava,
http://ttb.cvtisr.sk

Šéfredaktor:
Mgr. Martin Karlík
e-mail: martin.karlik@cvtisr.sk
+421/2/69 253 109

Grafická úprava:
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www.opii.gov.sk.

OBSAH

Vážení čitatelia,

Som nesmierne hrdý, že Vám môžem predstaviť zatiaľ najobsiahlejšie číslo časopisu TTb. A to aj vďaka najväčšiemu počtu anglických článkov z rôznych oblastí transferu technológií, no i samotným rozsahom. V databázach (DOAJ, EBSCO, PROQUEST, OPENAIRE) na podobný koncept časopisu nenatrafíte. Zároveň však musím oznámiť aj smutnú správu, a síce, že tento časopis už nebude naďalej vychádzať. Preto je jeho rozsah a množstvo odborných anglických článkov i formou poctivej rozlúčky.

Aktuálne vydanie časopisu TTb začíname veľmi dobre hodnoteným recenzovaným článkom od právnika a odborníka na problematiku duševného vlastníctva Tomáša Klinku, s nadpisom **„Exit z akademickej spin-off spoločnosti - prevencia, prevencia, prevencia!“**

Rubriku recenzovaných odborných článkov zastupuje aj Dušan Rostáš. Jeho článok s názvom **„Svojpomocné získavanie kapitálu univerzitnými startupmi“** sa zameriava na analýzu možností svojpomocného získavania kapitálu ako formy alternatívneho financovania, ktoré je pre univerzitné startupy dostupné bez toho, aby museli získavať špeciálne licencie či podliehať regulácii kapitálového trhu.

V kvalitnom prehľadovom odbornom článku docentka Erika Loučanová upriamuje pozornosť na **„Transfer technológií na Technickej univerzite vo Zvolene v rámci otvorených inovácií.“**

Veľmi kvalitný odborný článok s názvom **„The Effect of University Patent Transfers on Subsequent Innovation: Evidence from Chinese Universities“**, napísal expert na transfer technológií Zhenyu Gong. Vo svojej štúdii skúma aktivity univerzitného prenosu patentov a ich vplyv na inovačné výsledky.

Nemenej kvalitnú štúdiu s názvom **„Planning for Shared Innovative Activity: The Evolving Role of Material Transfer Agreements“** ponúka aj uznávaná profesorka práva Karen Sandrik.

Rubriku odborných článkov uzatvárajú dva kratšie, no veľmi hodnotné články. V prvom si fínsky expert a spoluzakladateľ spoločnosti MIMIR pokladá otázku, prečo systém výskumu a komercializácie často zlyháva. Článok má názov: **„Why the current system of research commercialization fails – and what to do about it.“**

V druhom článku nám už po druhýkrát nórsky expert na organizovanie špeciálnych workshopov v oblasti transferu technológií Håvard Almås ponúka pohľad do jeho aktivít v článku s názvom **„Seriously! Now what? – A technology transfer exploration.“**

V tomto čísle nájdete aj vyšší počet veľmi podnetných a zaujímavých rozhovorov. Barbara Tóthová vyspovedala projektovú manažérku spoločnosti FORTES interactive, s.r.o. Michaelu Fanglovú v súvislosti s inováciou- ochrannou antimikrobiálnou fóliou LOTUS a univerzitným transferom technológií v článku s názvom **“LOTUS foil ako úspešné spojenie vedy a praxe.“**

Prodekan Martin Rovňák, ktorý pôsobí na Fakulte manažmentu, ekonomiky a obchodu Prešovskej univerzity v Prešove v rozsiahlom rozhovore s názvom **„Od štúdia po prax. Transfer technológií**

v inovatívnom priemysle“, okrem iného predostrel aktivity pracoviska Katedry environmentálneho manažmentu.

Veľmi unikátny je anglicky písaný rozhovor **„Gifted children in the sign of successful technology transfer.“** V ňom sa Šárka Portešová, Michal Jabůrek a Ondřej Straka vzájomne vyspovedali v súvislosti s vývojom výnimočného diagnostického systému INVENIO v kooperácii s Masarykovou univerzitou v Brne.

Výnimočné sú aj aktivity Milana Kalaša, riaditeľa spoločnosti KAJO s.r.o., ktorá spolupracuje s univerzitami v oblasti hydrológie a klimatických zmien. Dopodrobna ich opísal v rozsiahlom rozhovore s názvom **„Disaster risk management is also a space for cooperation between science and practice.“**

Príklad dobrej praxe predstavila spoločnosť CIVITTA v rozhovore s názvom **„Challenger science as a pathway to commercialization of research”**, ich projektový manažér Martin Veselý predostrel hlavne detaily a výsledky projektu Challenger Science.

S príkladmi dobrej praxe samozrejme nekončíme. Vedci Přemysl Šedivka a Ondřej Dvořák predstavujú vyvinutie špeciálneho náterového systému ako príklad úspešného transferu technológií. Článok má názov **„Knowledge transfer of developed coating system from university laboratories to manufacturers.“**

Veľmi zaujímavý prehľad úspechov Centra pre prenos poznatkov a technológií Karlovej univerzity v Prahe ponúka redakčný článok s názvom **„Transfer at Charles University: Two institutions, one ecosystem, one common vision.”**

Tradičnú bodku za obsahom nového čísla má populárne náučná rubrika, tentoraz sa autori Martin Karlík a Juliana Bezáková zamerali na pútavý svet spolupráce akademickej sféry a firiem v oblasti vesmírneho priemyslu. Článok má názov **“Space industry. A new world where science meets practice.”**

Vážení čitatelia,

s veľkou vďakou k spolupracovníkom Odboru transferu technológií pri CVTI SR, redakčnej rade časopisu, i k mnohým kvalitným autorom, sa aj ja ako šéfredaktor lúčim a pevne dúfam, že Vás spomenutý bohatý obsah najnovšieho čísla presvedčí o doslova svetovej kvalite tohto odborného periodika a tiež o tom, že sa lúčime so cťou a s pocitom zanechania poctivej práce. Naša webstránka (ttb.sk) ostáva aj naďalej k dispozícii ako archív čísel a užitočných i podnetných článkov pre záujemcov o štúdium informácií o univerzitnom transfere technológií na Slovensku i vo svete.

Dúfam že i Vás naše články inšpirovali, či už pôsobíte vo vedeckom alebo firemnom sektore.

Srdečne sa s Vami lúčim a prajem mnoho úspechov!

Mgr. Martin Karlík, šéfredaktor časopisu TRANSFER TECHNOLÓGIÍ bulletin

Dear readers,

I am incredibly proud to present you with the most comprehensive issue of the TTb magazine so far. This is due to the largest number of English articles from various areas of tech transfer, as well as its sheer volume. You will not find a similar concept of the magazine in databases (DOAJ, EBSCO, PROQUEST, OPENAIRE). At the same time, however, I must also announce that this magazine will no longer be published. Therefore, its scope and the number of professional English articles are also a form of honest farewell.

We begin the current issue of TTb magazine with a highly rated peer-reviewed article by intellectual property lawyer and expert Tomáš Klinka, titled **„Exit from an academic spin-off company - prevention, prevention, prevention!"**

The column of reviewed professional articles is also represented by Dušan Rostáš. His article titled **„Self-assisted capital raising by university startups"** focuses on the analysis of the possibilities of self-assist capital raising as a form of alternative financing available to university startups without having to obtain special licenses or be subject to capital market regulation.

In a high-quality review article, Associate Professor Erika Loučanová draws attention to **„Technology transfer at the Technical university in Zvolen within the framework of open innovation."**

A very high-quality professional article titled **„The Effect of University Patent Transfers on Subsequent Innovation: Evidence from Chinese Universities"** was written by technology transfer expert Zhenyu Gong. In his study, he examines university patent transfer activities and their impact on innovation outcomes.

An equally high-quality study titled **„Planning for Shared Innovative Activity: The Evolving Role of Material Transfer Agreements"** is also offered by the renowned law professor Karen Sandrik.

The professional articles section is concluded by two shorter but very valuable articles. In the first, a Finnish expert and co-founder of MIMIR asks the question of why the research and commercialization system often fails. The article is titled: **„Why the current system of research commercialization fails – and what to do about it"**.

In the second article, for the second time, Norwegian expert in organizing special workshops in the field of technology transfer, Håvard Almås, offers us an insight into his activities in the article titled **„Seriously! Now what? – A technology transfer exploration."**

In this issue, you will also find a higher number of very stimulating and interesting interviews. Barbara Tóthová interviewed the project manager of FORTES interactive, s.r.o. Michaela Fanglová in connection with the innovation- protective antimicrobial LOTUS foil and university technology transfer in the article titled **„LOTUS foil as a successful combination of science and practice."**

Vice-dean Martin Rovňák, who works at the Faculty of Management, Economics and Trade of the University

of Prešov in Prešov, in an extensive interview titled **„From study to practice. Technology transfer in innovative industry“**, among other things, presented the activities of the Department of Environmental Management.

The English-language interview **„Gifted children in the sign of successful technology transfer.“** is unique. Šárka Portešová, Michal Jabůrek, and Ondřej Straka discussed the development of the exceptional diagnostic system INVENIO in cooperation with Masaryk University in Brno.

The activities of Milan Kalaš, director of KAJO s.r.o., which cooperates with universities in the field of hydrology and climate change, are also exceptional. He described them in detail in an extensive interview titled **„Disaster risk management is also a space for cooperation between science and practice.“**

An example of good practice was presented by the company CIVITTA in an interview titled **„Challenger science as a pathway to commercialization of research.”** Their project manager, Martin Veselý, mainly presented the details and results of the Challenger Science project.

Of course, the list of good practices continues. Scientists Přemysl Šedivka and Ondřej Dvořák present the development of a special coating system as an example of successful technology transfer. The article is titled **„Knowledge transfer of developed coating system from university laboratories to manufacturers.“**

A very interesting overview of the achievements of the Center for Knowledge and Technology Transfer of Charles University in Prague is offered by an editorial article titled **„Transfer at Charles University: Two institutions, one ecosystem, one common vision.”**

The traditional ending to the content of the new issue is the popular science column. This time, authors Martin Karlík and Juliana Bezáková focused on the fascinating world of cooperation between academia and companies in the space industry. The article is titled **“Space industry. A new world where science meets practice.”**

Dear readers,

With great gratitude to the colleagues of the Technology Transfer Department at SCSTI, the editorial board of the magazine, and to many high quality authors, as the editor-in-chief, I bid farewell and truly hope that the aforementioned rich content of the latest issue will convince you of the world-class quality of this professional periodical and that we bid farewell with honor and with the feeling of leaving behind honest work.

Our website (ttb.sk) remains available as an archive of issues and useful and stimulating articles for those interested in studying information about university technology transfer in Slovakia and around the world. I hope that our articles have inspired you, whether you work in the scientific or corporate sector.

I bid you a warm farewell and wish you much success!

Mgr. Martin Karlík, editor-in-chief of the TRANSFER TECHNOLOGY bulletin

EXIT Z AKADEMICKEJ SPIN-OFF SPOLOČNOSTI - PREVENCIA, PREVENCIA, PREVENCIA!

EXIT FROM ACADEMIC SPIN-OFF COMPANY - PREVENTION, PREVENTION, PREVENTION!

ABSTRAKT Akademické spin-off spoločnosti predstavujú dôležitý nástroj komercializácie výsledkov výskumu a vývoja, pričom ich úspešná prevádzka si vyžaduje stabilné vlastnícke vzťahy a efektívnu kontrolu nad strategickým smerovaním. Neželaný alebo nekontrolovaný exit spoločníkov môže ohroziť kontinuitu podnikania, ochranu duševného vlastníctva a finančnú stabilitu spoločnosti. Tento článok sa zameriava na mechanizmy prevencie exitu spoločníkov v spin-off spoločnostiach verejných výskumných inštitúcií (v.v.i.), pričom analyzuje ich právne základy a praktické uplatnenie. Medzi kľúčové nástroje patria schvaľovanie prevodu obchodného podielu valným zhromaždením, predkupné právo, *drag along* klauzula, iné zmluvné obmedzenia a prípadne aj záložné právo a zákaz konkurencie. Článok skúma ich výhody a limity, pričom odporúča ich vhodnú implementáciu v spoločenskej zmluve alebo dohode spoločníkov. Cieľom je poskytnúť právny rámec možností pre efektívnu prevenciu rizík a zabezpečenie dlhodobej udržateľnosti spin-off spoločností.

ABSTRACT Academic spin-off companies are an important tool for the commercialisation of research and development results, and their successful operation requires stable ownership relationships and effective control over strategic direction. An unwanted or uncontrolled exit of shareholders can threaten business continuity, the protection of intellectual property and the financial stability of the company. This article focuses on mechanisms for preventing shareholder exit in spin-off companies of public research institutions (v.v.i.), analysing their legal foundations and practical application. Key instruments include approval of the transfer of shares by the general meeting, pre-emption rights, *drag along* clauses, other contractual restrictions, and possibly also liens and non-compete clauses. The article examines their advantages and limitations in detail, recommending their appropriate implementation in the articles of association or shareholders‘ agreement. The aim is to provide a legal framework for effectively preventing risks and ensuring the long-term sustainability of spin-off companies.

ÚVOD

Akademické spin-off spoločnosti sú – resp. môžu byť – významným nástrojom komercializácie výsledkov výskumu a vývoja. Ich zakladateľmi sú na jednej strane vysoké školy a verejné výskumné inštitúcie (v.v.i) a to spravidla v partnerstve s ich zainteresovanými zamestnancami na strane druhej. Podmienky zakladania takýchto spoločností sú v slovenskom právnom poriadku upravené zákonom o vysokých školách (č. 131/2002 Z. z.). zákonom o verejnej výskumnej inštitúcii (č. 243/2017 Z. z.) a Obchodným zákonníkom (č. 513/1991 Zb.). O internej úprave zakladania spin-off spoločností pojednával skorší článok autora v našom časopise TTb.[I] Kľúčovou otázkou, ktorou sa autor zaoberá v tomto článku, je, ako predísť nežiadúcemu-neriadenému exitu (odchodu) spoločníkov a čo je v tomto smere možné spraviť preventívne už vo fáze zakladania spin-off spoločnosti. Pre zjednodušenie v texte uvažujeme len s v.vi., avšak ponúknuté odporúčania sú v zásade použiteľné aj pre vysoké školy a ich spin-off spoločnosti. Pozornosť je venovaná len spoločnosti s ručením obmedzeným (s.r.o.) ako najčastejšie využívanou právnou formou spin-off spoločnosti.

RIZIKÁ EXITU SPOLOČNÍKOV V AKADEMICKOM SPIN-OFFE

Vo všeobecnosti exit spoločníka môže byť spôsobený rôznymi dôvodmi, od osobných a finančných, až po nezlučiteľne rozdielne názory o ďalšom smerovaní spoločnosti. Skôr či neskôr otázka exitu spoločníkov príde na riešenie v každej spoločnosti a je potrebné na ňu myslieť už pri zakladaní spoločnosti. Z pohľadu v.v.i. je kľúčové, aby exit niektorého zo spoločníkov neohrozil kontrolu nad spoločnosťou, strategické rozhodovanie, ochranu duševného vlastníctva a finančnú stabilitu spin-off spoločnosti. S exitom úzko súvisí aj riziko tzv. *deadlocku*, teda patovej situácie medzi spoločníkmi, predstavuje závažný problém, ktorý môže paralyzovať rozhodovacie procesy a ohroziť samotné fungovanie spoločnosti. Osobitne v prípade, keď v.v.i. vstupuje do spin-off spoločností nepeňažným vkladom (napr. patentmi, know-how), je nevyhnutné, aby mala zabezpečené mechanizmy prevencie neželaného (neriadeného) exitu spoločníkov.

MECHANIZMY PREVENCIE A RIADENIA EXITU

Pre účely spin-off spoločnosti s účasťou v.v.i. je možné identifikovať viacero nástrojov ochrany pred nekontrolovaným exitom spoločníkov:

- Schvaľovanie prevodu obchodného podielu valným zhromaždením
- Predkupné právo na obchodný podiel
- *Drag along* (povinnosť pridať sa k predaju obchodného podielu)
- Iné zmluvné obmedzenia a klauzuly
- Záložné právo na obchodný podiel
- Zákaz konkurencie

Nie všetky tieto nástroje musia byť použité v každom prípade, avšak prvé tri z nich zrejme možno považovať za štandard dobrej praxe. Správnym miestom na adresovanie týchto otázok je spoločenská zmluva (prioritne) alebo prípadne samostatná dohoda spoločníkov (subsidiárne).[II]

SCHVAĽOVANIE PREVODU OBCHODNÉHO PODIELU VALNÝM ZHROMAŽDENÍM

Zmluvné obmedzenia prevodu podielu môžu výrazne ovplyvniť možnosť exitu spoločníka a prípadne ho aj zablokovať. Štandardne spočíva v po-

[I] *KLINKA, T.: Ako interne upraviť zakladanie spinoff spoločností v prostredí SAV? CVTI SR. TRANSFER TECHNOLÓGII bulletin 1/2024. s. 26-29.*

[II] *Zásah do kompetencie valného zhromaždenia musí byť vždy súčasťou spoločenskej zmluvy (resp. stanov), nepostačuje tu dohoda spoločníkov. Pozri § 125 ods. 1 písm. k) Obchodného zákonníka. Dohody medzi spoločníkmi na všeobecnej úrovni upravuje § 66c Obchodného zákonníka. Pokiaľ ide o záložné právo na obchodný podiel, takáto úprava nezvykne bývať súčasťou spoločenskej zmluvy, pretože záložné právo by už od vzniku spoločnosti figurovalo v obchodnom registri.*

žiadavke schválenia každého prevodu obchodného podielu valným zhromaždením, čím sa zabezpečí, že obchodný podiel nebude prevedený na toxickú tretiu osobu, ktorý by mohla ohroziť strategické ciele spin-off spoločnosti. Takúto kompetenciu však valné zhromaždenie nemá zo zákona (§ 125 Obchodného zákonníka), ale je potrebná zodpovedajúca úprava v spoločenskej zmluve,[II] prípadne v stanovách spoločnosti, ktoré však pre s.r.o. nie sú povinné a ani obvyklé. Určite je potrebné zohľadniť výšku (veľkosť) obchodných podielov jednotlivých spoločníkov, uznášaniaschopnosť valného zhromaždenia a potrebnú väčšinu na schválenie prevodu obchodného podielu, čo sú parametre, ktoré sa tiež typicky dojednávajú v spoločenskej zmluve. V.v.i. ako spoločník by v žiadnom prípade nemala dopustiť, že by sa v dôsledku schvaľovania prevodu obchodného podielu valným zhromaždením len sama obmedzila v možnostiach prevodu svojho obchodného podielu, avšak na druhej strane by nemala fakticky žiadny vplyv na zablokovanie prevodu obchodného podielu ostatných spoločníkov.

PREDKUPNÉ PRÁVO NA OBCHODNÝ PODIEL

Predkupné právo zabezpečuje, že spoločník, ktorý sa rozhodne previesť svoj obchodný podiel (alebo jeho časť), ho najprv ponúkne ostatným spoločníkom a to pomerne k podielu ich vkladov na základnom imaní spoločnosti a to za rovnakých podmienok, za ktorých je tretia strana pripravená obchodný podiel odkúpiť. Aj tu platí, že predkupné právo na obchodný podiel nevzniká zo zákona ako v prípade spoluvlastníkov podľa § 140 Občianskeho zákonníka, ale je potrebné ho osobitne dohodnúť a to v spoločenskej zmluve alebo v dohode spoločníkov. Z pohľadu v.v.i. ako spoločníka spin-off spoločnosti nemusí byť táto klauzula o predkupnom práve zásadná a je prípadne možné ju aj vynechať, ak je dostatočne dobre nastavené schvaľovania prevodu obchodného podielu valným zhromaždením, ako je vysvetlené v predchádzajúcej časti. Oba tieto mechanizmy je však dobre možné aj kumulovať, keď napríklad v.v.i. síce neuplatní svoje predkupné právo, ale môže prevod obchodného podielu zablokovať na valnom zhromaždení.

Pri úprave predkupného práva je potrebné pamätať na špecifikáciu náležitostí ponuky obchodného podielu, lehotu na uplatnenie predkupného práva, zánik predkupného práva, ak nebude včas uplatnené, na riešenie situácii, keď sa uplatnením predkupného práva nevyčerpá celý ponúknutý obchodný podiel (v prípade viac ako 2 spoločníkov) ako aj na formu a doručovanie zodpovedajúcich právnych úkonov.

Na tomto mieste je potrebné upozorniť na špecifické zákonné obmedzenie pri nakladaní s majetkom v.v.i., ktoré môže byť relevantné a je potrebné naň preventívne pamätať v prípade predkupného práva na obchodný podiel a prípadne aj iných klauzúl predpokladajúcich prevod obchodného podielu medzi spoločníkmi. Podľa § 32 ods. 2 zákona o verejnej výskumnej inštitúcii (č. 243/2017 Z. z.) v.v.i. nesmie uzatvoriť zmluvu, ktorá sa týka nadobudnutia majetku v.vi. alebo jeho scudzenia so svojím riaditeľom (pozri § 16), s členom svojej správnej rady (pozri § 17), vedeckej rady (pozri § 18) alebo dozornej rady (pozri § 19), so svojím vedúcim zamestnancom (§ 9 ods. 3 Zákonníka práce), so svojím zamestnancom zodpovedným za nakladanie s majetkom verejnej výskumnej inštitúcie alebo s blízkou osobou niektorej z týchto osôb (pozri § 16 Občianskeho zákonníka). Je vhodné poznamenať, že toto zákonné obmedzenie sa nevzťahuje na „bežných“ zamestnancov v.v.i. Ak by však jedným zo spoločníkov v spin-off spoločnosti mala byť niektorá z osôb vymenovaných v § 32 ods. 2 zákona o verejnej výskumnej inštitúcii, predkupné právo na obchodný podiel v.vi. by nemalo byť vôbec dohodnuté v prospech takéhoto spoločníka (spoločníkov), pretože jeho výkonom by došlo k porušeniu zákona o verejnej výskumnej inštitúcií s následkom absolútnej neplatnosti (pozri aj § 32 ods. 4 zákona o verejnej výskumnej inštitúcií). V takýchto prípadoch by riešením mohlo byť dohodnutie predkupného právo len v prospech v.v.i., nie však v prospech takéhoto spoločníka, ktorého zákon výslovne vylučuje z okruhu osôb oprávnených nadobudnúť majetok v.v.i. Uvedené primerané platí aj o iných klauzulách predpokladajúcich prevod obchodného podielu medzi spoločníkmi, ktoré stručne uvádzame ďalej v časti Iné zmluvné obmedzenia a klauzuly.

DRAG ALONG (POVINNOSŤ PRIDAŤ SA K PREDAJU OBCHODNÉHO PODIELU)

Podstatou klauzuly *drag along* je, že pri splnení určitých podmienok (napr. vstup strategického investora alebo dodržanie minimálnej ceny podielu) budú aj ostatní spoločníci povinní predať svoje podiely za tých istých podmienok. Takýto mechanizmus môže byť výhodný pre v.v.i., ktorá si chce zabezpečiť možnosť koordinovaného predaja v prípade záujmu strategického investora, a tým ochrániť hodnotu svojho duševného vlastníctva a vložených aktív. Podmienkou platnosti takejto dohody je súhlas všetkých spoločníkov pri uzatvorení spoločenskej zmluvy alebo jej neskoršej úprave, prípadne v dohode spoločníkov.

Klauzula *drag along* môže byť formulovaná aj tak, aby chránila nielen väčšinových, ale aj menšinových spoločníkov, pokiaľ je to v súlade so strategickými cieľmi spin-off spoločnosti a pri zohľadnení výšky obchodného podielu v.v.i. Bežne sa používa na ochranu väčšinových spoločníkov, ktorí chcú predať svoj podiel (alebo jeho časť), avšak je možné dohodnúť aj jej aplikáciu v prospech v.v.i., ktorá nemá v spin-off spoločnosti väčšinový podiel. V praxi je dôležité, aby bolo v spoločenskej zmluve jasne uvedené, či *drag along* môže byť uplatnená v prospech menšinového spoločníka, ak je ním práve v.v.i.

Klauzula *drag along* môže byť rozšírená aj vopred udelené poverenie pre toho spoločníka, v prospech ktorého svedčí táto klauzula, aby v mene všetkých spoločníkov rokoval so strategickým investorom a odsúhlasoval najlepšiu finálnu ponuku (BAFO - Best and Final Offer), pričom nie je nevyhnutné, aby takúto ponuku schvaľovali aj ostatní spoločníci. Tým sa zabraňuje blokovaniu predaja niektorým zo spoločníkov, ktorý by inak mohol zablokovať vstup investora. Aby takýto nástroj bol plne efektívny, je vhodné v prípadoch aplikácie klauzuly *drag along* výslovne vylúčiť schvaľovanie prevodu obchodného podielu valným zhromaždením a tiež uplatňovanie predkupného práva.

Pre úplnosť je vhodné poznamenať, že klauzula *drag along* nemá zákonnú úpravu pre s.r.o., nájdeme ju však v ustanoveniach Obchodného zákonníka o akciovej spoločnosti, konkrétne v § 220y Obchodného zákonníka (Právo požadovať prevod akcií) v rámci tzv. vedľajších ustanovení akcionárskej zmluvy. Ani táto zákonná úprava neobmedzuje klauzulu *drag along* len na ochranu väčšinového akcionára. Podstatnými náležitosťami takejto klauzuly má byť určenie podmienok výkonu práva požadovať prevod akcií a tiež určenie rozsahu alebo spôsobu určenia rozsahu, v akom oprávnený akcionár môže prevod akcií požadovať. V súlade s princípom zmluvnej voľnosti (autonómie), ktorým sa riadia dohody medzi spoločníkmi v zmysle § 66c Obchodného zákonníka, kam svojím obsahom patria aj vedľajšie dojednania súvisiace s prevodom účasti na spoločnosti, je autor presvedčený, že klauzulu *drag along* je možné platne dojednať aj medzi spoločníkmi s.r.o.

Významovo obrátená klauzula s názvom *tag along*, ktorá chráni typicky menšinových spoločníkov (akcionárov), zakotvuje právo pridať sa k prevodu obchodného podielu (akcií) iného spoločníka (akcionára) v zmysle § 220x Obchodného zákonníka. Praktické využitie klauzuly *tag along* je z hľadiska v.v.i. ako spoločníka v spin-off spoločnosti len obmedzené.

INÉ ZMLUVNÉ OBMEDZENIA A KLAUZULY

Medzi ďalšiu zmluvné obmedzenia, ktoré preventívne môžu prispieť k lepšiemu zvládnutiu exitu niektorého zo spoločníkov môžeme zaradiť napríklad povinnú mediáciu, tzv. ruskú ruletu, tzv. *texas shoot-out*, tzv. *buy-sell agreement*, povinné rotovanie v štatutárnych orgánoch spoločnosti alebo aj rozhodcovská doložka na riešenie sporov medzi spoločníkmi.

Mediácia umožňuje spoločníkom dosiahnuť dohodu (vyriešiť spor) prostredníctvom nestranného mediátora. Povinná mediácia môže byť zakotvená v spoločenskej zmluve ako povinný krok pred akýmkoľvek súdnym alebo arbitrážnym riešením sporu. Tento mechanizmus zvyšuje šancu na dohodu a minimalizuje eskaláciu konfliktu.

Ruská ruleta predstavuje mechanizmus riešenia *deadlocku*, pri ktorom jeden zo spoločníkov ponúkne svoj obchodný podiel za cenu, ktorú sám určí. Ostatní spoločníci majú potom povinnosť buď akceptovať ponuku (v pomere výšky svojich podielov) a ponúknutý podiel odkúpiť, alebo predať svoj vlastný podiel danému spoločníkovi za rovnakú cenu. Tento mechanizmus podporuje spravodlivé ocenenie podielov a odrádza od neprimerane vysokých alebo nízkych ponúk.

V prípade *texas shoot-out* každý spoločník predloží nezávislej tretej strane tajnú ponuku, za ktorú je ochotný odkúpiť podiel druhého spoločníka. Vyššia ponuka víťazí a jej predkladateľ je povinný odkúpiť podiel za určenú cenu. Tento mechanizmus efektívne rieši situácie, kde sa spoločníci nedokážu dohodnúť na spôsobe ukončenia ich partnerstva v spoločnosti.

Mechanizmus *buy-sell agreement* umožňuje spoločníkom vopred dohodnúť podmienky výkupu podielov a tiež podmienky riešenia konkrétnych spúšťacích udalostí, ako je napríklad odkúpenie, predaj alebo odlúčenie, ku ktorým dochádza pri exite (odchode) spoločníka zo spoločnosti.

Ak všetky predchádzajúce mechanizmy zlyhajú, efektívnym riešením môže byť rozhodcovská doložka, ktorou sa zveruje riešenie sporov medzi spoločníkmi nezávislému rozhodcovskému súdu podľa zákona o rozhodcovskom konaní (č. 244/2002 Z. z.). Medzi hlavné výhody rozhodcovského konania patrí najmä jeho rýchlosť, keď dĺžka rozhodcovského konania sa počíta rádovo v nižších jednotkách mesiacov, jeho diskrétnosť (neverejnosť), odbornosť (expertíza) a nemožnosť podať odvolanie proti rozhodcovskému rozsudku, ak si možnosť odvolania spoločníci výslovne nedohodnú, čo ani nie je obvyklé. Zoznam stálych rozhodcovských súdov je uvedený na webstránke Ministerstva spravodlivosti SR.[III]

ZÁLOŽNÉ PRÁVO NA OBCHODNÝ PODIEL

Zriadenie záložného práva na obchodný podiel sa odlišuje od skôr uvedených nástrojov riadeného exitu, keďže jeho hlavným účelom je v zmysle § 117a Obchodného zákonníka zabezpečenie určitej pohľadávky a nepriamo aj ochrana pred exekúciou obchodného podielu. V určitých situáciách však môže aj záložné právo na obchodný podiel predstavovať efektívny nástroj ochrany ostatných spoločníkov. S týmto nástrojom je však potrebné narábať opatrne, pretože vytvára značnú nerovnováhu medzi spoločníkmi. Musí totiž existovať pohľadávka jedného spoločníka (veriteľ) proti druhému spoločníkovi (dlžník), ktorej splatenie sa zabezpečuje záložným právom na obchodný podiel spoločníka, ktorý je dlžníkom. Spoločník (dlžník) síce pokračuje vo výkone svojich práv spoločníka (§ 117a ods. 5 Obchodného zákonníka), avšak informácia o záložnom práve na jeho obchodný podiel je verejne dostupná v obchodnom registri, čo môže navonok znižovať dôveryhodnosť celej spin-off spoločnosti.

Záložným právom zabezpečená pohľadávka spoločníka (veriteľa) voči obchodnému podielu spoločníka (dlžníka) predstavuje zároveň aj ochranu založeného obchodného podielu pred exekúciou (pozri § 151h ods. 6 Občianskeho zákonníka a § 61q ods. 2 Exekučného poriadku), ktorú zrejme ani nie je možné dosiahnuť inak.

Záložné právo musí byť zriadené písomnou zmluvou s úradne osvedčenými podpismi (§ 117a ods. 2 Obchodného zákonníka) a je účinné až zápisom do obchodného registra (§ 117a ods. 4 Obchodného zákonníka).

Ak sa obchodný podiel môže prevádzať iba so súhlasom valného zhromaždenia (pozri vyššie), vyžaduje sa súhlas valného zhromaždenia aj na zriadenie záložného práva na obchodný podiel, inak záložné právo nevznikne; na prevod založeného obchodného podielu pri výkone záložného práva sa súhlas valného zhromaždenia nevyžaduje. Ak

[III] *Pozri https://www.justice.gov.sk/sluzby/rozhodcovia/#zoznamy.*

sa podľa spoločenskej zmluvy vyžaduje na prevod obchodného podielu splnenie inej podmienky, vyžaduje sa splnenie tejto podmienky aj na vznik záložného práva (§ 117a ods. 3 Obchodného zákonníka).

Zákon nevylučuje, aby záložné právo bolo zriadené aj na obchodný podiel v.v.i. (pozri § 33 ods. 13 zákona o verejnej výskumnej inštitúcii).

ZÁKAZ KONKURENCIE

Zákaz konkurencie môže byť ďalším dôležitým opatrením pri exite spoločníka. Po jeho vystúpení zo spoločnosti tak môže byť dohodnuté obmedzenie jeho podnikateľskej činnosti v rovnakom alebo podobnom odvetví na určitý čas. Tým sa znižuje riziko, že „odídenci" využijú získané know-how a obchodné kontakty na konkurenčnú činnosť, ktorá by mohla poškodiť spin-off spoločnosť.

Právny základ tejto klauzuly vychádza z § 136 Obchodného zákonníka, ktorý upravuje zákaz konkurencie síce pre konateľov spoločnosti, avšak spoločenská zmluva môže rozšíriť tieto obmedzenia aj na spoločníkov a to už počas ich pôsobenia v spoločnosti (pozri aj § 84 Obchodného zákonníka) alebo aj po ich exite (odchode) zo spoločnosti. V praxi môže zákaz konkurencie zahŕňať obmedzenie zakladania alebo účasti v konkurenčných spoločnostiach, zákaz poskytovania služieb konkurentom spin-off spoločnosti, časové a územné ohraničenie platnosti zákazu (napr. na obdobie dvoch rokov po exite spoločníka).[IV]

Dôležitou súčasťou takejto dohody je aj jednoznačné definovanie, v čom spočíva porušenie zákazu konkurencie a mechanizmus kontroly a sankcie v prospech ostatných spoločníkov (alebo aj v prospech spoločnosti), aby bola zabezpečená vymožiteľnosť tohto zákazu.

Je potrebné poznamenať, že samotný zákaz konkurencie nepredstavuje právnu prekážku exitu spoločníka zo spin-off spoločnosti. Môže však odrádzať spoločníka od takého exitu, ktorý by vo svojich dôsledkov poškodzoval spoločnosť a ostatných spoločníkov.

ZÁVER

Preventívne opatrenia proti neželanému (nekontrolovanému) exitu spoločníkov sú nevyhnutné pre stabilitu akademických spin-off spoločností. Známe mechanizmy ako najmä schvaľovanie prevodu obchodného podielu valným zhromaždením, predkupné právo na obchodný podiel, *drag along* (povinnosť pridať sa k predaju obchodného podielu), záložné právo na obchodný podiel alebo zákaz konkurencie môžu byť účinnými nástrojmi ochrany vlastníckej štruktúry a zabezpečenia kontroly v.v.i. nad komercializovanými technológiami a duševným vlastníctvom. Vhodná implementácia týchto opatrení najmä v spoločenskej zmluve je kľúčová pre dlhodobú udržateľnosť spin-off spoločností.

Autor:
Tomáš Klinka*

* JUDr. Tomáš Klinka, advokát, partner v advokátskej kancelárii SIGNUM legal, Gaštanová 15, 811 04 Bratislava, 0948 931 570, tomas.klinka@signum.legal.

[IV] *Len pre kontext možno poukázať aj § 672a Obchodného zákonníka, ktorý sa týka možnosti dojednania konkurenčnej doložky pri obchodnom zastúpení. Toto ustanovenie, ktoré predstavuje transpozíciu príslušnej európskej smernice (č. 86/653/EHS), však nie je možné – ani analogicky – vztiahnuť na iné obchodnoprávne vzťahy, akými sú aj vzťahy medzi spoločníkmi.*

SVOJPOMOCNÉ ZÍSKAVANIE KAPITÁLU UNIVERZITNÝMI STARTUPMI *SELF-ASSISTED CAPITAL RAISING BY UNIVERSITY STARTUPS*

ABSTRAKT Príspevok sa zameriava na analýzu možností svojpomocného získavania kapitálu ako formy alternatívneho financovania, ktoré je pre univerzitné startupy dostupné bez toho, aby museli získavať špeciálne licencie či podliehať regulácii kapitálového trhu. Cieľom príspevku je identifikovať právny priestor (tzv. bezpečný prístav), ktorý umožňuje startupom flexibilne získavať financovanie vlastnými aktivitami, či už formou privátnych investícií malých investorov, alternatívnych investičných fondov, grantov, alebo iných foriem podpory. Príspevok poskytuje univerzitným startupom základnú orientáciu v oblasti právnej regulácie získavania kapitálu v kontexte slovenského právneho prostredia.

ABSTRACT The contribution focuses on analyzing self-help capital rising options as a source of alternative finance available to university startups without requiring them to obtain special licenses or be subject to capital market regulation. The contribution aims to identify safe harbours that allow startups to flexibly secure funding through their own activities, whether in the form of private investments from small investors, alternative investment funds, grants, or other forms of support. The contribution provides basic guidance for university startups in the area of legal regulation of capital raising within the context of the Slovak legal environment.

ÚVOD

V úvodných fázach života spoločnosti býva financovanie podnikania založené na svojpomocnom financovaní, ktoré zahŕňa využívanie vlastného kapitálu zakladateľov spoločnosti.[I] Náročnosť financovania začínajúcej spoločnosti býva rôzna a závisí od oblastí podnikania, v ktorej plánuje spoločnosť pôsobiť. Vzhľadom na účely tohto príspevku uvažujeme o startupoch ako o projektoch, ktoré prešli z fázy myšlienky a nápadu do fázy inštitucionalizácie a existujú už v podobe obchodnej spoločnosti, ktorá plánuje uviesť na trh určitý produkt alebo nejakú službu, avšak takáto služba alebo tento produkt ešte reálne neexistuje.[II] V raných fázach spravidla existuje určité duševné vlastníctvo, ktoré má potenciál byť komercializované, pričom v kontexte výskumných aktivít univerzít takéto duševné vlastníctvo obyčajne vzniklo ako výsledok akademického

[I] *Mazúr, J. In Grambličková, B., Mazúr, J., Barkoci, S. Právo startupových spoločností: správa, financovanie a duševné vlastníctvo. Bratislava: C. H. Beck, 2023, s 83.*

[II] *Pojem startupová spoločnosť je heterogénna kategória, ktorá nemusí odzrkadľovať to, či je činnosť aktérov projektu inštitucionalizovaná aj vo forme obchodnej spoločnosti. Porovnaj Mazúr, J. In Grambličková, B., Mazúr, J., Barkoci, S. Právo startupových spoločností: správa, financovanie a duševné vlastníctvo. Bratislava: C. H. Beck, 2023, s. 3.*

výskumu, ktorý je začlenený do obchodnej spoločnosti ako *spin-off* alebo *spin-out*[III]. V prípade *spin-off* startupov, ktoré sú spoločnosťami s majetkovou účasťou univerzity, to znamená zabezpečenie ich počiatočného financovania kombináciou vlastných zdrojov osoby, ktorá je spoluzakladateľom tejto spoločnosti, a univerzity. V prípade univerzitného startupu vo forme *spin-out* spoločnosti vlastných zdrojov zakladateľa.

Vzhľadom na často limitované prostriedky, ktoré môžu zakladajúci spoločníci do podnikania startupovej spoločnosti vložiť, je dôležitou otázkou, ktorú musia startupy v počiatočnej fáze riešiť, otázka získavania kapitálu. V tomto príspevku sa zameriame na niektoré svojpomocné formy získavania kapitálu pre univerzitné startupy (či už vo forme *spin-off*, alebo *spin-out* spoločností).

V prípade, že sú na financovanie startupu disponibilné vlastné zdroje spoločníkov nedostatočné, financovanie býva zvyčajne realizované prostredníctvom získavania dodatočného kapitálu. Slovenský kapitálový trh je nerozvinutý, získavanie kapitálu prostredníctvom emisie cenných papierov na slovenskom regulovanom trhu je teda v súčasnosti pre slovenský startup neodstupné. Okrem toho sa zdá, že nerozvinutý slovenský kapitálový trh nie je jedinou prekážkou získavania rizikového kapitálu, pretože aj v širšom regionálnom kontexte hľadajú európske startupy financovanie často v zahraničí.[IV]

Právna regulácia získavania kapitálu však existuje i na slovenskom kapitálovom trhu a je komplexná. Za základ regulačného rámca v slovenskom právnom prostredí možno označiť Zákon č. 203/2011 Z. z. o kolektívnom investovaní (ďalej len „Zákon o kolektívnom investovaní"), Zákon č. 566/2001 Z. z. o cenných papieroch a investičných službách (ďalej len „Zákon o CP"), Nariadenie Európskeho parlamentu a Rady (EÚ) 2017/1129 zo 14. júna 2017 o prospekte, ktorý sa má uverejniť pri verejnej ponuke cenných papierov alebo ich prijatí na obchodovanie na regulovanom trhu (ďalej len „Nariadenie o prospekte"), Nariadenie Európskeho parlamentu a Rady (EÚ) 2020/1503 zo 7. októbra 2020 o európskych poskytovateľoch služieb hromadného financovania (ďalej len „Nariadenie o crowdfundingu") a z pohľadu vydávania digitálnych aktív aj Nariadenie Európskeho parlamentu a Rady (EÚ) 2023/1114 z 31. mája 2023 o trhoch s kryptoaktívami (ďalej len „Nariadenie MICA"), ktoré reguluje kryptoaktíva a ich verejnú ponuku. Komplexnosť a náročnosť interpretácie tejto právnej regulácie podčiarkuje fakt, že vnútroštátna právna úprava je silne determinovaná európskym právom aj v podobe smerníc (napr. Smernica Európskeho parlamentu a Rady 2014/65/EÚ z 15. mája 2014 o trhoch s finančnými nástrojmi, tzv. Smernica MIFID II, alebo Smernica Európskeho parlamentu a Rady 2011/61/EÚ z 8. júna 2011 o správcoch alternatívnych investičných fondov, tzv. Smernica AIFMD). Európska právna úprava harmonizuje pravidlá platné i pre rozvinutejšie zahraničné trhy. Okrem toho je európsky rámec právnej regulácie jednotlivých subsektorov finančného trhu tvorený tiež tzv. level 2 legislatívou (rôzne vykonávacie nariadenia a technické štandardy) a level 3 legislatívou (napr. rôzne usmernenia Európskeho orgánu pre cenné papiere a trhy – ESMA). Spletitá právna regulácia znamená, že startup môže pri získavaní kapitálu často naraziť na bariéry spojené s reguláciami kapitálového trhu a potrebou získavania rôznych povolení, čo môže v konečnom dôsledku zvyšovať náročnosť a aj cenu získavania kapitálu.

Cieľom tohto príspevku je poukázať na tzv. bezpečné prístavy (*safe harbour*) regulácie kapitálových trhov, v ktorých môže startup získavať alternatívny kapitál svojpomocne, bez potreby získavania osobitných licencií alebo spĺňania požiadaviek podnikania v sektore kapitálového trhu alebo s minimálnymi nákladmi na špecifické verejnoprávne povolenia či licencie.

[III] *K rozdielu vytvorenia spin-off, resp. spin-out spoločnosti pozri Noskovič, J., Sališ, S. Rozhodovanie predchádzajúce založeniu univerzitnej spin-off alebo spin-out spoločnosti. Transfer technológií bulletin. číslo 2, rok 2022, s. 38.*

[IV] *Európska komisia v súčasnosti pripravuje novú stratégiu rozvoja startupov a scaleupov.* https://research-and-innovation.ec.europa.eu/strategy/strategy-research-and-innovation/jobs-and-economy/towards-eu-startup-and-scaleup-strategy_en

KOLEKTÍVNE INVESTOVANIE (Z POHĽADU STARTUPU)

Jednou z možností, ako získavať prostriedky nástrojmi kolektívneho investovania, je uchádzať sa o získanie prostriedkov z tzv. alternatívnych fondov kolektívneho investovania, či už rýdzo súkromných, alebo existujúcich s podporou verejných zdrojov.[V] S určitou dávkou zjednodušenia možno alternatívny investičný fond vnímať ako nástroj poskytovania rizikového kapitálu, ktorý je určený práve na financovanie spoločností, ktorých akcie alebo cenné papiere nie sú obchodované na regulovanom trhu, keďže alternatívny investičný fond môže investovať do majetku v podobe získavania obchodných podielov alebo získavania akcií startupov.[VI] Na Slovensku je v súčasnosti registrovaných 37 správcovských spoločností, ktoré môžu vytvárať a spravovať alternatívne investičné fondy, a povolenie na distribúciu alternatívnych investičných fondov má ďalších 160 subjektov.[VII] Startupy môžu tiež využívať rôzne nástroje na financovanie rizikového kapitálu, ktoré sú vytvárané na úrovni EÚ a mali by zabezpečiť financovanie i v oblastiach, kde by bolo investovanie súkromných fondov nedostupné.[VIII]

Pre rané štádia startupov je príznačné, že existuje snaha o minimalizáciu nákladov a regulácie. Startupy preto často hľadajú rôzne spôsoby, ako získavať kapitál čo najviac svojpomocne. Príkladom snahy startupov o takéto získavanie kapitálu bol vznik rôznych crowdfundingových platforiem[IX], ktoré reagovali na existujúci dopyt a existujúcu ponuku. Záujemcom dnes uľahčujú prístup k alternatívnemu financovaniu. Ako platformy spájajúce dopyt a ponuku pomáhajú „organizovať" trh s alternatívnym súkromným kapitálom tak pre investorov, ako aj pre účastníkov v pozícii startupov ako vlastníkov projektov. Práve fakticky vykonávaná činnosť týchto platforiem je zreteľným príkladom toho, ako v ostatných rokoch reagovala právna úprava na meniacu sa situáciu a následne bolo prijaté tzv. Nariadenie o crowdfundingu.[X] Pomyselná šedá zóna podnikania takýchto platforiem je v súčasnosti regulovaná, čo by malo prispieť k ich legitímnemu vnímaniu.

Právna regulácia kolektívneho investovania je obsiahnutá v Zákone o kolektívnom investovaní (skrátene len „ZKI"). Z právnoregulačného pohľadu je východiskom možnosť vykonávať kolektívne investovanie len vytváraním tuzemských subjektov kolektívneho investovania alebo zhromažďovaním peňažných prostriedkov a peniazmi oceniteľných hodnôt prostredníctvom ponuky cenných papierov alebo majetkových účastí v zahraničných subjektoch kolektívneho investovania.

V § 2 ods. 3 ZKI nachádzame všeobecný zákaz kolektívneho investovania, podľa ktorého sa zakazuje zhromažďovanie peňažných prostriedkov a peniazmi oceniteľných hodnôt na účel ich následného investovania za kumulatívneho splnenia dvoch podmienok. Prvou je podmienka, (I) že návratnosť takto zhromaždených peňažných prostriedkov a peniazmi

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[V] *tamtiež*

[VI] *Alternatívnym investičným fondom sa v zmysle § 4 ods. 6 ZKI rozumie fond, ktorý nie je štandardným fondom a do ktorého sa peňažné prostriedky a peniazmi oceniteľné hodnoty zhromažďujú prostredníctvom verejnej ponuky alebo privátnej ponuky s cieľom investovať takto zhromaždené peňažné prostriedky a peniazmi oceniteľné hodnoty do majetku ustanoveného týmto zákonom alebo vymedzeného štatútom alternatívneho investičného fondu.*

[VII] *Alternatívnych investičných fondov je celkovo registrovaných 68. Zdroj: Verejný register subjektov finančného trhu: https://subjekty.nbs.sk/*

[VIII] *Ide napríklad priamo o fondy vytvárané Európskou radou pre inovácie, napr. https://eic.ec.europa.eu/eic-fund/about-eic-fund_en.*

[IX] *Ako napr. zahraničný Kickstarter alebo slovenské Crowdberry*

[X] *Nariadenie Európskeho parlamentu a Rady (EÚ) 2020/1503 zo 7. októbra 2020 o európskych poskytovateľoch služieb hromadného financovania pre podnikanie a o zmene nariadenia (EÚ) 2017/1129 a smernice (EÚ) 2019/1937 (Text s významom pre EHP)*

oceniteľných hodnôt alebo zisk osôb, ktorých peňažné prostriedky a peniazmi oceniteľné hodnoty boli zhromaždené, sú čo i len čiastočne závislé od hodnoty alebo výnosu aktív, ktoré boli za zhromaždené peňažné prostriedky a peniazmi oceniteľné hodnoty nadobudnuté. Druhou je podmienka, (II) že sa vykonáva na základe povolenia vydaného podľa ZKI.

Zákon o kolektívnom investovaní poskytuje bezpečný prístav pre startupy, ktorých hlavným cieľom je financovanie činnosti v podobe výroby, výskumu alebo poskytovania iných služieb ako finančných služieb, pričom je financovaná prevažne z vlastných prostriedkov osoby zhromažďujúcej peňažné prostriedky.[XI] Na aplikáciu tejto výnimky je nevyhnutné kumulatívne splnenie dvoch podmienok, a to (I) hlavnej činnosti orientovanej na výrobu, výskum alebo poskytovanie služieb a (II) podmienky financovania z vlastných prostriedkov osoby, ktorá peňažné prostriedky zhromažďuje. Negatívnou podmienkou (III) je, že startup neposkytuje finančné služby. Podmienka týkajúca sa výšky vlastných prostriedkov a ich kombinovania so zhromaždením kapitálu od verejnosti bude splnená vždy vtedy, keď budú vlastné zdroje spoločnosti prevažovať nad získanými zdrojmi od investorov. Za vlastné zdroje spoločnosti by sa mali považovať zdroje, s ktorými nie je spojená právna povinnosť ich vrátiť.[XII] V závislosti od typu obchodnej spoločnosti môžu existovať v podobe vkladov spoločníkov do spoločnosti, príspevkov do kapitálových fondov, zdroje získané splatením emisného kurzu akcií alebo emisného ážia. Získavanie zdrojov v rámci bezpečného prístavu výnimky pre výskum a vývoj je možné vždy iba v kombinácii s vlastným kapitálom. Okrem toho musí byť splnená aj podmienka nefinančnej služby. Podmienke nefinančných služieb (resp. činností) sa budeme venovať ďalej v rámci metodiky posúdenia činnosti ako kolektívneho investovania.

METODIKA POSÚDENIA ČINNOSTI AKO KOLEKTÍVNEHO INVESTOVANIA

Podľa obrázka č. 1 vytvoreného na základe metodického usmernenia Národnej banky Slovenska (NBS)[XIII] možno pre posúdenie činnosti ako kolektívneho investovania využiť nasledujúcu zjednodušenú schému.[XIV]

1	áno	nie
Dochádza k zhromažďovaniu kapitálu od investorov za účelom vykonávania finančnej činnosti?		
Je investor vystavený trhovému riziku (závislosti návratnosti zhromaždeného kapitálu/zisku investora od hodnoty aktív, do ktorých bol kapitál investovaný)?		
Dochádza k spoločnému investovaniu kapitálu do rovnakého portfólia aktív, a teda je kapitál spravovaný spoločne a investori podliehajú spoločnému, združenému riziku?		
Vykonáva sa správa zhromaždeného kapitálu v prospech investorov?		

2	áno	nie
Spadá posudzovaná činnosť do niektorej zo zákonných výnimiek?		
Zhromažďuje sa kapitál od vopred existujúcej skupiny blízkych osôb (resp. ide o rodinný podnik)?		

* Pokiaľ je odpoveď na všetky otázky z prvej tabuľky "áno" a na všetky otázky z druhej tabuľky „nie" - ide o činnosť kolektívneho investovania
** Pokiaľ je odpoveď aspoň na jednu otázku z prvej tabuľky "nie" a aspoň na jednu otázku z druhej tabuľky "áno" - nejde o činnosť kolektívneho investovania

Obrázok č. 1: Zjednodušená schéma posudzovania činnosti kolektívneho investovania

Po zahliadnutí zjednodušenej schémy by sa na prvý pohľad mohlo zdať, že pre startupy vykonávajúce nefinančnú činnosť je téma kolektívneho investovania nepodstatná. Slovenské zákonné výnimky z kolektívneho investovania sú však formulované úzko a zákaz obsiahnutý v § 2 ods. 3 ZKI je všeobecný. Výklad toho, čo môže spadať pod finančnú alebo nefinančnú činnosť, môže preto v niektorých prípadoch vyžadovať zložitejšie posúdenie.

[XI] *§ 2 ods. 5 ZKI.*

[XII] *Porovnaj Mazúr, J. In Grambličková, B., Mazúr, J., Barkoci, S. Právo startupových spoločností: správa, financovanie a duševné vlastníctvo. Bratislava: C. H. Beck, 2023, s 88.*

[XIII] *Metodické usmernenie útvarov dohľadu nad finančným trhom Národnej banky Slovenska z 29. mája 2023 č. 5/2023 k neoprávnenému podnikaniu v oblasti kolektívneho investovania.*

[XIV] *tamtiež*

Výklad definície kolektívneho investovania podľa § 2 ods. 1 ZKI je bližšie vysvetľovaný v metodickom usmernení NBS[XV]. To rozlišuje medzi hlavnými a vedľajšími znakmi definície kolektívneho investovania, ktoré sú nevyhnutné na posúdenie toho, či ide o činnosť regulovanú zákonom. Hlavnými znakmi sú:

- podnikanie,
- zhromažďovanie peňažných prostriedkov a peniazmi oceniteľných hodnôt od investorov s cieľom spoločného investovania,
- investovanie zhromaždeného kapitálu v súlade s investičnou politikou,
- v prospech osôb, ktorých kapitál bol zhromaždený (ďalej „investor"),
- závislosť návratnosti zhromaždeného kapitálu od investorov alebo zisku investorov od hodnoty, alebo výnosu aktív, ktoré boli za zhromaždený kapitál nadobudnuté.

Vedľajšie znaky kolektívneho investovania vyvodzuje slovenský regulátor z tzv. ESMA usmernení[XVI]. Sú tiež odvodené z definície kolektívneho investovania. Zahŕňajú posúdenie:

- či návratnosť zhromaždeného kapitálu vyplýva zo spoločného (resp. združeného) rizika alebo miery účasti investorov na každodenných záležitostiach týkajúcich sa investovania poskytnutého kapitálu, resp. na vykonávanej činnosti,
- či dochádza k zhromažďovaniu kapitálu na účely vykonávania finančnej činnosti,
- či k nemu dochádza len s cieľom financovania inej (nefinančnej) činnosti.

V zmysle metodického usmernenia je vzťah medzi hlavnými a ďalšími znakmi charakterizovaný tým, že vedľajšie znaky slúžia ako pomôcka na posúdenie, či sú kumulatívne naplnené všetky hlavné znaky kolektívneho investovania alebo či sú splnené zákonné výnimky z kolektívneho investovania.[XVII]

Naplnenie definičného znaku podnikania dosiahnu spravidla všetky obchodné spoločnosti, pretože v zmysle § 2 ods. 2 písm. a) Obchodného zákonníka [XVIII] sú podnikateľmi *ex lege*.

Pre znak zhromažďovania kapitálu s cieľom spoločného investovania nie je podstatná forma nástroja slúžiaceho na získanie kapitálu, ako uvádza metodické usmernenie: „či napr. pôjde o vklad do základného imania obchodnej spoločnosti alebo družstva, vydanie prioritných alebo kmeňových akcií, vydanie iných cenných papierov, zmluvu o tichom spoločenstve alebo inú dohodu, na základe ktorej bude mať investor podiel na zisku, resp. hospodárskom výsledku subjektu, tiež podiel na likvidačnom zostatku či vyrovnací podiel. Rovnako môže ísť aj o kombináciu týchto spôsobov, pretože rozhodujúci je zámer osoby zhromažďujúcej kapitál od investorov tento kapitál použiť na spoločné investovanie v prospech investorov."

V tomto kontexte uvádza usmernenie NBS aj niekoľko príkladov. Príklad 2a znie: *„Spoločnosť A zhromaždí peňažné prostriedky od investorov, a to prostredníctvom zmluvy o tichom spoločenstve. Následne tieto peňažné prostriedky požičia inej spoločnosti, ktorú si spoločnosť A založí ako SPV (účelovo založený subjekt). SPV prostriedky zhromaždené spoločnosťou A ďalej investuje do cenných papierov, private equity alebo do nehnuteľností. Ak bude projekt úspešný, spoločnosť A dostane svoj podiel na zisku ako materská spoločnosť a neskôr sa to prejaví v zisku materskej spoločnosti, ktorá vyplatí zisk investorom – tichým spoločníkom. Ich zisk bude teda závislý od výsledkov investície uskutočnenej SPV. Spoločnosť A sa v takom prípade považuje za subjekt kolektívneho investovania. Spoločnosť A sa bude považovať za subjekt kolektívneho investovania aj v prípade, ak by tieto zhromaždené peňažné prostriedky požičala spoločnosti B, ktorá nie je*

[XV] *tamtiež*

[XVI] *ESMA je Európsky orgán pre cenné papiere a trhy.*

[XVII] *Metodické usmernenie útvarov dohľadu nad finančným trhom Národnej banky Slovenska z 29. mája 2023 č. 5/2023 k neoprávnenému podnikaniu v oblasti kolektívneho investovania, bod 7.*

[XVIII] *Zákon č. 513/1991 Zb. Obchodný zákonník*

majetkovo prepojená so spoločnosťou A, ale ktorá ďalej investuje do cenných papierov, private equity alebo do nehnuteľností.“

Z uvedeného príkladu vyplýva, že ak by univerzity (priamo alebo prostredníctvom osobitnej obchodnej spoločnosti) vykonávali centrálne zhromažďovanie prostriedkov pre startupy, zhromažďovanie kapitálu výmenou za podiel zo zisku napr. dcérskej startupovej spoločnosti by napĺňalo jeden z hlavných znakov kolektívneho investovania – zhromažďovanie prostriedkov s cieľom spoločného investovania.

Príklad 2b hovorí: *„V prípade, ak by spoločnosť A zhromaždila peňažné prostriedky vydaním dlhopisu s fixným alebo variabilným úrokom, spoločnosť A sa nebude považovať za subjekt kolektívneho investovania, pretože zisk investorov je vopred určený (fixne daný v prípade fixného úroku) alebo vopred určiteľný (na základe vopred určeného vzorca v prípade variabilného úroku určeného napr. ako 3M Euribor). Takáto investícia by sa nepovažovala za investíciu v prospech investorov, a teda investícia zhromaždeného kapitálu nie je investovaná v prospech investorov a investori v takomto prípade nepodstupujú riziko z investície.“* V zmysle uvedeného je prípustné získavanie kapitálu vydávaním cenných papierov s pevným výnosom, resp. so ziskom nezávislým od hodnoty podkladového aktíva nadobudnutého ako investíciu. Z tohto pohľadu je však potrebné upozorniť, že tak vydávanie, ako aj následná správa alebo distribúcia cenných papierov je regulovanou činnosťou.[XIX]

Metodické usmernenie je založené na extenzívnom výklade znaku tzv. investičnej politiky, ktorú možno v konkrétnych prípadoch ťažko rozlíšiť od obchodnej stratégie startupovej spoločnosti. Vyplýva to z nasledujúceho usmernenia: *„Za investičnú politiku sa majú považovať akékoľvek usmernenia poskytnuté na spravovanie podniku, v ktorých sa stanovujú investičné kritériá iné než všeobecné usmernenia uvedené v obchodnej stratégii, ktorou sa podnik so všeobecným komerčným alebo priemyselným účelom riadi. Na určenie toho, či je naplnený hlavný definičný znak – existencia investičnej stratégie – alebo, naopak, je v konkrétnom prípade definovaná obchodná stratégia, je nevyhnutné aj posúdenie ďalšieho (podporného, vedľajšieho) znaku, a to či sa vykonáva finančná alebo nefinančná činnosť.“*

Na lepšie pochopenie sú v usmernení uvádzané nasledujúce príklady:

„Príklad 8: V prípade, ak podnik zhromažďuje kapitál na účely výstavby (napr. logistického areálu, zdravotníckeho zariadenia a pod.) alebo na účely vykonávania inej vlastnej nefinančnej činnosti (napr. výrobu tovaru), nejde o činnosť kolektívneho investovania.

Príklad 9: Spoločnosť A zhromažďuje kapitál od investorov prostredníctvom uzatvorenia zmluvy o tichom spoločenstve, na základe ktorej budú mať tichí spoločníci majetkovú účasť v spoločnosti B – spoločnosť A teda vykonáva finančnú činnosť bez ohľadu na to, aký je predmet činnosti spoločnosti B.“

Pre univerzitné startupy majú tieto príklady nasledujúce implikácie:

- získavanie kapitálu univerzitným startupom od investorov na vykonávanie nefinančnej činnosti by bolo v zásade prípustné, ak by ho startup vykonával priamo a nepôjde o startup, ktorého hlavná činnosť by spočívala vo finančnej činnosti,
- okrem toho je potrebné posúdiť aj to, či by takéto získavanie kapitálu nespadalo do inej regulácie (napr. crowdfunding alebo regulácie cenných papierov) a v prípade využitia digitálnych inovácií napr. do oblasti regulácie kryptoaktív či finančných nástrojov.

Otáznym môže byť posúdenie obchodného modelu startupu založeného na neskoršom generovaní príjmov z duševného vlastníctva na základe výnosov z komercializácie licencií. Problém posudzovania finančnej činnosti NBS vysvetľuje na príkladoch podnikania s nehnuteľnosťami.

Podľa usmernenia je v prípade podnikania v oblasti nehnuteľností niekedy otázne, kde je hranica medzi

[XIX] *Tému riešime v časti 3 tohto príspevku.*

finančnou a prevádzkovou činnosťou podniku. Príklady 10 a 11 usmernenia uvádzajú nefinančné činnosti súvisiace s nehnuteľnosťami, ktorými sú: (I) prevádzka hotela alebo ubytovacieho zariadenia, (II) prevádzka sociálneho zariadenia (pre dôchodcov, deti, zdravotne znevýhodnené osoby a pod., (III) projektovanie nehnuteľností (vytvorenie koncepcie, projektu, výstavba nehnuteľnosti a jej následný predaj), (IV) tzv. facility management nehnuteľností (sprostredkovateľská činnosť alebo finančné poradenstvo v súvislosti s kúpou alebo predajom nehnuteľnosti, oceňovanie nehnuteľností). A príklady finančných činností, a to nákup, prenájom, lízing, správa a predaj nehnuteľností.

Príklad 11 usmernenia rieši konkrétne situácie: *„Ak vlastník nehnuteľnosti, napr. administratívnej budovy s kanceláriami, ponúka na predaj podiel na časti nehnuteľnosti a po predaji podielov k tejto nehnuteľnosti viacerým záujemcom je jeho zámerom vykonávanie správy takto spolu vlastnenej nehnuteľnosti na základe zmluvného vzťahu s jednotlivými spoluvlastníkmi danej nehnuteľnosti, takáto činnosť nie je považovaná za kolektívne investovanie, pretože:*

- *vlastník nehnuteľnosti v tomto prípade neinvestuje ďalej zhromaždené peňažné prostriedky, keďže ide o priamy predaj podielu k nehnuteľnosti a spoluvlastník (záujemca) týmto nadobúda všetky práva a povinnosti s vlastníctvom nehnuteľnosti súvisiace, ako aj kontrolu nad ďalšou správou nehnuteľnosti,*
- *zisk potenciálnych spoluvlastníkov nehnuteľnosti v tomto prípade nezávisí od ďalšej činnosti pôvodného vlastníka, ten má rovnaké práva a povinnosti ako ostatní spoluvlastníci nehnuteľnosti,*
- *cieľom pôvodného vlastníka nie je finančná činnosť, ale prevádzkovanie budovy s kanceláriami a spravovanie nájomných vzťahov s tretími osobami na základe dohody so spoluvlastníkmi budovy.“*

Okrem toho *„kúpa nehnuteľnosti za zhromaždené peňažné prostriedky od investorov na účely jej zhodnotenia a predaja so ziskom v budúcnosti, ktorý sa vyplatí investorom, alebo kúpa nehnuteľnosti za zhromaždené peňažné prostriedky od investorov s cieľom jej nájmu a vyplácania výnosov z nájmu nehnuteľnosti investorom nepredstavuje nefinančnú činnosť, a teda ide o kolektívne investovanie.“*[xx]

Z uvedeného je zrejmé, že za finančnú činnosť je z pohľadu kolektívneho investovania považovaný aj prenájom nehnuteľností či špekulácia na prípadné zhodnotenie nehnuteľností pri ich eventuálnom predaji v budúcnosti. Odhliadnuc od sektora nehnuteľností, z pohľadu univerzitných startupov, ktorých obchodná stratégia nesmeruje až k vývoju finálneho produktu, ale napr. k licencovaniu technológie môže pri zhromažďovaní kapitálu existovať riziko naplnenia znakov kolektívneho investovania. Pre voľbu spôsobu financovania je preto dôležité posúdiť aj cieľ startupu.

Z uvedeného môže byť prísny pohľad slovenského regulátora pre startup veľmi limitujúci, najmä ak získanie kapitálu smeruje k tomu, aby sa startup na pomyselnej ceste rastu posunul bližšie k vývoju prototypu s vidinou neskoršej komercializácie formou poskytovania licencií alebo prevodu duševného vlastníctva k technológii. Priestor na aplikáciu výnimiek podľa ZKI je pomerne úzky, pretože absentujú výnimky pre ponuky limitované obmedzenému počtu investorov, ktoré možno nájsť pri ponuke cenných papierov. Výnimka pre výskum a vývoj by mohla byť aplikovateľná taktiež iba za predpokladu, že činnosť startupu by nebola posúdená ako finančná.

Napokon do regulácie kolektívneho investovania nebudú spadať ani investície od tzv. anjelských investorov za predpokladu, že takéto osoby budú mať skutočný vplyv na správu a riadenie spoločnosti. Keďže poskytnutie investície anjelským investorom sa spravidla deje nadobudnutím ekvity spoločnosti, čím anjelský investor získava postavenie spoločníka v spoločnosti a svoje záujmy na správe a riadení spoločnosti si spravidla aj zmluvne ochráni, takáto činnosť by nemala mať znaky kolektívneho investovania.[xxi]

[xx] *Metodické usmernenie útvarov dohľadu nad finančným trhom Národnej banky Slovenska z 29. mája 2023 č. 5/2023 k neoprávnenému podnikaniu v oblasti kolektívneho investovania, bod 32.*

[xxi] *Pozri bod 28 Usmernenia NBS: „V prípade, ak majú všetci investori zásadný podiel na rozhodovaní o investovaní svojho kapitálu, nepôjde o spoločné investovanie podľa určených pravidiel (investičnej politiky), a teda nepôjde o kolektívne inves-*

CROWDFUNDING

Základná právna úprava crowdfundingu sa nachádza v Nariadení o poskytovateľoch služieb hromadného financovania. Z pohľadu získavania kapitálu startupom plní *crowdfunding* podobnú funkciu ako zhromažďovanie prostriedkov pri kolektívnom investovaní. Zo všeobecnejšieho pohľadu ide v oboch prípadoch o spôsoby získavania peňažných prostriedkov (tzv. *fundraising*). Predmetom regulácie je však v prípade *crowdfundingu* crowdfundingová platforma, ktorá uľahčuje zhromažďovanie prostriedkov ,nie subjekt, ktorý sa o prostriedky uchádza a o ich použití následne rozhoduje. Crowdfundingová platforma musí mať postavenie nezávislého sprostredkovateľa, ktoré je garantované ustanoveniami nariadenia o predchádzaní konfliktu záujmov[XXII]. Účelom nezávislosti crowdfundingovej platformy od startupu je zabezpečenie ochrany investorov. Samotný startup, ktorý má o získanie kapitálu záujem, nepotrebuje na získavanie kapitálu osobitnú licenciu alebo osobitné povolenie, vystupuje v pozícii tzv. vlastníka projektu. Startup sa môže uchádzať o získanie podpory investorov prostredníctvom crowdfundingovej platformy, avšak najviac do výšky 5 000 000 eur.[XXIII]

Výhodou získavania tohto druhu financovania je, že poskytuje startupu spätnú väzbu v súvislosti s možnosťou uplatnenia na trhu, ktorá sa reflektuje v objeme a rýchlosti, akou je startup schopný potrebný kapitál od investorov získať, resp. či ho vôbec môže získať.

Tým, že ekonomická podstata *crowdfundingu* spočíva v získavaní kapitálu od väčšieho počtu investorov, získavanie hromadného financovania môže podľa ZKI napĺňať aj znaky zhromažďovania kapitálu, a teda byť klasifikované ako kolektívne investovanie. Na rozdiel od získavania prostriedkov v prípade kolektívneho investovania nedefinuje crowdfundingová platforma, ktorá uľahčuje získavanie prostriedkov pre startup, investičnú stratégiu investora alebo obchodnú stratégiu startupu. Na túto skutočnosť reflektuje aj metodické usmernenie NBS v bodoch 17 a 38.[XXIV] Ak by však spojenie týchto činností (platformy a vlastníka projektu) nastalo v rámci startupu, mohlo by ísť o exces, ktorý by odôvodňoval posúdenie získavania hromadného financovania startupom aj cez prizmu kolektívneho investovania (a teda následne posudzovanie hlavných a vedľajších znakov podnikania startupu).

Startup môže uskutočniť *fundraising* aj v podobe tzv. *odmenového crowdfundingu*, ktorý nie je predmetom existujúcej právnej regulácie crowdfundingu. Pre *odmenový crowdfunding* je typické, že záväzkom startupu nie je poskytnúť investorovi peňažnú odmenu alebo podiel na zisku, ale poskytnúť mu inú formu odmeny (napr. reklamný produkt, produkt v limitovanej edícii, reklamný priestor a pod.). Pokiaľ *odmenový crowdfunding* spočíva v

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tovanie. Za zásadný podiel na rozhodovaní o investovaní kapitálu sa nepovažuje len bežné rozhodovanie na valných zhromaždeniach akcionárov, napr. o záležitostiach, ako sú zlúčenia alebo likvidácia, voľba zástupcov akcionárov alebo schválenie ročnej účtovnej závierky. Ak však existuje osoba, ktorá kapitál od investorov nielen zhromažďuje, ale aj rozhoduje (podľa určenej investičnej politiky a aj na základe vlastného uváženia) o spoločnom investovaní tohto kapitálu a rozhodovanie jednotlivých investorov je v tomto zmysle obmedzené alebo vylúčené, takáto činnosť sa považuje za činnosť kolektívneho investovania.“

[XXII] *Nariadenie o crowdfundingu, čl. 8.*

[XXIII] *Nariadenie o crowdfundingu, v čl. 1, ods. 1 písm. c).*

[XXIV] *V zmysle Usmernenia NBS bod 17: „Na vylúčenie prítomnosti investičnej stratégie je potrebné zvažovať aj okolnosti ďalších prípadných výnimiek, ako napríklad neexistencia každodennej kontroly správcu (alebo riadiaceho orgánu) subjektu, do ktorého bol majetok investorov zhromaždený; toto je splnené napríklad pri SPV (účelovo založených subjektoch) používaných pri crowdfundingu, ktorých cieľom je združenie majetku investorov a jeho investovanie do cieľovej spoločnosti, pričom správca alebo riadiaci orgán je oprávnený prijímať rozhodnutia o zásadných záležitostiach SPV len na základe záväzného ad hoc rozhodnutia investorov SPV (najmä v súvislosti s nákupom, predajom alebo iným nakladaním s podkladovým nelikvidným alebo nedeliteľným aktívom alebo vzhľadom na spôsob rozdelenia výnosu).“*

tom, že by investor mohol získať odmenu, ktorej hodnota nie je závislá od hodnoty podkladového aktíva, ktorá sa dá za jeho investíciu nadobudnúť, nešlo by v takom prípade ani o právne regulovaný crowdfunding, ani o kolektívne investovanie.[XXV]

Ak za majetkový vstup osoby (kvázi investora) nie je startupom ponúkané variabilné zhodnotenie vkladu závislé od nadobudnutého aktíva, tak takáto činnosť by nemala mať ani znaky kolektívneho investovania.
Predpredaj produktov alebo služieb môže byť tiež jedným zo spôsobov, ktorým môže startup získavať kapitál na svoju ďalšiu činnosť. Takáto činnosť by spravidla nespadala do regulácie získavania kapitálu ani z pohľadu crowdfundingu, ani z pohľadu kolektívneho investovania. V tomto prípade je pri predpredaji tovarov a nefinančných služieb určených fyzickým osobám potrebné dodržiavať všeobecné právne pravidlá ochrany spotrebiteľov, ktoré kladú nároky najmä na plnenie informačných povinností vo vzťahu k spotrebiteľom pred uzatvorením zmluvy. Alternatívou môže byť spustenie predpredajov určených iba v rámci veľkoobchodných trhov, na ktoré sa ochrana spotrebiteľov nevzťahuje.

Špecifická situácia by mohla nastať, ak by sa odmena poskytovala investorom v digitálnej podobe vo forme tzv. úžitkových tokenov (t. j. tokenov vymeniteľných za tovar alebo služby, ktoré ešte neexistujú). Nariadenie MICA v zmysle čl. 4 ods. 6 existenciu takýchto tokenov legitimizuje a za určitých podmienok ju vyníma aj spod regulácie kryptoaktív.[XXVI]

VEREJNÁ PONUKA CENNÝCH PAPIEROV

Verejná ponuka cenných papierov nemusí prebiehať iba na organizovanom trhu, ktorým je napríklad burza. Verejná ponuka cenných papierov je v slovenských podmienkach priamo regulovaná Nariadením Európskeho parlamentu a Rady (EÚ) 2017/1129 o prospekte cenného papiera (ďalej len „Nariadenia o prospekte"). Okrem toho slovenská právna úprava pozostáva zo Zákona o cenných papieroch a investičných službách, v ktorom sú implementované aj ďalšie európske právne predpisy tvoriace základ regulácie finančných nástrojov, ako napr. MIFID, ako aj v Zákone o dlhopisoch.[XXVII] Táto právna regulácia sa týka tak vydávania dlhopisov, ktoré sú dlhovým nástrojom kapitálového trhu alebo emisie akcií, ako aj ekvitných nástrojov kapitálového trhu.[XXVIII] Zjednodušene povedané, pre emisiu cenných papierov, ich verejnú ponuku a distribúciu je potrebné získať osobitné povolenia v závislosti od toho, v akom postavení na trhu bude subjekt pôsobiť (t. j. či bude emitentom, ktorý predajom cenného papiera získa kapitál, alebo osobou, ktorá ich distribuuje). Emisia dlhopisov môže byť jedným z nástrojov získavania cudzieho kapitálu mimo oblasti kolektívneho investovania. Využitie výnimiek podľa Nariadenia o prospekte cenného papiera umožňuje emisiu cenných papierov dokonca aj bez toho, aby musel mať startup schválený prospekt cenného papiera.

Bezpečné prístavy pre tieto emisie sa nachádzajú v prípade privátnych ponúk na maloobchodnom trhu, ktoré sú vykonávané samotným emitentom (t. j. startupovou spoločnosťou) alebo licencovaným finančným sprostredkovateľom a ktoré sú adresované menej ako 150 osobám, majú menovitú hodnotu a

[XXV] *Ako príklad na získavanie financovania možno uviesť napr. činnosť platformy Donio.*

[XXVI] *Článok 4 ods. 6 Nariadenia MICA: „Ak sa týka verejná ponuka kryptoaktíva iného, než je token naviazaný na aktíva alebo token elektronických peňazí, úžitkového tokenu poskytujúceho prístup k tovarom alebo službám, ktoré ešte neexistujú alebo sa ešte neposkytujú, trvanie verejnej ponuky, ako sa uvádza v bielom doklade o kryptoaktívach, nesmie presiahnuť 12 mesiacov od uverejnenia bieleho dokladu o kryptoaktívach."*

[XXVII] *Smernica Európskeho parlamentu a Rady 2014/65/EÚ z 15. mája 2014 o trhoch s finančnými nástrojmi, ktorou sa mení smernica 2002/92/ES a smernica 2011/61/EÚ*

[XXVIII] *Vojtko, M. In Vojtko, M., Jedinák, P., Pálka, R. a kol. Právo a prax kapitálových trhov. Praktická príručka. Bratislava: C. H. Beck, 2023, s. 1.*

emisný kurz dlhopisu aspoň 100-tisíc eur alebo nedosahujú celkový objem jedného milióna eur.[XXIX] Z právneho pohľadu je na prípravu emisie spĺňajúcej tieto podmienky postačujúca príprava emisných podmienok a nie je potrebné schvaľovanie prospektu cenného papiera NBS.[XXX]

Charakteristickým znakom dlhopisu na rozdiel od akcie, ktorá je majetkovým cenným papierom bez povinnosti vrátenia dlhu (hodnoty akcie) pri jej splatnosti, je jeho spojitosť so záväzkom vrátiť dlh. V prípade, ak by mal startup formu akciovej spoločnosti, jeho akcie sú cenným papierom[XXXI] a je možné využiť výnimky spod povinnosti zverejniť prospekt.

Podľa slovenského práva sa za cenný papier nepovažuje obchodný podiel.[XXXII] Prípadná ponuka obchodných podielov však so sebou nesie riziko posúdenia zhromažďovania kapitálu ako zhromažďovania peňažných prostriedkov, ktoré by mohlo byť posúdené ako kolektívne investovanie. Všeobecné informovanie o tom, že spoločnosť hľadá investora, by pre naplnenie znakov verejnej ponuky nepostačovalo.

V kontexte digitalizácie a využívania rôznych fintech inovácií je napokon potrebné upozorniť, že prípadné snahy o digitalizáciu obchodných podielov (tzv. tokenizácie) môžu viesť k tomu, že takto vzniknuté nástroje by mohli spadať pod reguláciu kryptoaktív alebo širšiu reguláciu finančných nástrojov podľa Smernice MIFID II.
Možnosť získavania kapitálu v rámci privátnych maloobchodných ponúk môže byť pre startup lákavá, z pozície investorov však môže byť vnímaná nedôveryhodne práve pre nedostatok regulácie. Schválenie prospektu prípadnej emisie cenných papierov preto môže mať na získavanie kapitálu aj pozitívny efekt.

FINANCOVANIE PROSTREDNÍCTVOM VEREJNÝCH PODPORNÝCH SCHÉM

Financovanie prostredníctvom verejných podporných schém predstavuje alternatívu pre tie startupy, ktoré majú výskumný potenciál. V prípade univerzitných spoločností môžeme vychádzať z toho, že tieto subjekty výskumný potenciál majú. V súčasnosti možno nájsť v rámci tejto skupiny na trhu s kapitálom rôzne podporné schémy v podobe nenávratnej finančnej pomoci, ale aj modifikované tradičné nástroje na báze dlhového financovania[XXXIII]. Získanie takýchto prostriedkov prijímateľom podpory je zväčša viazané na splnenie podmienok konkrétnej schémy v súlade so zverejnenou výzvou a môže byť spojené s formou určitého osvedčenia podmienok, napr. osvedčenie o spôsobilosti vykonávať výskum a vývoj podľa § 7 písm. e) zákona č. 172/2005 Z. z. o financovaní vedy a výskumu, prípadne splnením iných požiadaviek skôr administratívneho charakteru, ako je napr. registrácia v registri partnerov verejného sektora podľa zákona č. 315/2016 Z. z. o registri partnerov verejného sektora. Pre startupy to predstavuje skôr administratívnu záťaž než regulačnú bariéru.

Z pohľadu univerzitnej spoločnosti ide v prípade využívania týchto foriem financovania o získavanie prostriedkov pochádzajúcich z centralizovaného zdroja (v zmysle prostriedkov pochádzajúcich od jedného subjektu). Financovanie univerzitnou spoločnosťou je spravidla výhodnejšie než iné štandardizované formy financovania na trhu a môže byť pre univerzitnú spoločnosť dosiahnuteľné aj vo fázach, keď má spoločnosť produkty alebo služby v počiatočnom štádiu vývoja. Ide o externý kapitál pochádzajúci od osôb mimo okruhu zakladateľov,

[XXIX] *Jedinák, P. a Bojkovský, M. In Vojtko, M. Jedinák, P. Pálka, R. a kol. Právo a prax kapitálových trhov. Praktická príručka. Bratislava: C. H. Beck, 2023, s. 39.*

[XXX] *tamtiež*

[XXXI] *§ 2 ods. 2 písm. a) Zákona o cenných papieroch*

[XXXII] *Mazúr, J. In Grambličková, B., Mazúr, J., Barkoci, S. Právo startupových spoločností: správa, financovanie a duševné vlastníctvo. Bratislava: C. H. Beck, 2023, s. 19.*

[XXXIII] *Napr. financovanie poskytované prostredníctvom Slovak Investment Holding, a. s., v spolupráci s etablovanými finančnými inštitúciami.*

ktorý je dostupný aj v situácii, keď by bolo získanie externého kapitálu zo súkromného sektora príliš rizikové.[xxxiv] Nevýhodou tohto financovania môže byť byrokratická záťaž spojená nielen so žiadaním o príslušné financovanie, ale aj s neskorším využívaním týchto prostriedkov na nákup tovarov a služieb, pretože prijatie takejto podpory ich môže z pohľadu verejného obstarávania alebo z pohľadu povinností prijímateľa štátnej pomoci stavať do pozície regulovaných subjektov. Za nevýhodu možno označiť aj to, že získanie takéhoto financovania neposkytuje startupu zo strany trhu priamu spätnú väzbu, ktorá by verifikovala to, či má podnikateľský zámer potenciál startupu uspieť na trhu.

ZÁVER

V príspevku sme poukázali na alternatívne formy svojpomocného získavania kapitálu pre startupy a na jednotlivé úskalia právnej regulácie, ktoré sú s nimi spojené. Všeobecná regulácia získavania kapitálu je upravená v zákone o kolektívnom investovaní. Pre oblasť slovenskej právnej regulácie kolektívneho investovania nie je dôležité to, ktorým nástrojom má byť investícia vykonaná, ale skôr to, čo za ňu potenciálny investor dostane a akú činnosť vykonáva samotný startup.

Právna regulácia kolektívneho investovania obsahuje výnimku pre výskum a vývoj. Aplikácia tejto výnimky je limitovaná tým, že výška zhromaždeného kapitálu musí predstavovať v pomere k vlastným prostriedkom menej ako jednu polovicu financovania a činnosť samotnej startupovej spoločnosti nesmie spočívať v poskytovaní finančných služieb.

Pokiaľ je získavanie prostriedkov od investorov realizované tak, že im startup ponúkne určitý podiel definovaný percentom z výnosu z podkladového aktíva, takéto získavanie peňažných prostriedkov bude spravidla indikovať možnosť kolektívneho investovania.

Centralizovanie zhromažďovania prostriedkov univerzitou alebo do účelovo vytvorených spoločností a následné požičiavanie finančných prostriedkov samotnej spoločnosti, ktorá je nositeľom myšlienky, môže viesť k zvýšeniu rizika posúdenia zhromažďovania prostriedkov ako kolektívneho investovania.

Z pohľadu rizikovosti posúdenia podnikania ako kolektívneho investovania má význam aj to, či má neskoršia činnosť startupu povahu finančnej alebo nefinančnej činnosti. V prípade ponuky fixného zhodnotenia ako protihodnoty za dočasné odovzdanie peňažných prostriedkov do startupu by mala aktivita startupu v podstate povahu získania dlhového financovania (napr. úveru či pôžičky). Z pohľadu startupu by nebola na získavanie takýchto peňažných prostriedkov potrebná licencia. Bolo by ich možné získavať vydávaním napr. dlhopisov.

Crowdfundingové platformy predstavujú pre startupy ako vlastníkov projektov alternatívnu možnosť získavať kapitál bez toho, aby na to startup musel získať špecifické povolenie alebo špeciálnu licenciu. Ich využívanie je limitované na financovanie projektov do výšky 5 mil. eur. Mimo právnej regulácie kapitálových trhov ostávajú formy získavania kapitálu, keď by startup ponúkol osobe (kvázi investorovi) inú odmenu než výnos z investície.

V neposlednom rade môže byť nájdenie inovatívneho spôsobu financovania v kontexte digitalizácie aj technologickou inováciou samotného startupu. V danom kontexte by mali fintech startupy upriamiť pozornosť na inovačný hub Národnej banky Slovenska[xxxv], v rámci ktorého môžu startupy viesť s regulátorom dialóg o možnostiach inovácií v oblasti finančných služieb.

POĎAKOVANIE

Tento príspevok vznikol v rámci projektu APVV-23-0331: Integrácia únie kapitálových trhov: zmena korporačného financovania a záchrana obchodných spoločností vo finančných ťažkostiach.

[xxxiv] *Mazúr, J. In Grambličková, B., Mazúr, J., Barkoci, S. Právo startupových spoločností: správa, financovanie a duševné vlastníctvo. Bratislava: C. H. Beck, 2023, s. 411.*

[xxxv] *Viac informácií o inovačnom hube a podmienkach do jeho zapojenia sa možno nájsť na webovom sídle NBS https://nbs.sk/dohlad-nad-financnym-trhom/fintech/inovacny-hub/.*

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Zákon č. 203/2011 Z. z. o kolektívnom investovaní

Zákon č. 566/2001 Z. z. o cenných papieroch a investičných službách

Nariadenie Európskeho parlamentu a Rady (EÚ) 2017/1129 zo 14. júna 2017 o prospekte, ktorý sa má uverejniť pri verejnej ponuke cenných papierov alebo ich prijatí na obchodovanie na regulovanom trhu

Nariadenie Európskeho parlamentu a Rady (EÚ) 2020/1503 zo 7. októbra 2020 o európskych poskytovateľoch služieb hromadného financovania

Nariadenie Európskeho parlamentu a Rady (EÚ) 2023/1114 z 31. mája 2023 o trhoch s kryptoaktívami

Metodické usmernenie útvarov dohľadu nad finančným trhom Národnej banky Slovenska z 29. mája 2023 č. 5/2023 k neoprávnenému podnikaniu v oblasti kolektívneho investovania

Autor:
Mgr. Dušan Rostáš, PhD.
ORCID ID:0000-0003-1973-9203

TRANSFER TECHNOLÓGIÍ NA TECHNICKEJ UNIVERZITE VO ZVOLENE V RÁMCI OTVORENÝCH INOVÁCIÍ *OPEN INNOVATION AND TECHNOLOGY TRANSFER AT THE TECHNICAL UNIVERSITY IN ZVOLEN*

ABSTRAKT Univerzity predstavujú základ výskumu a inovácií a tie sú hnacou silou hospodárskeho rastu a udržateľného rozvoja. Univerzity zohrávajú veľkú rolu aj z pohľadu transferu poznatkov do praxe. Rozvoj spolupráce medzi subjektmi, v rámci ktorej zdroje a výmena znalostí presahujú hranice organizácií, vytvárajú otvorenejší prístup, kde sú kľúčovým faktorom otvorené inovácie, založené na spolupráci a výmene znalostí. Z uvedeného dôvodu sa náš príspevok sústreďuje na analýzu vybraných aspektov transferu technológií na Technickej univerzite vo Zvolene z pohľadu toku znalostí v rámci otvoreného prístupu k inováciám. Na hodnotenie sme využili výstupy Technickej univerzity vo Zvolene, uverejnené vo vedeckej databáze Web of Science. Ako primárnu metódu identifikácie otvorenosti transferu znalostí sme použili klastrovú analýzu. Na základe vykonanej analýzy môžeme konštatovať, že transfer technológií a znalostí Technickej univerzity vo Zvolene je z pohľadu spolupráce s inými organizáciami a univerzitami celosvetový.

ABSTRACT Universities are the foundation of research and innovation, and these are the driving force of economic growth and sustainable development. Universities also play a major role in terms of transferring this knowledge into practice. The development of cooperation among entities, within which resources and knowledge exchange go beyond the boundaries of organizations, creates more open approach. Open innovation, based on cooperation and knowledge exchange, plays a key factor here. For this reason, our contribution focuses on the analysis of selected aspects of technology transfer at the Technical University in Zvolen from the perspective of knowledge flow within the framework of open access to innovation. For the evaluation, we used the outputs of the Technical University in Zvolen published in the scientific database Web of Science. We used cluster analysis as the primary method for identifying the openness of knowledge transfer. Based on the analysis performed, we can conclude that the transfer of technology and knowledge at the Technical University in Zvolen is global, considering cooperation with other organizations and universities.

ÚVOD

Transfer technológií na akademickej pôde je z pohľadu otvorených inovácií v oblasti inovácií a výskumu aktuálnou témou. Väčšina teórií o transfere technológií na univerzitách hodnotí ich vzťah medzi univerzitami a priemyselnom prostredníctvom trojitej špirály Triple Helix, ktorú tvoria univerzity – priemysel – vláda (Etzkowitz, 2003; Etzkowitz et al., 2000). Model Helix sa považuje za rozšírenie úlohy univerzít v spoločnosti v oblasti rozvoja a šírenia vedomostí v ekonomike v rámci transferu technológií a znalostí, ktoré predstavujú rozvoj spolupráce charakteristickej otvorenými inováciami. Transfer technológií je definovaný rôznymi spôsobmi (Bozeman, 2000). Jeho definícia závisí od účelu a oblasti výskumu. Transfer technológií je špecifický proces prenosu znalostí, ktorý závisí od formy, akou spoločnosti spravujú znalosti (Bozeman, 2000; Padilla Bejarano et al., 2023; Bejarano et al., 2023).

Rôzne formy transferu technológií a znalostí medzi univerzitami a organizáciami v rámci otvorených inovácií závisia predovšetkým od politík a prostredia v každej krajine (González de la Fe, 2009). Okrem ekonomických, politických a právnych prostredí, ktoré zasahujú do transferu technológií, existujú aj vnútorné vplyvy v rámci univerzity, ktoré nakoniec určujú rýchlosť a smer toku vedomostí a jeho úlohy v inovačných systémoch založených na vedomostiach. Otvorené inovácie sú otvorenejším prístupom, v ktorom zdroje a výmena znalostí presahujú hranice organizácií, charakterizujú vzťahy spolupráce, ktoré existujú medzi univerzitami a organizáciami. Otvorená inovácia je teda inovačný proces založený na tokoch vedomostí, ktoré zámerne prekračujú hranice univerzity a organizácií. Tieto toky znalostí môžu znamenať prichádzajúce znalosti do organizácie, výstupné znalosti z organizácie alebo oboje, t. j. spojenie externých zdrojov znalostí a komercializačných aktivít (Padilla Bejarano et al., 2023; Bejarano et al., 2023).

Cieľom tohto výskumu je preto analyzovať transfer technológií na Technickej univerzite vo Zvolene z pohľadu toku znalostí v rámci otvorených inovácií.

METODIKA

Objektom analýzy je skúmanie toku znalostí v rámci otvoreného prístupu k inováciám z pohľadu vybraných aspektov transferu technológií. Skúmaným subjektom je Technická univerzita vo Zvolene (TUZVO) – moderná vysokoškolská inštitúcia, ktorá rozvíja tvorivé vedecké bádanie a na jeho základe poskytuje vzdelávanie v európskom vzdelávacom a výskumnom priestore (TUZVO, 2024). Pri vykonaní analýzy sme vychádzali z údajov vedeckej databázy Web of Science (ďalej WOS), ktorá prináša referenčné a citačné údaje z vedeckých časopisov, konferenčných zborníkov a iných dokumentov z rôznych vedných odborov a je využívaná na meranie, hodnotenie a sledovanie vedeckého výskumu (Gondová a Ilavská, 2025; CVTI, 2024; Birkle et al., 2020). Hodnotiacim obdobím boli roky 2014 – 2024, údaje boli získané k dátumu 1. 1. 2025. Na základe analýzy a vygenerovaných údajov z databázy WOS bola prostredníctvom VOSviewer verzie 1.6.20 spracovaná sieťová mapa charakterizujúca transfer technológií a znalostí Technickej univerzity vo Zvolene z pohľadu spoluautorstva na publikáciách podľa krajín spolupracujúcich na výskume.

VÝSLEDKY

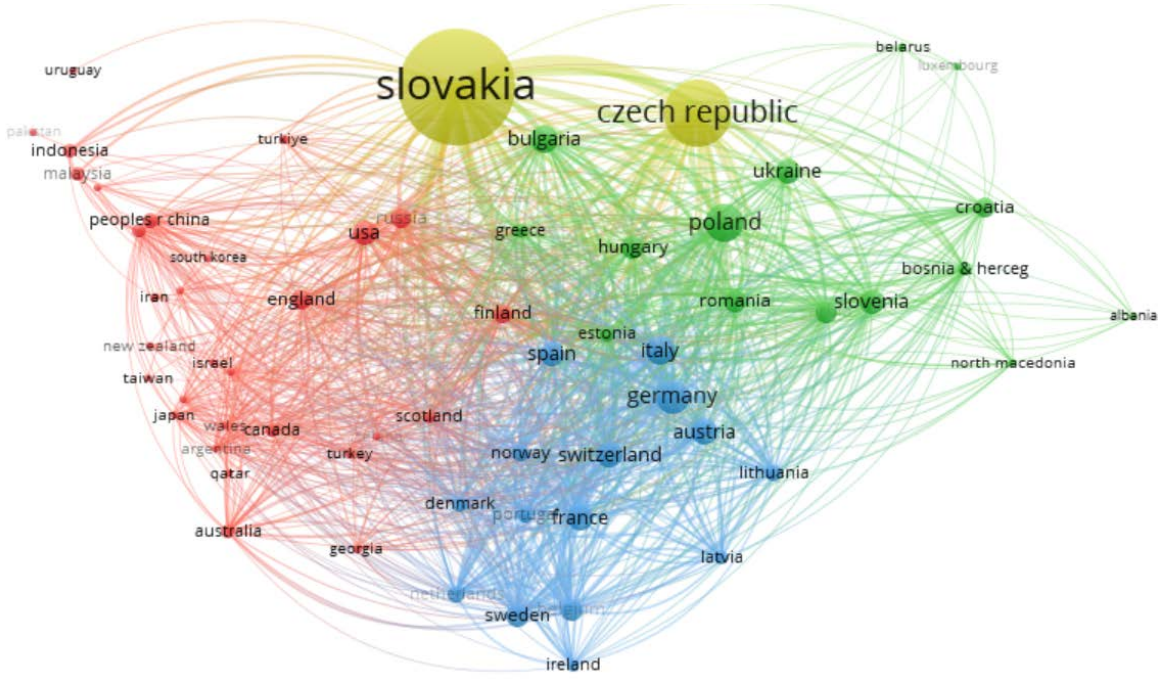
Výsledky analýzy charakterizujú transfer technológií na Technickej univerzite vo Zvolene z pohľadu toku znalostí v rámci otvoreného prístupu k inováciám. V skúmanom období rokov 2014 – 2024 s afiliáciou Technickej univerzity vo Zvolene bolo uverejnených 2762 publikácií a 23085 evidovaných ohlasov vo vedeckej databáze WOS (uvedené údaje sú evidované k 1. 1. 2025).

Oblasti výskumu, na ktoré sa zameriava Technická univerzita vo Zvolene (pozri tabuľka 1), sú lesníctvo, veda o materiáloch, papier, drevo, ekonomika, environmentálne vedy, ekológia a pod.

Pre potreby identifikácie transferu technológií na Technickej univerzite vo Zvolene z pohľadu toku znalostí v rámci otvoreného prístupu k inováciám bola spracovaná analýza spolupráce tejto inštitúcie

Oblasti výskumu	Početnosť	
	absolútna	relatívna
lesníctvo	663	24.004 %
veda o materiáloch, papier, drevo	623	22.556 %
ekonomika	274	9.920 %
environmentálne vedy	239	8.653 %
ekológia	167	6.046 %
manažment	144	5.214 %
multidisciplinárna náuka o materiáloch	135	4.888 %
veda o rastlinách	134	4.852 %
environmentálne štúdie	129	4.671 %
podnikanie	112	4.055 %
zelené a udržateľné technológie	107	3.874 %
aplikovaná fyzika	97	3.512 %
multidisciplinárne inžinierstvo	68	2.462 %
multidisciplinárne geovedy	66	2.390 %
veda o polyméroch	63	2.281 %
vodné zdroje	63	2.281 %
ochrana biodiverzity	59	2.136 %
podnikové financie	58	2.100 %
multidisciplinárne vedy	52	1.883 %
multidisciplinárna chémia	49	1.774 %
iné		

Tabuľka 1: Top 15 oblastí výskumu na Technickej univerzite vo Zvolene podľa databázy WOS. Zdroj: Databáza Web of Science, 2025



Obrázok 1: Sieťová mapa transferu technológií a znalostí v rámci otvoreného prístupu Technickej univerzity vo Zvolene podľa databázy WOS z pohľadu krajín, spracovaná prostredníctvom VOSviewer verzie 1.6.20

s inými organizáciami a univerzitami. Vychádzali sme z databázy identifikovaných výstupov vedeckej činnosti Technickej univerzity vo Zvolene v rámci vedeckej databázy Web of Science. Prostredníctvom klastrovej analýzy bola vytvorená sieťová mapa krajín, s ktorými TUZVO spolupracuje na úrovni rôznych organizácií a univerzít (pozri obrázok 1).

Táto spolupráca prezentuje transfer technológií a znalostí v rámci otvoreného prístupu Technickej univerzity vo Zvolene z pohľadu toku znalostí za posledných 10 rokov, podieľajúc sa na spoluautorstve na výsledkoch výskumu a vývoja s najvyšším výskytom. Z pohľadu spolupráce na rozvoji vedy a výskumu (spoluautorstva na výskume) bolo identifikovaných 110 krajín, s ktorými sa preukázalo spoluautorstvo Technickej univerzity vo Zvolene v rámci transferu technológií a znalostí. Najintenzívnejšiu spoluprácu môžeme identifikovať v rámci Slovenskej republiky a Českej republiky, so zvyšujúcou sa vzdialenosťou jednotlivých krajín sa táto intenzita znižuje, aj keď to nie je pravidlo a nie je to ani potvrdené analýzou. Na základe vykonanej analýzy môžeme konštatovať, že Technická univerzita má z pohľadu transferu technológií a toku znalostí v rámci otvoreného prístupu celosvetové spôsobenie.

ZÁVER

Transfer technológií na akademickej pôde je komplexným procesom, ktorý môže byť efektívne podporený prístupom otvorených inovácií. Tento inovačný model umožňuje lepšie prepojenie univerzít s inými organizáciami v rámci výskumu a inovácií, čím sa zvyšuje flexibilita, rýchlosť a efektivita transferu technológií, znalostí a inovácií. S daným procesom sú však spojené rôzne výzvy, ktoré je nevyhnutné identifikovať a zapracovávať do stratégií ďalšieho rozvoja.

POĎAKOVANIE

Tento článok vznikol v rámci Národnej stratégie výskumu, vývoja a inovácií na podporu transferu technológií a poznatkov na vysokých školách spojených s podporou profesionalizácie a zvýšenia personálnych kapacít centier pre transfer technológií alebo obdobných útvarov na podporu transferu poznatkov (CTT).

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Autor:
Erika Loučanová

DOC. ING. ERIKA LOUČANOVÁ, PHD.

Od roku 2007 pôsobí na Katedre marketingu, obchodu a svetového lesníctva Technickej univerzity vo Zvolene. Vo vedeckovýskumnej práci sa venuje oblasti inovačného manažmentu, čo zahŕňa inovácie, ekologické inovácie, inovačné analýzy, inovačné stratégie, interakcie medzi subjektmi v rámci inovačných sietí a klastrov a oblasťudržateľnosti. V rámci Národnej stratégie výskumu, vývoja a inovácií pôsobí ako odborná pracovníčka, ktorá zabezpečuje vedeckovýskumnú činnosť.

THE EFFECT OF UNIVERSITY PATENT TRANSFERS ON SUBSEQUENT INNOVATION: EVIDENCE FROM CHINESE UNIVERSITIES

ABSTRACT This study examines university patent transfer activities and their impact on innovation outcomes. The findings indicate that universities are becoming increasingly active in the patent transfer market, with invention patents and those in the manufacturing sector representing a substantial portion of transferred patents. Patent transfers positively affect university innovation, with a one-standard-deviation increase in patent mobility leading to a significant rise in innovation output. However, the impact of patent mobility varies by patent type and university characteristics. Universities with highly qualified research personnel and stronger social networks benefit more from patent transfers in innovation. These results underscore the role of patent transfers as a critical mechanism for fostering university innovation and highlight the institutional and regional factors that influence their effectiveness.

INTRODUCTION

Innovation is the cornerstone of a nation's competitiveness and a fundamental driver of economic growth. Universities, as central hubs of scientific research, play a crucial role in fostering innovation by providing essential research resources. Over the past few decades, China's investment in university research has increased significantly, rising from 580 million yuan in 1986 to 179.7 billion yuan in 2019. This surge in research funding has led to an exponential increase in research output, particularly in patents.

As research investment grows, universities are producing more scientific and technological outcomes, including academic papers, monographs, and patents. Patents, in particular, have seen a dramatic rise in application numbers. In 2005, Chinese universities filed approximately 20,000 patents annually, a figure that surged to 340,000 by 2019. Notably, around 60% of these patents were invention patents, which typically hold higher technological value. The growing patent output reflects the strengthening role of universities in driving technological advancements and their increasing contribution to innovation.

However, a major challenge lies in the effective transfer and commercialization of university research outcomes. Despite the large number of patents, the actual technology transfer rate remains relatively low compared to developed nations. Recognizing this issue, the Chinese government has implemented several policies, such as the "Action Plan for Promoting the Commercialization of Scientific and Technological Achievements" issued by the Ministry of Education and other departments between 2016 and 2020. These initiatives aim to facilitate the industrial

application of research findings, enhance the efficiency of technology transfer, and accelerate the transformation of scientific discoveries into productive forces.

Given the critical role of universities in national innovation systems, optimizing the process of research commercialization has become an urgent priority. Understanding how university-generated patents transition from research laboratories to real-world applications is essential for fostering economic development and maximizing the societal impact of innovation. Therefore, this study systematically examines the mechanisms and influencing factors behind university patent transfers, providing insights into how policy interventions can enhance technology commercialization and bridge the gap between academic research and industry adoption.

LITERATURE REVIEW

LITERATURE RELATED TO UNIVERSITY TECHNOLOGY TRANSFERS

Extensive research has explored the factors influencing university technology transfer. One of the primary determinants is the internal characteristics of universities. The research capacity of an institution, including the size and quality of its research personnel together with the level of R&D investment (Powers 2005, Xu et al. 2011), plays a significant role in facilitating technology transfer. Additionally, the structure and efficiency of university technology transfer offices (TTOs) significantly impact the commercialization process (Siegel et al. 2003a, 2004, Markman et al. 2004). Factors such as incentive mechanisms, managerial efficiency, institutional longevity, organizational scale, and even available resources have an impact on the effectiveness of technology transfer (Markman et al., 2005; Weckowska, 2015). Some studies suggest that well-designed reward systems within universities can positively contribute to technology transfer by motivating researchers to engage (Siegel et al. 2003b, Siegel et al 2004). However, other research indicates that excessive emphasis on financial incentives may divert researchers' attention from academic entrepreneurship, thereby causing distortion and limiting the broader impact of technology transfer (Grandi and Grimaldi 2005).

The intrinsic attributes of the technology being transferred also determine the likelihood of successful commercialization. Several studies have examined the role of patent characteristics, including the technological significance of innovation, the breadth of patent claims, and the specific domain of expertise (Powers 2005, Bozeman and Gaughan 2007). Moreover, the academic reputation and prior experience of the inventors play a key role in enhancing the credibility and attractiveness of the patented technology to potential industry partners (Chapple et al. 2005).

Another crucial dimension is the interaction between universities and external firms. Effective technology transfer requires strong university-industry linkages. Studies have highlighted the importance of sustained engagement with corporate entities, external licensing agencies, and intermediaries in facilitating the commercialization of research (Siegel et al. 2003a, 2004, Buenstorf and Geissler 2012). The frequency and depth of interactions between academic institutions and industry partners directly influence the speed and success of technology transfer. Additionally, cultural and institutional differences, geographic and economic distance, and discrepancies in technological capabilities or policy environments can create barriers to effective knowledge diffusion (Buenstorf and Schacht 2013, Fang et al. 2014).

While extensive research has examined the determinants of technology transfer, its consequences for subsequent university innovation remain an underexplored area. Theoretically, Thursby and Thursby (2007) applied a life-cycle model, suggesting that under a tenure-track system, revenue from technology transfer should positively influence future research output by providing both financial resources and incentives for continued innovation (Lach and Schankerman

2008). However, empirical evidence presents a more nuanced reality. Studies based on U.S. university data indicate that while financial income from technology transfer tends to reduce the quantity of research output, it positively impacts research quality (Lach & Schankerman). This apparent contradiction has been attributed to the research congestion effect, wherein researchers shift their focus towards deepening and refining existing knowledge rather than producing a high volume of discoveries (Jesen and Thursby, 2003).

Further investigations into academic researchers' time allocation suggest that engagement in technology transfer reshapes their research agenda. Given their dual responsibilities of conducting research and fulfilling teaching commitments, scholars must navigate trade-offs between fundamental and applied research. Some studies (Jensen and Thursby, 2003) argue that research commercialization incentivizes faculty members to prioritize application-driven projects, which, in turn, may reduce their involvement in exploratory scientific endeavors. These findings highlight the complex interplay between technology transfer, research output, and academic priorities, warranting further empirical investigation into how universities can balance commercialization efforts with fundamental knowledge creation.

LITERATURE RELATED TO PATENT TRANSACTIONS

The factors influencing innovation have been extensively studied in the literature. For instance, the stock market is generally more conducive to innovation than the bond market (Hsu et al. 2014), yet its positive impact is constrained by market liquidity (Fang et al. 2014). Similarly, a stable policy environment is more beneficial for fostering innovation than policy interventions themselves (Bhattacharya et al. 2017). Additionally, the establishment of high-tech industrial zones has been found to stimulate innovation through tax incentives, land subsidies, and improved access to financing (Tian and Xu 2022).

However, the ultimate goal of innovation is to realize economic benefits through technological advancements. The circulation of technology plays a crucial role in unlocking its economic potential. Recent research has increasingly focused on technology markets, particularly patent transactions, as a mechanism for reallocating technological resources efficiently. Early studies by Serrano (2010) analyzed patents granted and transferred in the United States, examining transactions from the perspectives of patent ownership, industry affiliation, and patent characteristics. Findings indicate that individual inventors and small firms exhibit the highest patent transaction rates while pharmaceutical and medical-related patents demonstrate the greatest liquidity. Furthermore, factors such as patent age, citation frequency, general applicability, and prior transaction history significantly influence the likelihood of patent transfers.

Building on this foundation, studies by Akcigit et al. (2016) explored the dynamics of U.S. patent markets and revealed that approximately 15–20% of patents are eventually sold, with an average transaction period of 5–6 years. Patents that are technologically distant from their original owner's core expertise tend to be sold more frequently, with transactions favoring buyers whose technological profile is more aligned with the acquired patents than that of the seller (Ma et al. 2022). Research on firms undergoing financial distress further illustrates the role of patent transactions in corporate restructuring. For instance, Serrano and Ziedonis (2019) examined the sale of patents by companies filing for bankruptcy, finding that firms liquidate a substantial portion of their patent portfolios within the first two quarters following bankruptcy filings, often prioritizing the sale of high-value and strategically significant patents to generate immediate financial relief.

Further empirical research has investigated the role of patent transactions in venture-backed startups. Studies show that among startups in innovation-intensive industries that failed

between 1988 and 2008, approximately 70% of their patents were sold, typically within a year of the firm's closure (Ma et al. 2022). These patents were predominantly acquired by companies operating within the same industry, underscoring the high redistributive value of intellectual property in technology markets. Comparative studies between large and small firms suggest that smaller firms are more active participants in patent transactions. (Figueroa and Serrano 2019). While large firms are more likely to acquire high-value patents due to their capacity for internal technology integration, smaller firms prioritize patents that complement their existing technological portfolios. Transaction costs also play a significant role, as smaller firms exhibit greater flexibility in engaging in patent sales, whereas larger corporations may find internal R&D investments more cost-effective.

Recent studies have begun to explore the broader impact of patent transactions on innovation. Patent transactions serve as a mechanism for optimizing the allocation of technological resources, thereby fostering economic growth and improving social welfare. Empirical evidence suggests that the economic value generated through patent transactions corresponds to approximately 10% of the transferred patent's intrinsic value and increases as transaction costs decline (Serrano 2018).

At the firm level, research by Brav et al. (2018) found that external financial interventions, such as hedge fund involvement, significantly increase the likelihood of patent sales. Firms tend to divest patents that are technologically distant from their core operations, thereby ensuring that intellectual property is utilized more efficiently and enhancing innovation efficiency. Han et al. (2022) demonstrated that patent transactions not only facilitate corporate innovation but also enable firms to specialize in their core technological competencies, promoting a more structured division of labor in innovation processes.

Additional studies by Hochberg et al. (2018) indicate that patents that are more likely to be transacted also have higher potential as collateral for financial leverage. The ability to liquidate patents enhances their residual value, increasing the feasibility of using patents for secured loans. Furthermore, research on patent litigation suggests that the likelihood of legal disputes decreases following patent transactions, as acquiring firms typically possess stronger legal resources to enforce intellectual property rights and resolve infringement claims more effectively (Galasso et al. 2013).

RESEARCH GAPS AND CONTRIBUTIONS OF THIS STUDY

Existing research on university technology transfer and patent transactions presents several key limitations. First, most studies focus on the factors influencing university technology transfer, with relatively few examining the transfer of university innovation outcomes from a patent-level perspective (Akcigit et al 2016, Serrano 2018). Second, while prior studies have explored the broader implications of patent transactions, such as their impact on social welfare and firm-level performance, their effects on universities remain underexplored (Han et al. 2022, Brav et al. 2018, Galasso 2013). Given that universities are major innovation hubs, understanding how university research activities are influenced by patent transfers is both a significant and pressing issue. This study addresses this gap by investigating university technology transfer through the lens of patent transactions and examining its impact on subsequent university innovation.

This study contributes to the literature on university technology transfer and innovation by addressing several key gaps and extending prior research in the following three aspects:

1. Investigating the Impact of Patent Transfers on University Innovation

While prior studies have explored the factors influencing university technology transfer, relatively few have examined how patent transfers—an essential mechanism of technology commercialization—affect subsequent university innovation. By analyzing patent-level data, this study provides empirical insights into whether and how patent transactions stimulate further innovation within universities.

1. The Role of Faculty Qualifications in Technology Transfer and Innovation

Existing research suggests that the quality of university researchers plays a crucial role in technology commercialization, but limited attention has been given to its moderating effect on the relationship between patent transfers and innovation. This study hypothesizes that universities with a higher proportion of senior faculty members—who possess greater expertise, credibility, and industry recognition—are more likely to experience stronger positive effects of patent transfers on subsequent innovation.

3. The Influence of University-Industry Social Networks

Technology transfer is inherently influenced by the strength of university-industry relationships, as close ties facilitate knowledge exchange and reduce information asymmetry in technology commercialization. This study examines whether universities with richer industry networks benefit more from patent transfers, leading to greater innovation outcomes.

The paper is structured as follows: Section 3 presents the data. Section 4 outlines the empirical model, detailing the methodology employed to examine the relationship between patent transfers and university innovation. Section 5 discusses the results, providing empirical findings and interpretations. Finally, Section 6 concludes the study, summarizing key insights and policy implications.

DATA

This study utilizes two primary datasets. The first dataset consists of patent transfer data spanning from 1999 to 2016, which includes core information such as patent application numbers, assignors, assignees, and execution dates of the transfers. The second dataset comprises basic patent information, covering patents that were applied for and granted between 1985 and 2016. This dataset includes details such as application numbers, applicants, grant dates, and application dates. Both datasets were obtained from the China National Intellectual Property Administration (CNIPA). Additionally, patent-level data from the EPS Database and CSMAR Database are incorporated as supplementary sources to enhance cross-validation and ensure robustness in the analysis.

DATA PRE-PROCESSING

To ensure the accuracy and reliability of the patent transfer data and to exclude non-commercial transfers, this study applied a series of preprocessing steps. The patent transfer dataset was first merged with the basic patent information dataset using patent application numbers, retaining only patents originally filed by domestic universities. Observations with missing key information, such as assignors, assignees, or execution dates, were removed. Additionally, records where the execution date of the transfer exceeded the patent's expiration date, or where the patent lifespan was abnormally short (less than four years) or beyond the maximum statutory validity, were excluded to prevent inconsistencies. Duplicate transactions involving the same patent being transferred multiple times by the same assignor or received multiple times by the same assignee were also removed. Given that not all registered patent transfers represent market-driven technology transactions, non-commercial transfers were identified and eliminated based on established methodologies in the literature, with adjustments made to fit the specific characteristics

of the dataset. Following these data-cleaning procedures, the final dataset comprises university-originated patent transfers that occurred between 1999 and 2016.

SUMMARY STATISTICS

This section presents descriptive statistics for the key variables in the regression sample, as shown in Table 1. The dataset consists of 8,705 university-year observations spanning from 1999 to 2016.

On average, universities apply for and are granted approximately 125.87 patents per year, but there is substantial variation across institutions, as indicated by a standard deviation of 212.61. Some universities record no patent applications in certain years, while the most productive institutions apply for as many as 1,165 patents in a single year. Among these granted patents, invention patents account for more than half, with a mean of 67.33, while utility model patents are slightly lower at 55.24. Notably, the distribution of invention patents exhibits greater variability across universities compared to utility models.

Regarding patent liquidity, the average probability of a university patent being transferred is 1.07%, with invention patents (1.25%) being more likely to be transacted than utility model patents (0.79%). This suggests that invention patents, which typically involve more substantial technological advancements, have greater marketability and higher demand in technology transfer.

In terms of university resources, the average annual R&D expenditure per university is approximately $17.36 million, with some institutions investing as much as $241.92 million, while others report little to no spending. Similarly, the number of researchers per university averages 411, but varies significantly, ranging from 3 to 3,893. University size, measured by the total number of students, faculty, and staff, exhibits considerable dispersion, with an average of 1,157.99 and a maximum of 9,376.

Additionally, in the university patent transfer dataset, 83.61% of all transfers occur after the patent has been granted, meaning that the analysis focuses primarily on post-grant patent transfers (patent rights transfers), rather than pre-grant transfers (application rights transfers). Given the nature of patent commercialization, universities appear to engage more actively in patent transactions after securing official patent rights.

Table 1. Summary Statistics

Variable s	Mean	SD	Min	Median	Max	Sample Size
Number of patents	125.87	212.61	0	40	1165	8705
Number of inventions	67.33	139.75	0	12	836	8705
Number of utilities	55.24	97.68	0	16	569	8705
Liquidity (%)	1.07	0.54	0	1.18	2.35	8705
Liquidity_invention (%)	1.25	0.79	0	1.43	3.05	8705
Liquidity_utility (%)	0.79	0.46	0	0.90	1.76	8705
R&D expenditure (M)	17.36	38.36	0	3.36	241.92	8705
Number of researchers	411.28	598.26	3	215	3893	8705
Scale/University size	1157.99	1490.13	46	718	9376	8705

Note: Scale/University size is measured by the total number of faculty and staff.
R&D expenditure is measured by millions of dollars.

PATENT TYPE

The composition of university patent transfers from 2001 to 2015 reveals a strong dominance of invention patents, which consistently accounted for the majority of transferred patents. In 2001, all transferred patents were invention patents (100%). Although the share fluctuated over time, it remained consistently high, averaging around 85% in most years. The lowest recorded proportion of invention patents occurred in 2004 (54.05%), coinciding with a temporary increase in utility model patents, which accounted for 40.54% of transfers that year.

Utility model patents generally constituted a smaller but stable share, ranging between 10% and 17% in most years, except for notable peaks in 2004 (40.54%) and 2015 (14.29%). Design patents, on the other hand, represented the smallest fraction of transferred patents, exceeding 5% only in 2004 (5.41%), while in most years, their share was negligible or zero.

The consistently high proportion of invention patents in university technology transfer suggests that universities primarily commercialize patents with higher technological and commercial value, aligning with their role as key innovation hubs. This trend also indicates that university patent transfers emphasize knowledge-intensive technologies, reinforcing their significance in driving technological progress and industry applications.

Table 2. Type Composition of Patent Sample

	Inventions	Utilities	Designs
2001	100	0	0
2002	95.83	0	4.17
2003	92.86	7.14	0
2004	54.05	40.54	5.41
2005	75.76	24.24	0
2006	87.32	11.27	1.41
2007	87.62	12.38	0
2008	81.70	17.67	0.63
2009	82.83	17.17	0
2010	86.78	13.22	0
2011	83.89	16.00	0.12
2012	85.96	13.96	0.08
2013	86.61	12.89	0.50
2014	89.35	9.93	0.71
2015	85.51	14.29	0.19

INDUSTRY COMPOSITION

The industry distribution of university patent transfers from 2001 to 2015 highlights a strong concentration in the manufacturing sector, which consistently accounted for the largest share of transferred patents. In the early years, manufacturing patents made up nearly 100% of all transfers, with 2001, 2002, and 2005 seeing no transfers in any other sector. Over time, the dominance of manufacturing patents declined slightly, reaching 86.19% in 2015, indicating a gradual diversification in university technology commercialization.

The second-largest category of transferred patents belonged to the information transmission, software, and information technology services sector, which saw a steady increase in its share over time. While its proportion remained below 10% in most years, it reached 8.53% in 2012 and continued to grow, reflecting the increasing role of digital and software-related innovations in university technology transfer.

Other industries, such as electricity, heat, gas, and water production and supply, as well as construction, accounted for relatively small but gradually rising shares. For instance, patents in the electricity and energy sector increased from 0% in the early 2000s to nearly 5% by 2015, signaling growing university engagement in energy-related innovations. Similarly, agriculture, forestry, animal husbandry, and fishery, as well as mining, had only minimal participation in patent transfers, with their combined share rarely exceeding 1-2% in any given year.

These trends suggest that while manufacturing remains the dominant sector for university patent transfers, there is a clear shift towards greater industry diversification, with increasing participation from the technology, energy, and infrastructure sectors. This evolution reflects the broader transformation of university research commercialization, as more industries engage in the adoption and application of academic innovations.

Table 3. Industry Composition of Patent Trading Sample

Year	Agriculture, Forestry, Animal Husbandry, and Fishery	Mining	Manufacturing	Electricity, Heat, Gas, and Water	Construction	Software and Information Technology Services
2001	0	0	100	0	0	0
2002	0	0	100	0	0	0
2003	7.14	0	92.86	0	0	0
2004	0	0	97.33	0	0	2.70
2005	0	0	100	0	0	0
2006	0	2.82	80.28	1.41	0	15.49
2007	2.86	0	92.38	0	0	4.76
2008	0.63	0.32	89.27	2.84	0.63	6.31
2009	0.76	0.51	90.15	1.77	2.53	4.29
2010	1.11	0	90.31	2.64	2.86	3.08
2011	1.42	0.12	91.35	1.90	1.54	3.67
2012	0.93	0	85.73	3.34	1.47	8.53
2013	0.60	0.15	89.89	2.49	1.44	5.43
2014	1.28	0.19	89.83	1.76	1.14	5.80
2015	0.97	0.05	86.19	4.97	1.55	6.28

MODEL
VARIABLES

The key explanatory variable in this study is patent liquidity, which captures the likelihood of a university's patents being transferred. Since patent transfers and university innovation may be endogenously related, this study constructs a patent liquidity index to mitigate potential biases. This measure follows existing methodologies but is adapted to fit the dataset's specific characteristics. **Patent liquidity is defined as the average probability of a university's valid patents being transacted (Serrano 2010).** To construct this measure, the transaction probability of each patent is estimated based on its authorization year, industry classification, and the year of transfer. Specifically, for each year, the transaction probability is calculated as the proportion of patents within a given authorization year and industry category that were successfully transferred. Since each patent has a corresponding authorization year and industry classification, this approach allows for the estimation of transaction probabilities across universities.

The stock of valid patents at each university includes only those that have been granted but have not yet expired. Given that most patent transfers occur within a few years after authorization, this study considers only patents authorized within the past six years when constructing the university's valid patent stock. Empirical distributions indicate that more than 70% of patent transfers take place within the first six years after authorization. Additionally, because design patents typically have lower technological content and account for only a small fraction of transactions in the dataset, this study focuses on invention patents and utility models when examining the impact of patent transfers on innovation. The patent liquidity index is thus computed as the average probability of valid patents being transacted at each university, with separate calculations for invention patents and utility models to allow for heterogeneity analysis.

Using patent liquidity as the explanatory variable offers two key advantages. First, it is directly linked to actual patent transfer activity, as it is constructed using real transaction data while accounting for authorization year and industry-specific characteristics. A higher patent liquidity index implies a greater likelihood of patent transfers at a given university. Second, it reduces concerns regarding potential endogeneity, as the index is derived from the full patent transaction dataset rather than being influenced by any single university's characteristics. This ensures that the measure remains largely exogenous to individual university-level factors, mitigating biases related to reverse causality.

The dependent variable in this study is university innovation output, measured as the number of patents applied for and granted by each university. Following established literature, granted patent counts serve as a proxy for innovation performance. To account for the skewed distribution of patent filings, the negative binomial model is used. Similar measures are also constructed for invention patents and utility models. Given that innovation processes take time, patent applications are expected to exhibit a lagged response to influencing factors. Therefore, a two-year lag of patent counts is used as the primary dependent variable, with additional robustness checks conducted using a one-year lag to validate the results.

To control factors that may also influence university innovation output, several variables are included in the regression models. These include R&D expenditures, the number of research personnel, and university size, where university size is proxied by the total number of faculty members. Each of these variables is log-transformed to improve model stability. The data for these controls are sourced from the Compilation of Science and Technology Statistics for Higher Education Institutions.

ENDOGENEITY

This study incorporates university-fixed effects and year-fixed effects into the regression model. University fixed effects control for time-invariant institutional characteristics that may influence both patent liquidity and innovation, such as university reputation, historical research strength, or long-standing industry collaborations. Year-fixed effects account for macroeconomic and policy changes that could impact university innovation trends over time, such as national R&D funding policies, intellectual property (IP) law reforms, or broader shifts in technology markets. Together, these fixed effects help eliminate unobserved heterogeneity that could bias the estimation results.

A key concern in assessing the causal impact of patent liquidity on university innovation is reverse causality—that is, universities that are inherently more innovative may engage in more technology transfers rather than technology transfers driving future innovation. To address this issue, this study adopts a lagged explanatory variable approach, using one-year lagged patent liquidity as the key independent variable. This approach aligns with the theoretical expectation that patent commercialization activities today influence research and innovation outcomes with a time lag, rather than the other way around. By ensuring that patent liquidity at time t is used to explain innovation output at time t+1, the model reduces the risk of simultaneity bias.

Additionally, to further eliminate potential endogeneity, this study employs an instrumental variable (IV) approach, using the total technology transfer volume in the province where a university is located (excluding the university's transactions) as an instrument for patent liquidity. The rationale for this IV is that technology transfer activity at the provincial level reflects the overall vibrancy of the regional technology market, which likely influences the ease and likelihood of a university transferring its patents. However, this measure is unlikely to directly impact a specific university's patenting decisions beyond its effect on liquidity. The assumption is that while a dynamic regional technology market facilitates knowledge diffusion and enhances the probability of patent transactions, it does not independently drive a university's innovation output.

By incorporating fixed effects, lagged explanatory variables, and an IV approach, these methodological choices help ensure that the estimated effects are not driven by omitted variable bias, simultaneity, or unobserved regional shocks. Robustness checks, including alternative lag structures and placebo tests, further validate the reliability of the findings.

EMPIRICAL MODEL SPECIFICATION

To exame the impact of patent transfers on universitllowing empirial model:$$ln(Patents) = \beta_0 + \beta_1 * liquidity_{it} + \beta_2 * ln(R\&D)_{it} + \beta_3 * ln(Researchers)_{it} + \beta_4 * scale_{it} + univerity_i + time_t + \varepsilon_{it}$$

The empirical model in this study examines the relationship between patent transfers and university innovation. I use the negative binomial model since the number of patents is a count variable and can be zero in our data set. In the model, i represents universities, and t denotes years. The key explanatory variable is patent liquidity, which measures the probability of a university's patent being transferred. The dependent variable is the log-transformed count of patents applied for and granted, with a one-year lag to account for the time required for research and development before patents are filed and approved.

The regression also includes several control variables that may influence university innovation, including R&D expenditures (ln R&D), research personnel (ln Researchers), and university size (scale). To account for unobserved heterogeneity, university-fixed effects, and year-fixed effects are incorporated into the model. Standard errors are clustered at the university level to correct for potential serial correlation. Additionally, to mitigate the influence of extreme values, continuous variables are winsorized at the 1st and 99th percentiles.

RESULTS

BASELINE ESTIMATION

This section presents the baseline regression results examining the impact of patent liquidity on university innovation output. Table 4 reports results from three different specifications: instrumental variable (IV) estimation, fixed effects (FE) estimation, and ordinary least squares (OLS) estimation. Across all models, patent liquidity is found to have a positive and statistically significant effect on innovation, reinforcing the hypothesis that a more active patent market enhances university research output.

Column (1) presents results from the IV estimation, addressing potential endogeneity concerns by using the total technology transfer volume in the province (excluding the university's transactions) as an instrument for patent liquidity. The estimated coefficient for patent liquidity (0.125, $p < 0.01$) remains positive and statistically significant, suggesting that an increase in university patent market activity stimulates further innovation.

Column (2) reports the FE model, which includes university-fixed effects and year-fixed effects to account for unobserved time-invariant institutional characteristics and broader economic or policy changes that could influence university innovation trends. The coefficient on patent liquidity (0.136, $p < 0.01$) remains robust, supporting the argument that increased patent transfers are associated with higher research output, even after controlling university-specific factors.

Column (3) presents the OLS regression, which, while yielding a larger coefficient (0.633, $p < 0.01$), is more susceptible to omitted variable bias and potential simultaneity issues. The discrepancy in coefficient magnitudes across specifications suggests that OLS may overestimate the effect of patent liquidity on innovation due to endogeneity concerns.

Table 4. The Effect of Patent Liquidity on Innovation

	(1) IV	(2) FE	(3) OLS
Liquidity	0.125***	0.136***	0.633***
	(0.05)	(0.05)	(0.07)
Ln(R&D)	0.022***	0.027***	0.057***
	(0.00)	(0.006)	(0.01)
Ln(researchers)	0.135***	0.142***	0.470***
	(0.04)	(0.050)	(0.06)
scale	-0.118***	-0.097***	0.364***
	(0.04)	(0.048)	(0.10)
University FE	Yes	Yes	No
Year FE	Yes	Yes	No
1 -stage F statistics	14.72	-	-
Adjusted R^2	0.855	0.468	0.215
Observations	8705	8705	8705

Note: The dependent variable is the number of patents. The estimation is conducted using a negative binomial model. Adjusted R-squared values are reported to assess model fit.
***p < 0.01, **p < 0.05, *p < 0.1.

DIFFERENTIATED EFFECTS BY PATENT TYPE

Since invention patents dominate university patent transfers and exhibit higher liquidity than utility models (Table 2), it is crucial to examine whether the impact of liquidity varies across patent types. Table 5 presents separate estimations of the effect of invention patent liquidity on invention and utility while controlling for fixed effects and other covariates.

The results indicate that utility model innovation is more responsive to changes in liquidity. Specifically, a one-standard-deviation increase in liquidity leads to a 38.6% increase in utility model output, whereas the corresponding increase for invention patents is 16.5%. This suggests that utility models, which are typically less technologically complex, respond more immediately to fluctuations in patent liquidity.

One possible explanation for this pattern is that utility models tend to have shorter commercialization cycles and lower transaction costs, making them more sensitive to shifts in the patent transfer market. In contrast, invention patents often involve longer R&D processes, higher technological complexity, and more stringent approval requirements, leading to a more gradual response to changes in liquidity. This aligns with the notion that high-tech patents require sustained investment and industry collaboration, whereas utility models are often more readily commercialized by firms seeking incremental innovations.

Table 5. The Effect of Patent Liquidity on Innovation: Different Types of Patents

	(1) Patents	(2) Inventions	(3) Utilities
Liquidity	0.125***	0.165***	0.386***
	(0.05)	(0.03)	(0.06)
Ln(R&D)	0.022***	0.018***	0.026***
	(0.00)	(0.00)	(0.01)
Ln(researchers)	0.135***	0.067**	0.121**
	(0.04)	(0.03)	(0.05)
scale	-0.118***	-0.146**	-0.236**
	(0.04)	(0.07)	(0.09)
University FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
IV	Yes	Yes	Yes
Adjusted R^2	0.855	0.897	0.807

Note: The dependent variable is the number of patents, inventions and utilities.
The estimation is conducted using a negative binomial model.
***p < 0.01, **p < 0.05, *p < 0.1.

HETEROGENEOUS EFFECTS BY UNIVERSITY TYPE

The impact of patent liquidity on innovation varies across university types, given their distinct research orientations and industry links. Unlike firms that operate within specific industries, universities are classified based on their disciplinary focus. Following the Shanghai Ranking's classification, this study categorizes universities into comprehensive, science & engineering, and medical universities and examines how patent liquidity affects innovation within each group (Table 6).

The results show that patent liquidity positively affects innovation across all university types, reinforcing the role of an active patent market in fostering knowledge commercialization. Among them, science & engineering universities exhibit the strongest response to invention patent liquidity (0.238*), suggesting that technology-driven institutions benefit most from dynamic patent markets due to their stronger industry collaborations and applied research focus. For utility models, comprehensive universities show the highest sensitivity (0.395*), indicating that multidisciplinary institutions may be more engaged in commercializing lower-complexity patents. In contrast, medical universities show the weakest response to patent liquidity, particularly for utility models (0.272*), likely due to longer commercialization timelines and regulatory constraints in medical research.

Table 6. The Effect of Patent Liquidity on Innovation: Different Types of University

	(1)	(2)	(3)	(4)	(5)	(6)
Univ. Type	Comprehensive		Science & Engineer		Medical	
Patent Type	Inventions	Utilities	Inventions	Utilities	Inventions	Utilities
Liquidity	0.160***	0.395***	0.238***	0.394***	0.181**	0.272*
	(0.05)	(0.13)	(0.06)	(0.14)	(0.07)	(0.14)
Ln(R&D)	0.017**	0.041***	0.009	0.006	0.023	0.024
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
Ln(researchers)	0.045	0.105	0.082	0.111	-0.108	-0.093
	(0.06)	(0.11)	(0.05)	(0.09)	(0.13)	(0.15)
scale	-0.90	-0.208	0.047	0.348	-0.128	-0.025
	(0.13)	(0.18)	(0.20)	(0.29)	(0.14)	(0.18)
University FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
IV	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.917	0.812	0.897	0.765	0.753	0.618
Observations	1503	1503	1717	1717	538	538

Note: The dependent variable is the number of inventions and utilities.
The estimation is conducted using a negative binomial model.
***p < 0.01, **p < 0.05, *p < 0.1.

HETEROGENEOUS EFFECTS OF PATENT LIQUIDITY ON UNIVERSITY INNOVATION

As highlighted in the literature, the actual occurrence of patent transfers is influenced by multiple factors, among which university-specific characteristics play a crucial role. Two particularly important aspects are the qualifications of university researchers and their social networks. These factors shape the ability of universities to effectively transfer technology and determine how patent liquidity translates into innovation outcomes.

The Role of Researcher Qualifications

Since technology is an intangible asset, it is often characterized by high information asymmetry and significant uncertainty regarding its market potential and economic value. If a technology is developed by researchers with higher academic qualifications, it is likely to be perceived as more valuable, making it easier to commercialize. To capture this dimension, this study measures the share of senior faculty members (with high academic ranks) within each university over the sample period. Universities with a share above the median are classified as high-research-qualification institutions, while those below the median are considered low-research-qualification institutions.

Table 7 presents the estimation results, showing that higher researcher qualifications strengthen the effect of patent liquidity on innovation across both invention and utility model patents. Specifically, in universities with high research qualifications, a one-standard-deviation increase in patent liquidity leads to a 12.5% increase in invention patent output and a 51.7% increase in utility model output. In contrast, in universities with lower research qualifications, the corresponding effects are only 11.3% and 24.4%, respectively. These findings suggest that universities with more highly qualified researchers benefit more significantly from an active patent market. Highly qualified researchers may have greater technical expertise, stronger reputations, and broader professional recognition, which enhances the perceived value and marketability of their patents. Moreover, universities with more senior faculty members may have more developed internal support mechanisms for patent commercialization, further reinforcing the positive effects of patent liquidity on innovation output.

Table 7. The Heterogeneous Effects of Patent Liquidity on Innovation by Researchers' Qualifications

	High Research Qualifications		Low Research Qualifications	
	Inventions	Utilities	Inventions	Utilities
Liquidity	0.205***	0.517***	0.113***	0.244***
	(0.04)	(0.08)	(0.04)	(0.08)
Ln(R&D)	0.010*	0.028***	0.026***	0.025***
	(0.01)	(0.01)	(0.01)	(0.01)
Ln(researchers)	0.032	0.028***	0.089*	0.155*
	(0.04)	(0.01)	(0.05)	(0.08)
scale	-0.50***	0.050	-0.220***	-0.361***
	(0.14)	(0.19)	(0.07)	(0.11)
University FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
IV	Yes	Yes	Yes	Yes
Adjusted R^2	0.899	0.813	0.894	0.801
Observations	4550	4550	4155	4155

Note: The dependent variable is the number of inventions and utilities.
The estimation is conducted using a negative binomial model. ***p < 0.01, **p < 0.05, *p < 0.1.

The Role of Social Networks

Another key determinant of patent transfers is the social network strength of university researchers, particularly their collaborations with firms and industry partners. Universities that maintain strong connections with enterprises and other external stakeholders are more likely to engage in efficient knowledge transfer and technology commercialization. Stronger networks facilitate trust-building, reduce information asymmetry, and enhance the matching process between technology suppliers (universities) and demand-side firms.

To measure social network strength, this study uses the proportion of university R&D funding sourced from enterprises and other external organizations. Universities with above-median industry funding shares are classified as having strong social networks, while those below the median are categorized as having weak social networks.

The regression results in Table 8 confirm that strong social networks amplify the effect of patent liquidity on innovation, particularly for invention patents. In universities with strong social networks, a one-standard-deviation increase in patent liquidity leads to a 23.1% increase in invention patent output and a 29.2% increase in utility model output. By contrast, in universities with weaker social networks, the corresponding effects on invention and utility model patents are 10.1% and 32.3%, respectively.

Table 8. The Heterogeneous Effects of Patent Liquidity on Innovation by Social Networks

	Strong Social Networks		Weak Social Networks	
	Inventions	Utilities	Inventions	Utilities
Liquidity	0.231**	0.292***	0.101***	0.323***
	(0.04)	(0.09)	(0.04)	(0.08)
Ln(R&D)	0.014***	0.013**	0.024***	0.042***
	(0.00)	(0.01)	(0.01)	(0.01)
Ln(researchers)	0.084*	0.108	0.031	0.126*
	(0.05)	(0.08)	(0.05)	(0.07)
scale	-0.176	-0.708	-0.061	-0.316***
	(0.15)	(0.20)	(0.07)	(0.11)
University FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
IV	Yes	Yes	Yes	Yes
Adjusted R^2	0.893	0.790	0.758	0.723
Observations	5195	5195	3510	3510

Note: The dependent variable is the number of inventions and utilities.
The estimation is conducted using a negative binomial model.
***p < 0.01, **p < 0.05, *p < 0.1.

These findings suggest that universities with stronger industry ties are more effective at leveraging patent market activity for innovation. Institutions with well-established corporate collaborations may receive more market feedback, align their research more closely with industry needs, and benefit from faster and more efficient technology diffusion. The weaker effect of social networks on utility model patents suggests that these patents, which often require less industry-specific customization, are less reliant on strong external networks for commercialization. The results underscore the importance of both researcher qualifications and social network strength in shaping the relationship between patent liquidity and university innovation. Universities with highly qualified researchers and strong external links are better positioned to capitalize on an active patent market, making targeted policies crucial for enhancing university technology transfer.

Policymakers should consider strategies such as providing commercialization training for researchers, establishing more structured university-industry collaboration programs, and developing market-oriented research incentives to further bridge the gap between academic innovation and market application. Strengthening institutional support for technology transfer offices (TTOs) and reducing barriers to industry-academia partnerships could also enhance the innovation impact of university patent liquidity.

CONCLUSION

This study investigates the landscape of university patent transfers, including the extent of university participation, the composition of transferred patent types, and their industry distribution. Building on this, it further explores the impact of patent transfers on university innovation. The findings reveal a steady increase in the number of university patent transfers over time, with the probability of post-grant transfers also showing an upward trend. The majority of transferred patents belong to the invention category, with a significant portion associated with the manufacturing sector. More importantly, patent transfers exert a positive effect on university innovation, with a one-standard-deviation increase in patent liquidity leading to a 12.5% rise in innovation output.

The effects of patent transfers on innovation, however, are not uniform across different types of patents and universities. Universities with higher-qualified researchers and stronger social networks experience a greater innovation boost from patent liquidity, while institutions located in regions with higher economic development and better financing accessibility also benefit more significantly from technology transfer activities. These findings contribute to the existing literature on university technology transfer and patent transactions, providing theoretical and empirical support for policies aimed at optimizing university patent commercialization. The results suggest that patent transfers not only activate existing technological resources and generate economic value but also stimulate further innovation, reinforcing the dynamic role of universities in driving technological progress.

To enhance the efficiency and impact of university patent transfers, universities should strengthen their technology transfer infrastructure, aligning with the policy framework established by the Ministry of Science and Technology and the Ministry of Education to advance professional technology transfer institutions. This involves establishing dedicated technology transfer offices (TTOs), cultivating specialized personnel, and improving commercialization mechanisms. Additionally, universities should develop effective incentive structures to encourage researchers to actively participate in technology transfer, incorporating commercialization performance as a key metric in faculty evaluation and promotion decisions. Given the high degree of information asymmetry and market uncertainty in patent transactions, universities must also implement robust risk assessment frameworks to mitigate potential challenges in the commercialization

process. Furthermore, leveraging patent navigation services can provide universities with strategic insights into industry trends, facilitating the development of high-value patents and improving the alignment of research outputs with market needs.

By strengthening the institutional mechanisms that support technology transfer, universities can further enhance their role in innovation ecosystems, improve the efficiency of knowledge commercialization, and contribute more effectively to technological advancement and economic development.

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Author:
Zhenyu Gong[1]

[1] Central University of Finance and Economics, School of Innovation and Development, China Academy of Management and Economics, Beijing, China, 100060.

PLANNING FOR SHARED INNOVATIVE ACTIVITY: THE EVOLVING ROLE OF MATERIAL TRANSFER AGREEMENTS

ABSTRACT Material transfer agreements ("MTAs")—contractual agreements governing the transfer of materials, research tools, and data—provide critical access to researchers and often mark the beginning of shared innovative activity. Yet MTAs have long been known to cause delays or abandonment of promising research. Studies demonstrate that access to materials and data is more problematic for researchers than patents. This essay explains one of the reasons why these seemingly humble agreements cause so many delays. It then shows how technology transfer specialists can improve the material transfer process and thereby facilitate shared innovative activity.

INTRODUCTION

In today's scientific and technological landscape, new discoveries, products, and inventions often involve teams of researchers spanning academic institutions, research laboratories, governmental entities, and private industry partners who share expertise, laboratory space, equipment, materials, know-how, and expenses. The future of science and technology is collaborative. How best to support this collaboration through access to tangible research materials, tools, and data is the subject of this essay.

Historically, MTAs functioned primarily as recording mechanisms to track the transfer of research materials and tools, as well as accompanying data, and set expectations for unexpected events, such as laboratory or transportation accidents, infringement lawsuits, or the introduction of new third parties. This type of MTA is what I will call herein the "traditional MTA." Yet, now, some industry parties are using MTAs for more than just documentation and basic protections. Industry parties are leveraging MTAs to develop meaningful collaborative relationships, particularly with academic partners. This type of MTA is what I will call herein the "modern MTA." This shift from a traditional MTA to modern MTA is likely leading to more shared innovative activity between academic and industry science—a goal of many technology transfer offices (TTOs). Yet if TTOs or industry partners miss this shift in the evolving use of MTAs, frustrating negotiations will likely ensue.

SHARED INNOVATIVE ACTIVITY

Shared innovative activity is a form of collaboration requiring repeated interactions where parties share innovation responsibility. This collaboration is essential between academic institutions, public entities, and private firms to establish new fields and deepen understanding of existing ones. Shared innovative activity also smooths the transition from upstream research to downstream development and commercialization. This is important, as academic institutions continue to explore and sometimes struggle with downstream development and commercialization.

However, shared innovative activity presents challenges. As the commercialization of science advances, and the once-clear distinction between noncommercial scientists focusing on "upstream" research and commercial scientists on "downstream" development has blurred, academic institutions are engaging in downstream activities and seeking valuable patents and collaborations with private partners. Indeed, this is the focus of many TTO activities.

Yet industry parties may now view academic institutions not just as potential partners, but also as competitors. Moreover, the memorialization of detailed research and collaboration ideas between partners—partners that likely do not have the same motivations or end goals—is difficult, as is planning for high levels of risk and uncertainty that naturally accompanies most forms of innovation. As a result of these challenges, these collaborative-seeking or collaborative-memorializing agreements may take months or even years to negotiate and execute. Frustratingly, during negotiations between industry parties and TTOs or technology transfer professionals, researchers often struggle to access essential building blocks for their projects, causing delays that can jeopardize research grants and increase tensions between researchers and their respective administrative offices (Eisenberg, 2008; Walsh et al, 2007).

Traditional MTAs minimize upfront negotiation costs through standardization, making them efficient and perfect for one-time transfers. Traditional MTAs are straightforward, short agreements, designed to get the transfer done without prompting or forcing parties to plan for shared innovative activity. Yet modern MTAs are not so straightforward. Modern MTAs invest more resources in initial relationship-building provisions. This means transaction costs are increased to strategically establish collaborative routines that can reduce friction in later, more complex negotiations if the parties end up engaging in shared innovative activity together. These economic trade-offs help explain why industry partners, with their long-term commercialization horizons, often prefer the modern approach despite its initial complexity.

Before exploring the modern MTA and determining when to invest time and energy in this different contracting style, let's review the traditional MTA and its most common provisions.

THE TRADITIONAL MTA: A ONE-TIME INTERACTION

Consider a scenario where a global health crisis emerges requiring rapid vaccine development. A biotechnology company with an innovative mRNA "plug-and-play" platform technology needs access to crucial research materials and data, including the virus's key protein structure, from a government research institute to develop a vaccine against a novel respiratory virus. Conversely, government research teams need access to the biotech's plug-and-play tool to simultaneously work on identifying mRNA virus vaccine candidates.

In this time-sensitive scenario, an MTA becomes the critical first step. An MTA allows the immediate sharing of essential scientific materials and data while more complex agreements are still being contemplated and/or negotiated. In this way, the traditional MTA serves as a bridge, enabling scientists to begin work immediately while legal teams continue developing more comprehensive agreements covering manufacturing, distribution, and commercialization rights.

In this hypothetical case that largely mirrors that of Moderna and the National Institutes of Health of the United States (NIH), as well as BioNTech and Pfizer, quickly executed MTAs enabled researchers to design an mRNA construct within days of the viral sequence becoming available. This facilitated production of clinical batches within weeks—all while the details of longer-term partnership arrangements were still being finalized (GlobeNewswire, 2020).

Despite repeated calls for standardization for over 20 years now, most academic institutions use their own MTA variations rather than standardized forms like the U.S. Uniform Biological Materials Transfer Agreement (UBMTA) developed by NIH and the Association of University Technology Managers, the U.S. Public Health Service Material Transfer Agreement (PHA MTA), or the European Commission Material Transfer Agreement (EC MTA). Like the MTAs used in the initial days of the Covid-19 pandemic, traditional MTAs developed separately from the UBMTA, PHA MTA, or EC MTA, among others, are simple in structure and include boilerplate language covering:

1. Ownership provisions (provider retains ownership of original material)
2. Use limitations (typically research-only, non-commercial use)
3. Transfer restrictions (prohibiting further transfers)
4. Liability and confidentiality provisions (recipient assumes responsibility for use & both parties agree to appropriate confidentiality terms)
5. Attribution requirements (acknowledgment in publications and sometimes a review period prior to publication)

These MTAs generally establish one-time transfers without expectations of ongoing collaboration. Traditional MTAs are not meant to cover or plan for any sort of shared innovative activity. At most, traditional MTAs might contain a boilerplate intellectual property provision that sets the expectation of the parties that they will not collaborate and create any joint IP, and if they do jointly work together, then the general laws of the jurisdiction will apply to determine any such ownership of jointly created IP. This IP provision does little, if anything, to help parties determine inventorship or ownership of IP stemming from shared innovative activity, and, again, that is likely okay. This is a traditional MTA—researchers and parties are transferring materials, not working together.

But these traditional MTAs do still serve another function: they give parties a chance to see if their research and maybe their researchers are compatible for shared innovative activity. This means that a traditional MTA can still open the door to future shared innovative activity, even when the initial goal or expectation is simply a transfer of research materials.

For example, when describing a particular project at Pfizer, the former Senior Vice President, of Pfizer Inc. and former President of Pfizer Global Research and Development (after starting at Pfizer as a medicinal chemist decades earlier) explained that an ultimately impactful project at Pfizer started with a simple conversation at a conference between a scientist in Pfizer's immune suppression group and an NIH researcher. After this initial conversation, "the first thing" Pfizer needed was "access" to the enzyme that the NIH researcher was studying so that the parties could determine if it was worth talking with each other further to plan out and define a research collaboration (LaMattina, 2009).

The parties did not sign a modern MTA. Instead, the NIH has a standard template form that is used in situations like this, one that closely resembles the standard template form of the Slovak Centre of Scientific and Technical Information (SCSTI MTA). These traditional MTAs are also like the ones used above at the outset of the Covid-19 pandemic, and they have an important role in technology transfer. These are sign-and-go agreements requiring very little interaction between TTOs and other technology transfer professionals. Some academic institutions in the U.S. have now published policies regarding the timing and process of processing these types of MTAs, helping to increase predictability and transparency regarding the timing of various types of MTAs (WU-Madison MTA Process, 2018).

THE MODERN MTA: RELATIONAL CONTRACTING TO PLAN FOR SHARED INNOVATIVE ACTIVITY

While governmental agencies and public partners, including the NIH, SCSTI, and regional TTOs like the Technology Transfer Office at Masaryk University, have understandably steered towards

standardization of traditional MTAs to gain efficiency and certainty in negotiations—leading to faster execution and fewer delays in accessing important materials, tools, and data—some industry partners are intentionally moving in the opposite direction. These industry partners opt for a modern MTA approach that includes forward-looking terms setting the stage for further interactions with the aim to collaborative together on research or commercialization, reflecting different priorities in how they manage the transfer process.

A Modern MTA is not a 2- or 3-page boilerplate agreement that can be read and digested in 15 minutes. Instead, it often spans from 6-12 pages and employs relational contracting to plan for shared innovative technology within the agreement itself. Normative words and phrases that many contract litigators and specialists grimace at—including "good faith," "diligently," "commercial reasonableness," and expressed "desires" to engage in undefined "collaborative research"—fill these contractual agreements (Sandrik, 2016). Beyond simple terminology, these agreements often contain somewhat complex conflict management provisions requiring parties to go through several detailed steps to resolve conflicts before resorting to litigation.

These normative terms and provisions are not enforceable in most jurisdictions—few litigators would take words like "diligently," "desire," or even "good faith" into court to contest a breach of contract—yet these relational contracting practices are interwoven, or braided, with classic enforceable terms featuring strict data protection, disclosure, publication, and ownership provisions (Gilson et al., 2010). If a data protection provision is breached, that is objectively actionable, and parties should expect to adhere strictly to the parts of the contract that are immediately and easily litigated.

This type of relational contracting promotes collaborative innovation that depends on both formal contract provisions (enforceable in court) and informal constraints (requiring extra-legal or non-legal sanctions such as goodwill, reputational costs, or even restitution remedies to police behavior). Theoretical literature posits that this sort of braided contract—combining both formal and informal terms—creates information-sharing and relationship-building routines between parties (Jennejohn, 2020; Sandrik, 2017). Indeed, this style of contracting is common in biotech and pharmaceutical collaborative and commercialization agreements (Gilson et al., 2010; Sandrik, 2025).

Beyond simple one-time transfers of materials, industry partners use these agreements to facilitate knowledge and resource sharing that evolves into broader collaboration, employing conflict management provisions to establish joint steering committees that solve problems as they arise. These joint committees routinely meet, even when no conflict between the parties exists in the moment. This approach to knowledge governance and conflict governance is important, because at the early contracting stage it is impossible to detail precise outcomes or mandates for every potential situation between the parties. The parties must make decisions when the stakes are high and when motivations between the parties may not always align.

Notably for technology transfer specialists, in the private industry sector, these modern MTAs are not always labeled as such, instead sometimes opting for descriptive terms like "collaboration and license agreement" or variations of the classic CRADA (Cooperative Research and Development Agreement) (Sandrik, 2016).

MOVING TOWARDS THE MODERN MTA IN SLOVAKIA

As a U.S.-based researcher and lawyer temporarily living in Slovakia, I was intrigued to discover modern MTA elements extending beyond what I typically observe in transfers involving academic or government TTOs (and instead only observe

when looking at transfers between biotech or pharmaceutical firms). With all contracts of public institutions in Slovakia being publicly accessible, observing contract innovation in real-time provides valuable insights for TTOs (and foreign researchers), particularly as collaboration between academic and industry or academic and government science continues to emerge in the region.

A notable recent example incorporating elements of a modern MTA is a "Data and Material Transfer Agreement" between Univerzitná Nemocnica L. Pasteura Košice and the Institute of Neuroimmunology, SAS. I highlight this particular agreement here for two main reasons: it is a bilingual agreement (Slovak and English, with the Slovak version prioritized in case of conflict), making it more reliable for an English-speaker like me to use in contract analysis, and it involves the type of parties that, at least in the U.S., are not always on the cutting edge of contract innovation, but that are in the area of science where we, as a global society, need cutting edge partnerships and innovation.

The Data and Material Transfer Agreement include elements of the traditional MTA, including:

1. Ownership provisions (provider retains ownership of original material)
2. Use limitations (research-only for the identified research project)
3. Liability and confidentiality provisions (recipient assumes responsibility for use & both parties agree to appropriate confidentiality terms)

However, moving beyond traditional provisions, the Data and Material Transfer Agreement also has sections covering intellectual property and conflict management that reflect the relational contracting approach of the modern MTA.

Section 5.2 states that if there is a "common creation of Intellectual Property [joint invention] by both Parties, the Parties shall decide jointly about the further use and responsibilities of the either Party." The term "shall" is an example of classic promissory language often viewed as enforceable in a court of law, while "decide jointly" represents the informal, less enforceable element characteristic of braided or relational-focused contracts. This language establishes a clear expectation that collaborative creation will be matched with collaborative decision-making regarding ownership—precisely the type of open-ended, relationship-focused approach that modern MTAs embrace.

In a more developed modern MTAs, we might expect additional qualifiers such as "shall decide in good faith" or references to established joint committees comprised of executives and principal investigators from each party to govern this decision-making process. While this particular agreement lacks these specific normative elements, it does address conflict management in Section 9.1, requiring parties to "first attempt to settle any and all disputes . . . through good faith negotiation before resorting to the competent courts [of] exclusive jurisdiction . . . ."

Though we as technology transfer professionals might want more robust conflict management provisions beyond this basic governing law clause using the term of "good faith," Section 9.1 still demonstrates greater attention to collaborative problem-solving than typically found in traditional MTAs, reflecting the braided contracting approach where formal and informal elements work together to create information sharing routines. It also could very much be an appropriate level of planning for these particular parties and their desires for future shared innovative activity.

Yet to push the example further, what additional elements could strengthen this agreement without significantly increasing transaction costs? One easy element is including contractual language requiring periodic meetings or brief check-ins between sending and receiving researchers that would work to actively build and develop their professional and collaborative relationship. While parties

don't necessarily need contractual directives to communicate in this way, embedding relationship-building mechanisms in the agreement establishes clear expectations that are set when all parties are aligned, and projects are proceeding as planned.

The value of including these relationship-based elements is that the parties are looking to and following the agreement during favorable times so that when challenging circumstances arise, and they often do, the parties will already have a practice of looking to and following the agreement. In other words, when TTOs and contract specialists demonstrate that the parties' initial expectation is continuous collaborative engagement—even if just for research updates—they establish routines for information and knowledge sharing. In my experience, this approach significantly improves outcomes, as research projects rarely proceed exactly according to plan in either academic science or technology and we need practice, routine practice, working with one another in good times so that we can still work together in more challenging times.

By incorporating these relational elements, this Material and Data Transfer Agreement has elements, albeit relatively minimal at this point, beyond a traditional MTA that allows parties to starting thinking about and planning for shared innovative activity. To me, as a technology transfer professional and as someone that is invested in seeing the growth of Slovakia's scientific and technical communities on a worldwide stage, this is exciting. It is a tangible illustration of Slovakia's participation in contemporary scientific and technology collaboration practices and the impact of local and regional TTOs on routine contracting practices in the region.

CONCLUSION

The disconnection between traditional and modern MTA approaches represents a fundamental difference in organizational objectives that can impede scientific progress. Academic researchers and TTOs often prioritize efficient, standardized transfers to maintain research momentum and meet publication or grant timelines, while industry partners increasingly view MTAs as opportunities to establish deeper collaborative relationships. This divergence results in prolonged negotiations that delay access to essential materials and potentially valuable partnerships.

Technology transfer professionals stand at this critical intersection, balancing competing interests while facilitating scientific and technological advancement. By understanding both traditional and modern approaches to the MTA, they can better navigate these complex negotiations. For academic and governmental institutions working with industry partners, recognizing when to embrace elements of the modern MTA—with its relational contracting principles and forward-looking collaborative provisions—can transform potential friction points into opportunities for shared innovative activity.

Conversely, industry partners should recognize when standard transfers with one-time interactions best serve immediate the parties' collective needs. This mutual understanding enables more strategic decisions about when to employ simple, standardized agreements versus when to invest in the development of more complex, relationship-building MTAs.

As science continues to advance through increasingly collaborative efforts, balancing these approaches becomes essential. The evolution of MTAs from simple transfer documents to potential bridges for sustained partnership reflects the changing landscape of scientific innovation itself—one that increasingly depends on the thoughtful integration of academic insight, industry capabilities, and public resources. By embracing this evolution while remaining mindful of when each approach best serves scientific progress, technology transfer professionals can help unlock the full potential of shared innovative activity in addressing tomorrow's scientific and technical challenges.

PROFESSOR KAREN SANDRIK

Is the Associate Dean for Faculty and the Maynard & Bertha Wilson Professor of Law at Willamette University School of Law, in Salem, Oregon, USA. Upon her return to the U.S. in July 2025, she will join the Faculty of Law at Marquette University Law School in Milwaukee, Wisconsin. Karen regularly teaches courses in intellectual property law and commercial law, and researches and writes about patent law, intellectual property licensing, and technology transfer and collaboration. She would like to connect at karen.sandrik@gmail.com.

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Author:
Karen Sandrik

The winning student team of Deep Dive 2024, where student teams compete to solve commercialization challenges of research groups about to spin off. Source: Archive A.H.

WHY THE CURRENT SYSTEM OF RESEARCH COMMERCIALIZATION FAILS – AND WHAT TO DO ABOUT IT

Europe is undergoing a profound economic and geopolitical transformation, confronting questions of sovereignty, productivity, and sustainable growth. Crises like the pandemic, supply chain disruptions, the energy crunch, and rising global tensions have shaken our foundations and forced a re-evaluation of key systems. Yet amid all this talk of resilience and competitiveness, one critical enabler of our future prosperity remains conspicuously absent: research commercialization.

The ability to turn scientific breakthroughs into real-world impact will determine whether Europe emerges from this transition stronger or slips into global irrelevance. Our current system is failing to deliver. High-quality research remains unused, talent is draining away, and Europe lags behind. Rather than asking how to fix the existing setup, we must consider whether it's time to fundamentally rethink it. The question we should be asking is not just how to improve research commercialization but whether the current system is outdated.

HOW DID WE GET HERE? UNDERSTANDING OUR BORROWED SYSTEM

Has anyone actually stopped to question how our current approach to research commercialization came to be? The dominant model, where universities own inventions and intellectual property (IP) of academic staff, and technology transfer offices (TTOs) are the ones in charge of deciding about commercialization, was largely adopted from the United States. The Bayh-Dole Act of 1980 allowed American universities to commercialize federally funded research by granting them IP ownership. The logic was simple and well-meant: if universities controlled the IP, they would take on the responsibility of getting it to market, avoiding the liability of a single inventor being a barrier in a breakthrough benefiting society.

This model was exported worldwide, including to Europe, despite our fundamentally different structures and values. And here's the real paradox: even the world's leading TTOs, including those in the US, acknowledge that the system is broken. The system is not working well anywhere, and should be restructured to optimize for societal benefit. We should see this as an opportunity. Not to tweak a failing system, but to build a better one from the ground up, suited to European strengths and priorities.

The situation takes even weirder turns, when we fit a borrowed model onto European institutions. Our state aid laws, which are designed to prevent public funds from distorting the market, often create contradictions when applied to the US-based model of research commercialization. A system originally designed to facilitate innovation ends up obstructing it.

Rather than trying to force together mismatched policies, we should be designing a first-principles approach to commercialization—one that aligns with European values, strengthens our welfare state, and maximizes societal benefit.

EUROPE'S STRENGTHS: THE SCIENCE POWERHOUSE THAT FAILS TO DELIVER

Let's acknowledge what we do have going for us:
- Europe leads the US and China in science and engineering article output.
- European citizens overwhelmingly support science as a driver of progress and wellbeing.
- We have world-class education and research institutions, and a culture that values long-term scientific progress.

But here lies the bottleneck: 95% of European patents remain unused. Of course patents are just one proxy, but an important one. These are technologies vetted by experts and in the case of universities backed by public funding, yet they never make it into society.

If we are serious about European competitiveness, this is the hidden opportunity we should be seizing.

The 2024 MIMIR Fellows batch. MIMIR Fellows is a 6-month education program to equip 12 students with the skills and tools to be able to contribute to research commercialization. Source: Archive A.H.

A NEW MODEL FOR EUROPE: RESEARCH COMMERCIALIZATION AS THE BLACK HORSE

If we can make Europe the best place in the world for bringing science into society, we will win the global talent competition, solve critical global challenges, as well as drive economic growth and sovereignty.

We already see this happening on a small scale. If you want to work at a top quantum computing company today, you have to consider Finland because of IQM. Category-defining deep tech companies create gravitational pull for talent. If we scale this across multiple fields, Europe becomes the global center of breakthrough innovation.

To create a research commercialization system that works, we need to address:

Culture: Making Commercialization Integral for Scientific Impact
- Scientists should see commercialization as part of their impact toolkit, not as a distraction from basic research.
- The relationship between academia and entrepreneurship must be seen as complementary. Great commercialization requires excellent basic research.
- We must educate the masses to appreciate research commercialization, and to realize its complexity and importance.

Structures: Rethinking Funding, Incentives, and Legal Barriers
- In Finland, we invest over €200K per student in their education with the assumption that they will work, pay taxes, and contribute to the economy. Yet when research-based inventions could generate companies that create jobs and economic returns, we suddenly worry about state aid laws and privatizing taxpayer money. This is a contradiction we need to resolve.
- TTOs need new funding models. Universities in many countries lack funding for commercialization activities, forcing them to extract harsh ownership terms. We cannot fully blame universities for bad term sheets when they are forced into short-term revenue extraction.
- Academic career paths must encourage commercialization. Scientists should not have to abandon research to become entrepreneurs. We need pathways where top researchers can stay in academia while actively commercializing their work.

Team Formation: Building Winning Teams
- Building a strong spinout team is one of the hardest challenges. Academic silos and institutional barriers make it even harder.
- We need to encourage encounters between scientists and entrepreneurs, highlighting their shared mission and complementary skill sets. Without this, promising technologies will never reach the market.

A BRIGHTER FUTURE

Europe is already the region that produces the best science. Imagine if we were also the easiest, most efficient place to bring that science into real-world solutions.

And we can make the case for it in Europe. The rest of the world cannot.

This is not a theoretical exercise. We are actively working on policy changes and grassroots programs to shift the culture around research commercialization, using university students as the catalysts for change. We are already engaged with the OECD and the European Commission on these issues, but we need a broad, cross-sector, and cross-ministry dialogue to kickstart the new system. And we need it fast.

If you are working on this problem, whatever your sector or discipline, please reach out. We need to do this together, as a European effort.

Let's make this happen!

Author:
Ahmed Hadi

KNOWLEDGE TRANSFER OF DEVELOPED COATING SYSTEM FROM UNIVERSITY LABORATORIES TO MANUFACTURERS

The speed and efficiency of the development and transfer process is key to maintaining competitiveness. There is high competition in the area of coating systems for wood surface protection. Developing new wood protection systems brings a competitive advantage to manufacturers of both coatings and final products. However, it is necessary to optimize development capacities in research organizations and private companies or to share these capacities.

ABSTRACT The process from development to the transfer of the final product takes place in several stages, and to achieve an effective transfer, the cooperation of the given actors is needed, both within each organization and inter-organizationally. At some stage, it is effective to choose the outsourcing route, both in the development phase and in the phase of intellectual property protection or transfer. The goal is to streamline processes so that investments in the intellectual property protection and transfer process ensure a sufficient return for participating organizations. In the example of a real case study, the issues of the development process with the mentioned limits are described, and a procedure is proposed for the effective launch of the product in the form of a coating system for the protection of oak heartwood through commercial partners from university laboratories.

INTRODUCTION As a result of global climate change, the structure of forest stands in Central Europe is also changing, with spruce monocultures gradually changing in favor of forest stands with a content of mixed deciduous tree species. However, the processing industry is long-term in terms of capital, product, and technology for the processing of coniferous species of wood (Bozzolan et al., 2024). Depending on the change in the species structure of forest stands in favor of deciduous tree species, the production programs of processing companies will also gradually change. Various types of hardwoods will be processed more and more, and with this comes the need to develop new types of products and related systems for their protection for indoor and outdoor use. The trend is to implement an ever-increasing volume of wood in buildings as a starting point for reducing the ecological burden (Hansen et al., 2025; López & Hincapié, 2022). For this, legislative frameworks and standards are being adjusted, both at the level of the European Commission and the level of individual member states. An example is the change in standards to increase the height limit for high-rise wood-based buildings across the European Union. Therefore, intensive research, development, and transfer in the area of new procedures and products is necessary in such a conservative sector as wood processing and the production of materials based on it (Drongelen & Cooke, 2002). The presented process

of development, protection, and transfer of the technical solution focuses on the protection of the oak wood surface with a transparent coating system designed for exterior applications (Aghion & Howitt 1996; Hearl, 1980). The introduction of effective research and development processes even in relatively conservative sectors (Dwyer *et* al., 2007; Miller & Friesen, 1982), such as the woodworking and construction industries, will be necessary for increasing production efficiency, reducing costs and increasing competitiveness (Macák *et* al. 2020; Michal *et* al., 2021).

RESEARCH, DEVELOPMENT, AND VERIFICATION PROCESS

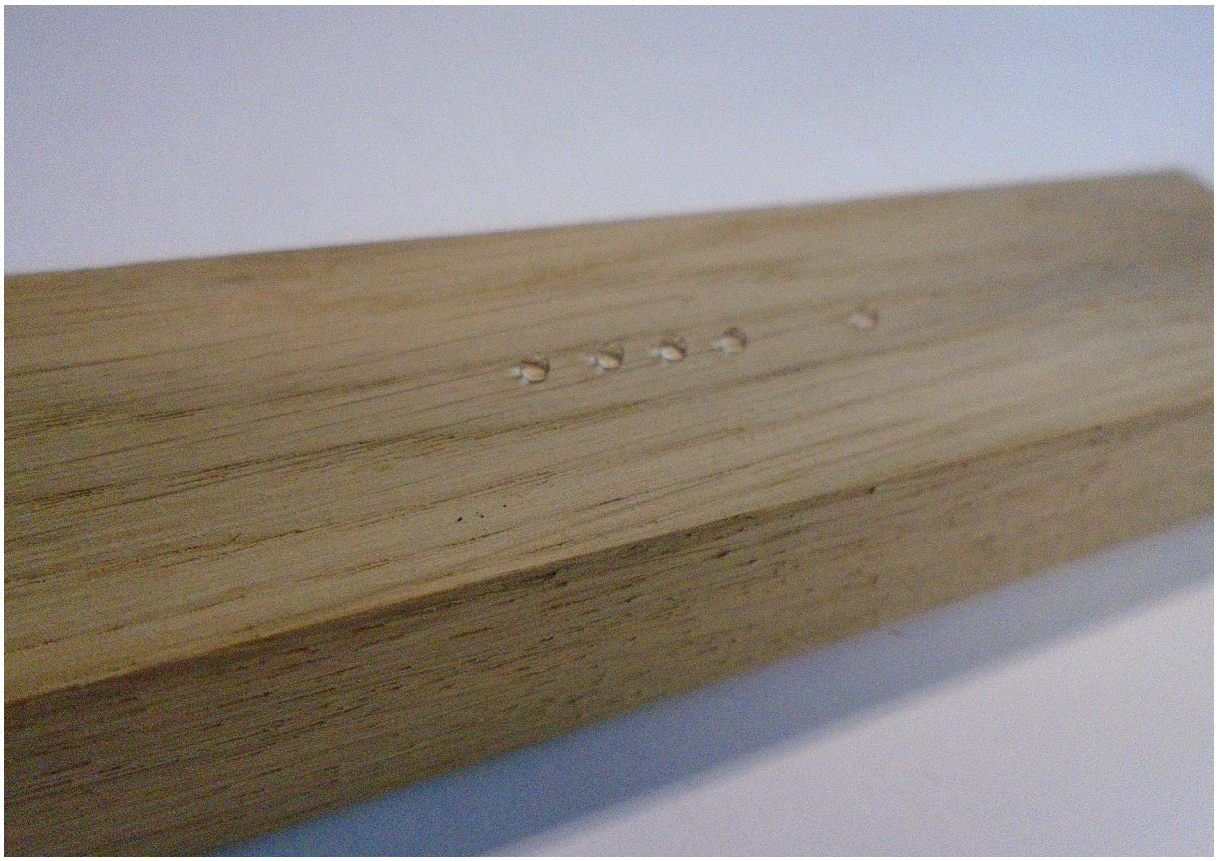
Procedurally, in the first phase, a market analysis in the area of coating systems and existing technical solutions for patent protection was processed (Gibbons et al., 2020), while we use the services of consulting companies and their analyses (Ketan & Tyagi, 2024). Based on market analysis between manufacturers of coating systems and customers, a requirement was specified for the development of a new coating system that would improve the properties of oak heartwood in application. At the same time, a feasibility study with a cash flow calculation for the given paint system product was prepared. Oak wood has the potential to be used both indoors and outdoors. Thanks to the content of a high proportion of core wood species in the wood, great resistance to degradation and the action of biotic agents is ensured. Thus, the lifespan of the oak wood is extended. The advantageous mechanical properties also enable the application of oak wood for structural use in buildings. The wood processing sector is quite conservative in terms of development and innovation. On the contrary, there is a high level of competition in the industry of development and production of coating systems. As a result, coating system manufacturers are forced to innovate and are open to collaboration in the research and development of new applications. In the second phase, a commercial partner was specifically contacted, namely the traditional Czech company MATRIX a.s., which already has experience in the development and marketing of innovative technical solutions. The advantage is that it is a holding that has experts in the field of wood processing and protection, has its own production capacities, and has an internal system set up for introducing innovations into its product portfolio. Subsidiary company Dřevocentrum CZ a.s. operates distribution channels and sales for both small customers and large manufacturers. In the segment of coating systems, the inclusion of a new product, a coating system for the surface protection of the heartwood of deciduous species, was a competitive advantage from the point of view of the distributor and seller. Therefore, contractual research was started with this commercial partner as part of a scientific research project entitled „Increasing the resistance of coating systems on selected types of wood in exterior applications“, reg. no. TH02020873, financed within the EPSILON program by the Technological Agency of the Czech Republic. The research was carried out within the framework of a partner consortium, the research organization of the Czech University of Life Sciences Prague, the Faculty of Forestry and Wood Sciences, the Department of Wood Processing and Biomaterials, and the company MATRIX a.s. The laboratory infrastructure of both participating partner organizations was used for research and development, testing and transfer was carried out under the conditions of the production division of MATRIX a.s.

TECHNICAL SOLUTION OF INNOVATION

The subject of intellectual property protection of the technical solution was a coating for protecting the surface of oak wood for interior and exterior use. It is a transparent coating system with a high degree of protection against UV radiation and other biotic and abiotic factors that have a long-term destructive effect on the surface structure of wood when it is exposed to the interior and exterior. The first layer of the transparent coating system consists of a water-dilutable base glaze based on alkyd resins containing ZnO

Product potential: An example of a wooden bridge with the application of a coating system product.
Source: Dvořák Ondřej, 2024

nanoparticles, where the concentration and size of these nanoparticles affects the strength and flexibility of the system. At the same time, this base layer allows limited penetration of water vapor in both directions into and out of the wood. The second layer consists of 2-(2-hydroxyphenyl)-benzotriazole, which acts as a light stabilizer reflecting and absorbing a wide spectrum of UV radiation and thus protects the texture and preserves the color of the underlying wood. The third layer contains sterically hindered amine stabilizers HALS, which stabilize the gloss of the surface, eliminate cracking and the chalking process of the colors of the selected aging paint system. **The system has a 2.5 times higher lifespan** compared to the paint systems used so far, which **represents a 30-40% saving in surface protection costs** and, at the same time, a saving in time during its restoration in terms of substrate preparation and application to wood.



Verification of the properties of the coating system product before application. Source: Přemysl Šedivka, 2025

TECHNICAL SOLUTION OF INNOVATION

The technical solution was protected by a utility model and a patent, patent file no. 309 200 Transparent paint for the wood species oak, a material based on oak wood with extended color fastness, a part for the production of exterior wooden structures containing it and their use, and functional samples of oak wood treated with various variants of surface modification and a water-dilutable exterior coating system based on acrylates were created. For the intellectual property protection process, a patent agent, the company of patent agents HARBER IP s.r.o., was used. The close and open cooperation between the originators and the patent attorney streamlines the process of preparing a high-quality technical solution for filing a utility model and patent application. The rights to the results were divided between the two research organizations in an equal share of 50:50%, namely through a contractual relationship through a license agreement.

PROCESS OF TRANSFER TO PRODUCTION AND SALES

As part of the process of transfer to production, a production model was chosen through a third partner organization, where, on the basis of a concluded contract, Rhenocoll manufactures products of the developed coating system for protecting the surface of oak wood. The entry of a third entity utilizes the effect of economies of scale, when the company Rhenocoll produces coating systems in large volumes, is equipped with production lines with the possibility of operative regulation of the quantity of the production volume of individual batches. The control of the quality of production and packaging is also handled better, since this company has its own narrowly profiled and experienced experts for this activity. The final product is distributed and sold through the Matrix a.s. holding subsidiary, Dřevocentrum CZ a.s. Dřevocentrum CZ a.s. is a wholesaler of wood products, has distribution centers and warehouses for end customers within its regional branches. The final product of the coating system is produced under the marketing brand of Dřevocentrum CZ, a.s. This model of outsourcing the production of the coating system at the partner organization Rhenocoll also systematically enables a quick reaction to changes in market requirements. There are different requirements for delivery volumes between the seasons, considerably larger sales volumes are realized on the market in the period from spring to autumn, also the toning of shades of paint systems and the volumes of given batches vary depending on the type of customer. The coating system manufacturer Rhenocoll thus preferentially processes orders from Dřevocentrum CZ, a.s., thereby speeding up the process of processing and delivering orders directly to the customer, which leads to satisfaction. Product sales model through own sales centers of subsidiary Dřevocentrum CZ, a.s. enables direct communication with end customers, effective and professional training of both sales representatives and end customers. At the same time, the satisfaction of end customers is analyzed through this feedback model, and requirements for potential new products are analyzed. The research organization of the Department of Wood Processing and Biomaterials, Faculty of Forestry and Wood Science, Czech University of Life Sciences in Prague also figures in this phase, where scientific and research workers provide professional training to sales representatives. Furthermore, they intensively consult the potential requirements of end customers and look for new possibilities for the development of new products for the given required applications. In this way, the process of contract research is ensured, where the research organization has a direct connection and directly obtains information about the requirements of end customers and the development of the market for the given product as such, which enables the creation of a strategy and a time frame for an effective framework of research tasks.

Application potential: Assessment of the application potential of the developed coating system as part of the Transfera Technology Day competition. Source: Přemysl Šedivka, 2024

SUMMARY The key to understanding market requirements, to an effective process of analysis of research, development, protection of intellectual property and transfer is open cooperation between participating entities, optimization of the ratio of own human, device and infrastructure capacities for research and outsourcing. This leads to streamlining and speeding up processes to optimize and reduce costs for research, development, and transfer of new applications and products to end customers on the market. The speed of perception of requirements for modification or change of internal processes enables correct and responsible decision-making by managers of participating organizations in the field of innovation so they can recognize and reflect market requirements on time. It is all the more difficult in the case of cooperation between research organizations, such as public universities, where decision-making processes are time-consuming and procedurally more demanding due to the organizational structure compared to small or medium-sized private companies. Understanding one's internal processes in both research organizations and private firms is important in terms of rapidly changing market conditions and competitive challenges.

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Authors:
Přemysl Šedivka, Ondřej Dvořák

ING. PŘEMYSL ŠEDIVKA, PH.D.

Přemysl Šedivka works as a researcher at the Department of Wood Processing and Biomaterials, Faculty of Forestry and Wood Sciences, Czech University of Life Sciences Prague. Professionally focuses on the research and development of wood-based materials for non-structural and structural applications. Another area is the research and development of nanostructures and nanocomposites.

ING. ONDŘEJ DVOŘÁK, PH.D.

Ondřej Dvořák works as a researcher at the Department of Wood Processing and Biomaterials, Faculty of Forestry and Wood Sciences, Czech University of Life Sciences Prague. Professionally focuses on research and development of coating systems for wood protection and evaluation of changes in its properties. It deals with methods of accelerated and natural aging of wood and wood based materials and methods of its protection.

Determining actions and goals for a planned transfer process. Source: TU Berlin/Berlin University Alliance

SERIOUSLY! NOW WHAT? – A TECHNOLOGY TRANSFER EXPLORATION

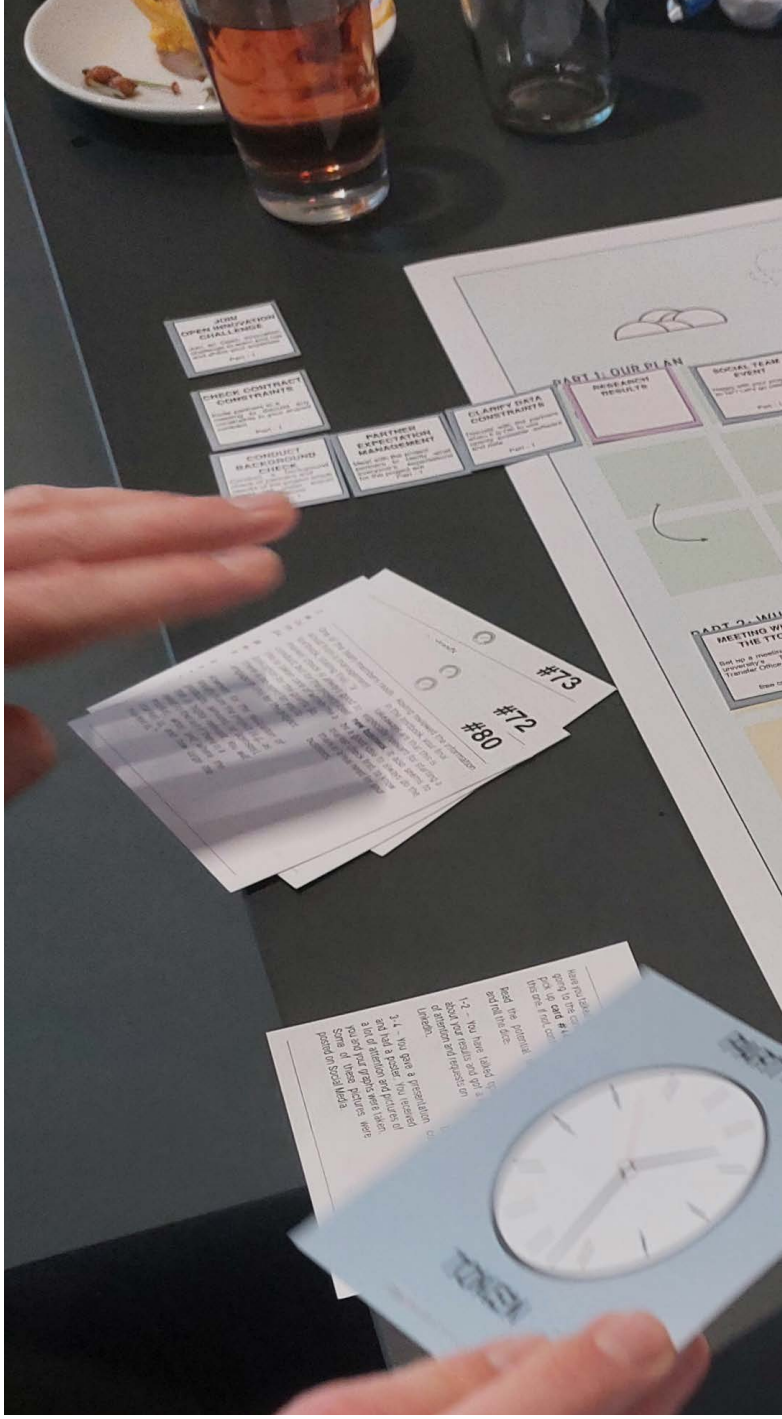
Getting people and organizations interested in and actively engaged in technology transfer can be difficult. For many that would benefit from implementing approaches to transfer, the crucial importance becomes apparent far too late. Especially among early-career researchers and start-up businesses, this is a widespread issue – but we also see it happening in more established businesses too often. To help these actors understand why technology transfer matters, House of Knowledge has created a serious game (a game with a primary purpose beyond entertainment) about technology transfer, called *"Seriously! Now what?"*.

The game was developed in collaboration with the Technische Universität Berlin (TUB) and funded by the Berlin University Alliance (BUA) as part of its Postdoc Academy. Although it was designed for researchers, its learning objectives are relevant to anyone interested in sharing perspectives and improving their understanding of technology transfer through simulation — key strengths of the collaborative serious game approach to learning.

TECHNOLOGY TRANSFER FOR INNOVATORS

The game brings players together in small groups to explore how technology transfer works in practice and its role in their research and future careers. Players take on the role of a research group working on a fictional project and are challenged to develop their ideal technology transfer process, aiming to secure and commercialize their results successfully. They must define their goals, decide on actions and their sequence, and plan how to secure their findings. Once their plan is in place, they navigate 'real-life' scenarios to stress-test their plan in a simulated environment.

The game's main objectives are to provide insight into the added value of technology transfer and help players understand its challenges, strategies, and success factors. This is achieved through knowledge exchange, where players learn from each other's experiences as well as inputs from the Technology Transfer Office (TTO) of the university. To progress through the game, players explore how to plan for technology transfer, dealing with common challenges that may occur before and during transfer, as well as tackling hurdles such as publishing results before patenting and licensing. The game uses realistic scenarios that players can relate to, facilitating the exchange of experiences. To complete the game, player groups will have to discuss, share, and use their prior knowledge and experience and work together as a team to be able to solve complex problems.



The game is played using a board to map out the planned technology transfer process, along with two decks of cards – one for situation story events and another for guiding team decisions during play. The game also uses a guiding booklet providing theoretical insights and key takeaways, which the players can keep after the game is completed. Magnus Hakvåg (CEO, House of Knowledge) and/or Dipl.-Ing. Jeanne Trommer, Dr. Christine Oesterhelt, and Dr. Caroline Reid (TUB Research and Technology Transfer Department) facilitate the game to ensure an engaging and insightful player experience.

Overcoming challenges together when executing a plan. Source: TU Berlin/Berlin University Alliance

EXPECTED OUTCOMES

Playing *"Seriously! Now What?"* allows participants to share their experiences and learn from others' perspectives. The game fosters knowledge exchange, offering fresh insights and best practices in technology transfer. Engaging diverse groups, it encourages interorganizational learning, helping players understand how technology transfer works beyond their organizations. This broadens their perspective and deepens their appreciation of different approaches. The exchange of ideas can lead to improved technology transfer practices at both individual and organizational levels. Additionally, the game's collaborative problem-solving design helps players develop new skills, enhance teamwork, and gain valuable tactic knowledge.

In addition to being used by novices for getting an understanding of technology transfer importance, the game can be used by technology transfer experts as a platform for exchanging ideas and insights. As such, it complements the "Serious Tech Transfer Game" described in a previous article, which was designed especially for experts. Thus, *"Seriously! Now What?"* can be used by technology transfer organizations for educational, outreach, and dissemination purposes. For even deeper learning, the two games may also be played in sequence.

HOUSE OF KNOWLEDGE

House of Knowledge is a Norway-based company specializing in capability building and serious game development. Collaborating globally with universities, NGOs, and industry partners, the company designs games that foster collaboration, knowledge exchange, and skill development. With expertise in intellectual property (IP) and technology transfer, the House of Knowledge has created multiple serious games for organizations like WIPO and LESI and has developed games for data extraction, governance, and cross-cultural exchange in EU-funded research projects.

THE BUA POSTDOC ACADEMY

The BUA Postdoc Academy is a program of the Berlin University Alliance, a consortium of the four leading scientific institutions in Berlin: The Freie Universität Berlin, the Humboldt Universität, the Technische Universität, and the Charité – Universitätsmedizin. The Postdoc Academy aims to provide support for postdocs of the BUA institutions in their career development. The primary task is to assist postdocs in making informed and individually good career decisions. It creates an environment where postdocs can recognize their own strengths, acquire necessary competencies, and build relevant knowledge and skills. A key aspect of this process is networking: the BUA Postdoc Academy promotes exchange and interdisciplinary networking between postdocs and other actors in the scientific community.

Author:
Håvard Almås

"Seriously! Now what?" game board. Source: TU Berlin/Berlin University Alliance

TRANSFER AT CHARLES UNIVERSITY: TWO INSTITUTIONS, ONE ECOSYSTEM, ONE COMMON VISION

Two institutions that play a key role in the support and long-term shaping of the innovation ecosystem collaborate closely on the transfer of knowledge and technology at Charles University. At the same time, they ensure an important function of the university, which is connecting the academic sphere with the commercial sphere. Both institutions have been pursuing one common goal for a long time: to find suitable solutions for the commercialization of scientific research results.

We could briefly describe their agenda as follows. As an internal part of Charles University, the Centre for Knowledge and Technology Transfer (CKTT CU) focuses on supporting academic staff, students, and faculties in their activities, which in any way contribute to the development of the university's innovation ecosystem. At the same time, its priorities include education in the field of transfer, the application of innovations in practice on the one hand, and project management in the field of grant and subsidy opportunities, especially in the field of applied research and innovation on the other.

The second of the institutions involved in cultivating the transfer ecosystem is Charles University Innovations Prague (CUIP). The subsidiary of Charles University was founded in 2018 and has 132 licenses granted, 23 patents sold, and implemented 10 spin-offs. As part of the incubation process, it assesses the stage in which the relevant research or the innovation being developed is located while being able to define suitable sources of funding for their further development. In the process of scientific transfer, its key role is setting the business strategy of transferring the innovation into practice. The team conducts market analysis, searches for investors and commercial partners, sets legal conditions for cooperation, and takes care of the strategy of intellectual property protection. In CUIP, the PR team also sets up the communication strategy of new brands and the media coverage of technologies and innovations. Examples of successful brands arising from CUIP's collaboration with the academic and commercial sphere include spin-off companies originating from the Charles University such as Charles Games, Genespector, or FOGA technology.

The visual appearance of the game project Velvet 89, a spin-off of the Charles Games company, which focuses on the key moments of the Velvet Revolution in Czechoslovakia. Source: Charles Games

The clean extinguishing technology FOGA, developed in cooperation with the 1st Faculty of Medicine of the Charles University at the BIOCEV center, introduced in 2024, continues to confirm its high commercial potential.
Source: FOGA / CUIP, www.cuip.cz

CPPT: HOW TO EXPAND THE HORIZONS OF UNIVERSITY EDUCATION

One of the pillars of the activities of the Centre for Knowledge and Technology Transfer is education, more specifically education for entrepreneurship. Entrepreneurship and entrepreneurial skills are key concepts. However, this is not business education or training in business skills. This concept of education is based on a much broader approach as well as the context in which these activities take place. CPPT creates space for interdisciplinary cooperation and an individual and value-driven approach, all with lecturers from practice and the prestige of Charles University.

The university as an institution, not only Charles University, is a place where countless ideas with the potential to change the world for the better are born. And within the transfer ecosystem, every such idea deserves care and support to fully develop. The educational activities that CPPT organizes and offers are therefore designed to develop participants not only in entrepreneurship and creative thinking but also to help change their way of thinking. The goal is for students to be able to translate their academic knowledge into practice and shape it in a way that will positively impact the society. And it's not just Charles University students. CPPT courses, which are newly evaluated with micro-certificates, are open to anyone from the university environment and beyond, who wants their ideas to turn into practice, implement beneficial commercial and non-profit activities, or progress in any way in their professional and personal growth.

ENTREPRENEURSHIP AT CHARLES UNIVERSITY AND THE LIVING LABORATORY

The Living Laboratory of Cooperation is one of the courses in the field of entrepreneurship that students and non-students can take at Charles University. As part of the concept of entrepreneurship, they are organized by the Centre for Knowledge and Technology Transfer, and as of this year, the courses are newly evaluated with micro-certificates. At the same time, the term entrepreneurship and entrepreneurial skills are not equal to enterprising skills, it is not about learning to do business. Here, students learn how to take their ideas and use them to create value with a longer-lasting social impact. How to turn your idea into practice. They will encounter concepts such as management in science, self-organization, changemaking, or a Human-Centered Management. These and other concepts will be explained to them during experiential learning by the lecturer of the Living Laboratory of Cooperation course, Kateřina Jiřinová, an expert on innovative approaches in management.

What should we imagine under the term Living Laboratory?

The Living Laboratory is the terminus technicus. Simply put, it's a space where people test and develop new ideas together in the real world. Well, we are focusing on new ways of cooperation.

Why is that?

Today's world is very fast, connected, and has many challenges. With whom no one is alone. If we aim for social impact, we need to be able to work together. At the same time, we tend to assume that we can do it all by ourselves. But I think having a safe training space where we can test whether this is the case can be very beneficial.

I myself prefer the form of learning through experience. Students prepare real socially beneficial events in teams and learn from them. For newbies, it can be one of the first practices, and for the more experienced, it is an opportunity to try something new or see how they work in a different context.

WHAT IS A MICRO-CERTIFICATE

A micro-certificate (micro-credential or micro-certification) is an additional form of education that allows students to expand their qualifications as part of lifelong learning. At the same time, it offers greater flexibility in choosing the educational content that suit best their professional goals, as well as time options. It makes it possible to combine studies with other study or work commitments. Microcredits are a way to demonstrate that the student has acquired specific skills in the standards of the specific institution. At CKTT UC, they allow interested parties to deepen their knowledge in the field of project management, science and innovation management or the application of science to practice, but also, for example, to improve their entrepreneurial skills.

By working on real projects, we naturally have the opportunity to experience real situations and real emotions – joy, stress, communication noise, feelings of victory and failure, experience of conflicts, gratitude, surprise. It is simply alive by all means. In practice, we usually tend to run away from these situations to other things that we need to solve. However, we have space to reflect on all that is happening. Discuss the quality of cooperation and share research-based tips and good practices for different situations, learning from them. This is how we get the most out of the experience together.

What does the concept of self-organization mean?

It is one of the possible approaches to how a group of people can work together. The natural counterpart is the managerial hierarchy. Self-organization is based on the assumption that people can make their own decisions and coordinate according to what makes sense to them and how they agree with each other. There is no need for someone at the top to assign tasks to be completed. This system of self-organization can work not only in smaller, but also larger communities. When one knows how to prevent chaos from arising.

However, it is not that self-organization is good and managerial hierarchy is bad. Rather, it is useful to know the different ways of cooperation and to know what to expect from them, where to look for them, how to be successful in it and most importantly - which form of cooperation makes you feel good.

How would you explain the term Human-Centered Management? Can it even be learned? Doesn‘t it follow from a person‘s natural setting?

I think most people have at one time or another experienced the feeling, whether at work, school, or elsewhere, as if they were more of a cog in a machine than a person. Why do we feel this waywhat does it entail, where does it come from? It‘s good to stop and examine it. When we also consider the development of artificial intelligence and the expected impact on jobs, this thinking acquires another dimension.

There is always tension at the core of cooperation - people versus performance. We need both. Let‘s talk about how to do it. Either we can alternate the two extreme modes, or we will connect the two concepts at the core level. That will bring words like trust, freedom, personal responsibility, talent, meaningfulness, shared leadership, and others. When we talk about humanity in cooperation, this is what I mean. Performance

KATEŘINA JIŘINOVÁ

Kateřina Jiřinová, an expert on innovative approaches in management, creates space for personal development in several areas at CKTT. Katka deals with topics such as self-organization, Human-Centered Management, learning through experience and changemaking. She intensively supports the third role of the university and believes in the positive social influence of the academic environment. If you don‘t find Kateřina in the corridors of Charles University, she is probably busy with another socially beneficial initiative in cooperation with organizations such as Red Button, Ashoka or the OSF Foundation. She believes that it makes sense to devote her energy to projects and activities that have the potential to make the world a better place to live.

is also important here, but it is not the only measure of success. And what's more, we reach it differently. Thus, the key debate does not take place at the level of new tools or techniques, but rather at the level of mindset and personal paradigms. Everything else grows out of it.

Is it possible to learn humanity through cooperation?

Paradoxically, someone needs to unlearn some things first. But the answer is yes. Two typical triggers will make you rethink what you want out of a collaboration. A crisis such as burnout or a way of ending an employment relationship that leaves you with very unpleasant feelings. Or an encounter with a person, situation, or book - through which you learn something significantly new. Both of these triggers will make you think, search for more information, and experiment.

AN EXAMPLE OF GOOD PRACTICE IN TECHNOLOGY TRANSFER BY CUIP

FOGA: TECHNOLOGY THAT SERVES SOCIETY

In April 2024, Charles University, on behalf of its subsidiary Charles University Innovations Prague, Inc. (CUIP) and the company Walk on Water Ltd., introduced fire blankets that cannot cause burns. Leveraging technology founded on cutting-edge scientific discoveries, these blankets emerge as a novel product in the marketplace, boasting firefighting capabilities comparable with conventional fire extinguishers, a claim validated by a certification authority. Foga is a clean and safe option offering a modern alternative to fire extinguishers. It finds application in manufacturing, gastronomy operations, laboratories, but also in households. The material is made of 100% cotton, engineered to maximally absorb the contained extinguishing agent. In parallel, it employs the technology of a thermal shield, formed by scientists from the First Faculty of Medicine at Charles University in the BIOCEV center, which ensures the effect of a safe, thermally impermeable layer thanks to stabilized metal nanoparticles.

The Foga technology has continued its successful development and has also enjoys media interest. Since 2021, a continuous study has been underway, confirming that Foga still maintains its fire-fighting capabilities, which makes it possible to declare a three-year product shelf life. This project, in the launch of which CUIP participated, is one of the best examples of connecting academic research with the commercial sphere, which brought about innovative solutions with a practical impact on society.

It is worth noting that in 2024 the Foga fire blanket project achieved several significant milestones that strengthened its position on the market and expanded the possibilities of using this innovative fire-fighting agent. As an example, we can cite the expansion of use in academic institutions. For example, the Academy of Performing Arts in Prague decided to equip its workplace with Foga fire blankets in November 2024.

For more information about transfer at Charles University: www.cppt.cz and www.cuip.cz

Authors:
Martin Karlík, CUIP

DISASTER RISK MANAGEMENT IS ALSO A SPACE FOR COOPERATION BETWEEN SCIENCE AND PRACTICE

Hydrology and expertise in the field of catastrophic risks or climate resilience. The connection between technology transfer and science and practice was explained in an interview by Milan Kalaš. The founder of the successful KAJO company will also explain the specifics of the cooperation between research and companies in the areas he has been working on for many years.

How would you define the company KAJO s.r.o. in connection with the cooperation of science and practice? What is your main mission?

KAJO started from my need to address certain activities that did not fit into my work at the Joint Research Centre (JRC) of the European Commission. My work has always been on the edge between science and practical application. Being at the JRC exposed me to high science, but I wanted to see the practical application of my research rather than another published paper. Suddenly, I had more activities that were not in line with the mandate of JRC, so I decided to start the company. Then we got our first Horizon project, and the whole story started. By the way, KAJO has a much longer history. It was a company of my grandfather, producing wooden sports equipment like skis and hockey sticks (later known as Sulov).

KAJO Services bridges the gap between scientific research and real-world applications by combining cutting-edge technology with academic advancements in environmental monitoring, disaster risk management, and climate resilience. Our mission is to ensure that state-of-the-art research, data analytics, modeling, and artificial intelligence are translated into practical, scalable solutions for public and private entities, policymakers, and communities.

What is the solution to bridging this gap?

We have realized that bridging this gap is not just about technology—it's also about communication. Scientific evidence and innovations are only truly impactful if they are understood and embraced by the general public. That's why we have expanded our focus to include tools and services that improve the communication of complex environmental data, helping people grasp risks better and make informed decisions. By doing so, we ensure that the benefits of scientific progress extend beyond experts and institutions, empowering society as a whole. For example, when we work on climate adaptation measures, these should not only be effective in reducing the negative impacts of climate change but should also come from and be accepted by the community.

Ing. PhD. Milan Kalaš. Author: Šimon Kalaš

What kinds of experts does your team consist of?

The KAJO team is highly interdisciplinary, bringing together experts in meteorology, hydrology, disaster risk management, climate risk assessment, geospatial analysis, software, and web development. Our diversity in expertise allows us to tackle complex challenges from multiple perspectives, ensuring that our solutions are both scientifically robust and practically applicable. Our team is also highly international; at the moment, we have 6 nationalities living in 5 countries. We operate in a remote-first environment, enabling collaboration across borders and even time zones. This setup fosters independence, creativity, and flexibility, allowing each team member to contribute their expertise while benefiting from a dynamic exchange of ideas.

One aspect I am particularly proud of, especially as a science and information technology consultancy, is our strong gender balance. This is not a result of any internal policy; instead, we believe in offering equal opportunities to everyone and giving them the space to excel in their ways. So far, this has naturally nurtured our diverse and balanced team, where different strengths and perspectives come together like ingredients in a delicate dish.

What is the composition of your team?

The composition of our team and the workstyle is strongly influenced by my work experience. I was very lucky and I met very influential people at different stages of my career. At the university, it was my PhD mentor who managed to push my hidden talents and gave me all the support and freedom I needed. Then, I had a very similar experience when I started as a young kid working as a national expert at the JRC in the team of international experts working on the development of the first operational European Flood warning system. My supervisor was wise and brave enough to give us the freedom to fly. We took this opportunity and developed a solution that is still unique. I am sure it was not always easy to cope with this bunch of crazy characters. It was similar to my colleagues because at JRC, I had a chance to work with excellent people and was somehow compatible. We were a super-efficient team.

This is the experience I am trying to bring to KAJO. We are trying to select people who are excellent in what they do, but similarly, we make an effort to select people who fit well in the team and are pleasant to work with. ;)

For me, it is fantastic to find a person who is somehow mentally compatible and is filling the missing piece of my thinking. :) That is super rare, and it is a real gift. ;)

Please describe the focus of the simON project from your side, especially the participation with TU Košice.

simON is a startup born from our successful collaboration with the Slovak Space Office, stemming from our role as a mentoring organization in their SpacePort incubator. During this program, one of the participating teams was exploring VR applications, which immediately resonated with our work in extreme event management. Since disasters such as floods, wildfires, or severe storms are rare and difficult to train for, VR/XR technologies provide an ideal platform for immersive training, emergency planning, and decision-making support.

Presentation of KAJO's application of immersive technologies in disaster risk management during the GOBEYOND project. Source: Archive M.K.

What started as an incubator project quickly evolved into a long-term collaboration, and today, the simON team is fully integrated into KAJO Services' activities. Initially based in Košice at the TECHNICOM University Incubator, simON benefited from proximity to TUKE, gaining access to mentorship, cutting-edge technology, and an innovation-driven environment. For us at KAJO, this was an ideal setup—having a young and ambitious team embedded in a university setting allowed them to grow in an ecosystem that fostered both academic and entrepreneurial development.

Now, simON continues to play a key role in our broader vision, enhancing KAJO's capabilities in immersive technologies for disaster risk reduction, crisis management, and also climate adaptation. We are also continuously exploring new venues and business opportunities.

What other projects and activities do you work on with Slovak and foreign universities? Please describe the form of your participation.

In our projects and consultancy activities we are collaborating with more than 50 universities in Europe, Africa, and China. With some universities, it is a one-time or a single project collaboration without any intense interaction. On the other hand, with some, we have a very intense and long-

term collaboration. With the universities of Barcelona, Bologna, and Reading we have many projects and I would consider them to be our core team of collaborators. Slovak universities (as my alma mater where I have a lot of friends) and some of our colleagues are also affiliated there. Through our projects, we also made very strong ties with UNIZA and TUKE. We also have colleagues affiliated with the University of Prešov.

A common aspect of these collaborations is the excellent people and friends we have there. This might be a particularity of KAJO which was absent in the early years in the Slovak eco-system and we did not have any links to Slovak entities. Only during the COVID pandemic when I was forced to stay in Slovakia for a longer time, I got to know some people, and we started talking and planning activities together. This has resulted in the first project to organize hackathons on urban mobility in Žilina and Košice. This was the triggering moment for all follow-up projects with Slovak entities. We started inviting other Slovak partners and also used cities and regions as pilots for our activities.

Can you tell me something about the CLIMAAX project?

It is a project where we are developing a harmonized and openly available methodology to assess climate risks across Europe. In Climaax we have Žilina City as one of the pilots, where KAJO developed a method for assessing heatwaves. MEDEWSA project is focusing on Early Warnings and together with the Slovak Hydrometeorological Institute, we are developing impact-based early warnings in Košice region. In Medewsa we collaborate with high-level institutions like the World Meteorological Organization and the tools we are developing aim to contribute to the global initiative of the United Nations called Early Warnings for All. In the RETIME project, we have the highest representation of Slovak partners together with KAJO which is also the Žilina Self-governing region and the University of Žilina. The latest one we have with the Prešov Self-governing region is the Pathway2resilience project, where we assist the Prešov Region in improving its climate resilience.

What other projects would you like to mention?

I would also like to mention our last project (at the time of this interview), which is extremely ambitious and aims to revolutionize the way we model climate and predict weather. WeatherGenerator is coordinated by ECWMF (the institution that is behind most of the weather predictions we use every day), and together with 16 top-level organizations, including meteorological, supercomputing, and AI organizations in Europe, we aim to revolutionize the use of AI in earth process modeling as part of EU's Destination Earth.

Another project worth mentioning is Albatross, which focuses on climate adaptation in sub-Saharan Africa. We are designing new climate services and innovative climate-adaptation measures in Kenya, Tanzania, Madagascar, South Africa, and Ghana.

It is often said that the worlds of entrepreneurs and scientists are different. As part of your practice, you try to combine them. How do you do it? Is there any know-how for this?

It is often said that scientists and entrepreneurs operate in different worlds—one driven by discovery and academic rigor, the other by practical application and market needs. At KAJO, we (try to) bring these worlds together, ensuring that cutting-edge scientific research doesn't just remain in publications but is transformed into real-world solutions that create tangible impact.

For me, EU projects have a fantastic added value to bring various stakeholders together. We use this opportunity at KAJO to trigger a dialogue and co-design our solutions involving scientists, decision-makers, and industry experts from the very beginning, ensuring that research outcomes align with operational needs. Being in the middle between science and entrepreneurship, we are focusing on finding the right balance between those two worlds. We often act as translators between scientific and business professionals speaking very different languages.

The project environment gives our team the freedom to explore innovations in a strongly collaborative atmosphere and helps us to develop skills and tools to effectively communicate project findings.

Is that the most important thing in today's world?

Sure. The process of communicating science to the general public and bringing project outcomes to life is anything but straightforward—especially in today's world, where misinformation spreads faster than facts, and society often clings to simple and comfortable lies rather than complex realities. This challenge is particularly evident in climate science, disaster risk management, and environmental policies, where scientific findings are often met with skepticism or resistance. The rise of social media, selective news consumption, and politically charged discussions around climate change have only made this process harder. In many cases, even when scientific evidence is clear and well-documented, the way it is communicated determines whether it will be accepted or ignored.

In our work, we've realized that simply presenting data is not enough—we need to engage, visualize, and make information relatable. This is why we've expanded our focus to include tools and services that improve science communication, whether through interactive platforms, immersive technologies like VR/XR, or more engaging storytelling techniques.

If we want scientific progress to lead to real-world change, we need to go beyond traditional academic dissemination and meet people where they are—whether it's through digital media, community engagement, or decision-support tools that help policymakers turn data into action. Bridging the gap between scientific reality and public perception is one of the biggest challenges of our time.

What is the current situation regarding cooperation between science and practice in the field of environmental protection and climate change, especially about changes in policies and legislation within the EU and especially the USA?

The cooperation between science and practice in environmental protection and climate change is evolving rapidly, driven by increasing climate risks, policy shifts, and technological advancements like the rise of AI. However, significant gaps remain between scientific innovation and real-world implementation. While research in climate modeling, risk assessment, and adaptation strategies has advanced significantly, turning these findings into practical, scalable solutions still requires stronger industry- academic collaboration and more streamlined policy frameworks. These policy frameworks (like climate adaptation strategies) are often implemented in a very weird way only because regions are obliged to do so. Results are often very generic and do not reflect the real needs, challenges, or scientific evidence. The main difference between the EU and the US, I see, is in the way innovations are driven.

How is it in the case of the European Union?

In the EU, the integration of science into practice is largely driven by policy initiatives like the European Green Deal, Destination Earth, and various Horizon Europe projects. All our R&D activities are funded under the Horizon Europe and Destination Earth programs (e.g., CLIMAAX, MedEWSa, and WeatherGenerator). After the project's lifetime, it is not easy to bring the results into real life or business because we often lack the funding for the last mile of development before we can reach the market. We don't have any support from national or EU funding. The EU has recognized this problem and is slowly introducing tools and services to address it, but not at a sufficient level. At the national level, it is missing completely.

So is it different in the US?

Yes. The USA has a more market-driven approach, with strong private sector involvement in climate solutions, risk modeling, and early warning systems. However, the policy landscape in the USA is more fragmented, with differences at federal, state, and municipal levels creating challenges for standardizing climate adaptation strategies. I have friendly companies that are doing similar activities as KAJO, and they got access to large investments in their first years, allowing them to go straight to the market, although solutions are often less solid in terms of science integration, transparency of methods, and results.

What is the future of university technology transfer in this area? (In areas that your company deals with).

Technology transfer from universities to real-world applications is something that should be straightforward but often isn't—especially in areas like climate science, disaster risk management, and AI-driven environmental modeling. I've seen firsthand how many brilliant research ideas never make it past the academic paper stage simply because there isn't a structured mechanism to bring them into widespread use.

At KAJO, we work with top European universities and research institutions, and the pattern is often the same—scientists develop incredible methodologies, but there's no clear pathway to operational deployment.

One of the biggest hurdles is the "last mile" of development, where research has reached a high level of maturity but isn't quite ready for the market. EU funding heavily supports research and development, but once a project ends, we are often left with no resources to finalize, commercialize, or operationalize our work.

We've faced this challenge in several projects. For example, in the OPerandum project, we developed a knowledge platform about nature-based solutions for climate adaptation. It is designed to guide through the process of selection and implantation of adaptation measures in a user-defined location. It's an ambitious effort with a high level of innovation, but making this tool truly accessible and commercially exploitable is a real challenge. In the projects we are trying to push to co-develop solutions with researchers from the very beginning, ensuring that what we build is both scientifically sound and deployable in real-world settings, but the project outcomes always need the last refactoring to meet the market needs and this is where I see room for improvements. On one hand, it can be addressed by the funding authority which should dedicate the budget to the exploitation of the solutions with business potential. On the

other hand, dedicated innovation hubs and technology transfer at universities could play a significant role in facilitating this process as well.

As a test, we are trying to work together with the Center for Technology Transfer of the University of Žilina to create realistic business plans for our exploitable results of the RETIME project.

What is the major obstacles for Slovak institutions and companies in highly innovative international projects?

I think that one of the main obstacles is the lack of institutional support for co-financing requirements. Many cutting-edge projects require a significant level of co-funding, which can be a deal-breaker for Slovak participants. KAJO experienced this challenge firsthand when we had to step out of a very prestigious high-performance computing project simply because we couldn't secure the required 50% co-financing at the time. What made the situation even more frustrating was that all other participating organizations from different countries received institutional or national support covering at least the co-financing requirement, and in most cases, even more than that—to ensure their participation and to support their country's representation in the consortium.

In Slovakia, unfortunately, such mechanisms do not exist in the same structured way. While other countries actively invest in supporting their research institutions, universities, and innovative companies to be part of major international initiatives, Slovak entities often have to rely entirely on their own financial resources. This puts them at a significant disadvantage, making it much harder for Slovak organizations to engage in top-tier, high-impact projects.

Compare cooperation with Slovak and foreign universities. In what ways have ours improved compared to the past, and in what ways should they catch up with the rest of the „Western" world?

When KAJO started, our collaborations were almost exclusively international. It wasn't that we deliberately avoided working with Slovak universities—it just wasn't part of our ecosystem at the time. However, over the past few years, this has changed significantly, and today we have strong partnerships with Slovak institutions like UNIZA, TUKE, and the University of Prešov. The biggest shift I've noticed is that Slovak universities are now much more engaged in international projects, particularly through Horizon Europe.

This has brought them closer to top-tier European institutions and has led to higher-quality research collaborations. The level of expertise has always been there, but now there are more opportunities to put it to use in real-world projects.

That said, there are still significant differences compared to top universities in Western Europe. One of the key gaps is industry collaboration. In places like Barcelona, Bologna, or Reading—where we have long-term partnerships—universities have well-developed tech transfer offices that actively facilitate partnerships with businesses. They act as intermediaries, helping research teams navigate commercialization, access funding, and connect with industry partners. Many of our partner organizations are successful university spin-offs.

One of the biggest takeaways from working with Slovak institutions is that success is often about the people, not the institutions themselves. Our collaborations work best when we find individuals—whether

researchers, professors, or policymakers—who are forward-thinking, motivated, and willing to break out of the rigid structures that sometimes hold back innovation. That's why I strongly believe that personal relationships and shared vision matter more than formal institutional structures.

What I still see as a big problem is the internal competition among the universities and in general, the typical Slovak habit of being jealous about others' success. I am not saying this is not happening abroad, but it is so much less prominent. We seem to be having difficulties giving credits and promoting each other's work. I would maybe expect having more visibility and eventually more requests for business collaboration in our home country rather than abroad, but this is not happening.

Author:
Martin Karlík

HOW THE ECOSYSTEM IN SLOVAKIA COULD IMPROVE:

1. Develop stronger tech transfer mechanisms—so that research findings don't stay in papers but actually get used.
2. Reduce bureaucratic hurdles in funding innovation—to make research more agile and responsive to real-world needs.
3. Encourage a startup mentality in researchers—helping them see the market potential of their work and providing support to turn research into products or services.

MILAN KALAŠ

Milan Kalaš is a hydrologist and expert in disaster risk management and climate resilience, originally from Bytča, Slovakia. He studied at the Slovak University of Technology in Bratislava, specializing in hydrology and water management, where he also earned his doctoral degree.
Since 2003, he has been living and working in Italy, where he is a researcher and freelance consultant at the Joint Research Centre of the European Commission. In 2012, he founded KAJO, initially as a small consultancy to support his independent activities. Over the years, KAJO has grown into a respected player in disaster risk management, climate adaptation, and environmental technology, collaborating with leading international institutions. Beyond his professional work, Milan is a father of two boys, balancing his passion for science and innovation with family life.

GIFTED CHILDREN IN THE SIGN OF SUCCESSFUL TECHNOLOGY TRANSFER

Šárka Portešová, Michal Jabůrek, and Ondřej Straka are psychologists working at the Faculty of Social Studies of Masaryk University, where they deal with developmental psychology, psychological assessment, and primarily, the psychology of gifted children. Together with a broader team of colleagues, they have developed a unique diagnostic system called Invenio, which is the topic of this interview.

You are psychologists whose main professional domain is assessing and educating gifted children. What are the characteristics of these children, and why do you think it is necessary to foster their talents systematically?

ŠP: Traditionally, we refer to children as gifted if they excel in a particular area above their peers - their abilities are, therefore, significantly advanced. This may be a single, narrowly defined ability, but some gifted children are more versatile, so their talents are expressed in more than one way. How advanced a particular ability is at the current age naturally varies from child to child. In extreme cases, a child's abilities and/or knowledge may be comparable to or greater than those of a typical adult. At the outset, we must also emphasize that as psychologists and authors of the Invenio tests, we focus specifically on intellectual giftedness, and we are therefore concerned with finding and supporting children with exceptionally advanced intellectual abilities. Of course, this is not the only type of talent – some children are gifted in the field of arts (such as music, painting...), sports, or in other specific areas. These types of giftedness are also important and often very fascinating, but they are at the same time the main domain of other disciplines, and as psychologists, we come into contact with them rather incidentally.

When talking about children with intellectual gifts, in the first place, they are characterized – practically by definition – by their exceptionally developed intellectual abilities. Logical thinking probably comes to mind first and foremost, but the range of abilities in which some children may excel is broader and may include, for example, spatial imagination or linguistic talent. Less obvious may be another fact that has, however, been confirmed by ample psychological research in recent decades. It is that exceptional intellectual talent is often accompanied by typical motivational, personality or emotional-social characteristics in which these children differ from their peers. Briefly, we can mention curiosity and a heightened need for knowledge, perfectionism, or a preference for the company of older children or adults, to give just a few examples. Conversely, these children often do not enjoy games or other leisure activities typically enjoyed by peers of their age. Often, gifted children are also characterized by developmental asynchrony – a condition in which individual mental abilities develop unevenly. Thus, the same child may have an adult level of logical thinking or mathematical knowledge but be very immature emotionally, even compared to peers.

Authors of the Invenio system: Šárka Portešová (top), Michal Jabůrek (middle) and Ondřej Straka (bottom). Source: Invenio

OS: From this also follows why our educational system must pay systematic attention to gifted children. The matter has two levels: individual and societal. In the first place, of course, it is necessary to mention the educational needs from the point of view of gifted children themselves. As they have advanced thinking and usually also advanced knowledge, they may find much of the curriculum in particular school subjects uninteresting and unstimulating. Imagine a typical third- or fourth-grader being forced to relearn the first grade curriculum - recognizing individual letters, learning the seasons of the year, counting to twenty... The absurdity of such a situation is quite obvious, and it is equally obvious that the child would probably not enjoy such teaching very much, nor would it be very beneficial to him or her. Less apparent is the fact that children whose cognitive development is accelerated by, say, 2-3 years of age can go through a very similar experience if they receive standard instruction in their current grade without any adjustment or consideration of their giftedness. Yet, the solution may not always be to simply skip a grade, precisely because of the developmental asynchrony mentioned above. For example, a child might thrive academically in a higher grade but might also have great difficulty fitting in with new classmates. Fortunately, there are appropriate pedagogical approaches to take account of a child's giftedness in his or her current environment, such as curriculum enrichment, curriculum compacting, mentoring, and others. Such forms of education are not only beneficial for the gifted children themselves, who will usually be more motivated and happier at school, but are also beneficial on a second, societal level. Talents are the most valuable resource our society has, and any support given to their development can return many times in the future. However, to support these children, it is necessary to find them first, and this is probably the biggest obstacle to optimal care for the gifted in our country in the long term.

MJ: In Czechia, the system of pedagogical-psychological counselling centers is responsible for identifying gifted children and recommending adjustments to their education. However, these institutions also deal with several other problems (learning disabilities, behavioral disorders, emotional difficulties, and many others), which leads to long waiting times and the fact that when a potentially gifted child is diagnosed, there is often less time than would be optimal for the whole assessment. An even bigger problem is that only a certain group of parents – especially those who are motivated and those who have already noticed the manifestations of exceptional giftedness in their child – usually request an examination at the pedagogical-psychological counselling center. The second source of applications for examination at the counseling center are the nominations of pupils by the schools, or more precisely, teachers. However, as several studies have shown, pedagogical nominations are only partially reliable and depend heavily on the experience of the teacher (experience does not only refer to the mere length of teaching practice, but also whether or not the teacher has already met a gifted pupil during that time). Thus, a large number of gifted children are not examined at all in the PPCS, and their educational needs are not taken into account in school. This is also evidenced by statistics from the Czech School Inspectorate, according to which the number of „formally" diagnosed children is lower than theoretical assumptions by an order of magnitude. This situation has been going on for a long time and, unfortunately, does not seem to get any better. This was the main incentive for us to develop the Invenio diagnostic system.

What does the Invenio system look like and what may it be used for?

ŠP: Invenio is a screening diagnostic system that enables large-scale testing of specific cognitive abilities in children. The system uses the principle of game-based assessment, where individual tests are framed as computer games from the child's perspective to increase motivation and reduce potential test anxiety. At the same time, however, each of these games functions as a full-fledged psychological test in the background, with established basic psychometric parameters that are comparable in their values to those

of standard tests commonly used in individual psychological practice. The game tests are administered to children online, through a common web browser, typically in the computer lab of their school. The system, therefore requires no installation or complicated maintenance by the school.

MJ: Because of our academic background, we try hard to have the diagnostic games stand on firm theoretical footing. The content of the tests is therefore based on the so-called CHC theory of intelligence, which is the modern and probably most influential model of human cognitive abilities at present. The advantage is that several widely used psychological tests for individual diagnostics are also based on this theory, so if a child is tested by a psychologist and at the same time by one of the Invenio games, it is in principle possible to integrate information from both sources, allowing a deeper and more accurate understanding of the child's abilities. Abilities that can be measured by Invenio game tests include, for example, various types of logical thinking (inductive, deductive, quantitative), learning efficiency, spatial imagination, information processing speed or working memory. The Invenio system is primarily designed to find gifted pupils, but it can reliably measure individual abilities in the average and below average range, and for all children the system generates a report for parents after testing that includes the results and recommendations for the child's further development.

What are the main advantages of the Invenio system as compared to classic psychological tests? Does it also have some drawbacks?

OS: Traditional intelligence tests can be boring or stressful for many children. This is especially true of tests that can be administered in groups, and this problem is all the more serious the younger tested children are. For this reason, there are relatively few classic group-administered tests on the market suitable for the primary school children, and they are completely lacking for the youngest pupils. Invenio tests are designed to increase children's motivation and reduce potential test anxiety through game-based principles. It both makes the testing process more enjoyable for children, and it also leads to better quality of results, because if test-takers are, for instance, stressed, their scores are likely to be lower than

A screenshot of a game testing associative memory. Source: Invenio

their actual abilities. Owing to these benefits, it is possible to administer Invenio truly across the board, to all pupils in a classroom. The computerized form of administration has yet another advantage over pencil-and-paper tests: it allows recording and further analyses of data other than simple correctness/incorrectness of answers to individual items – for example time taken to solve individual items, indicators of different solving strategies, etc.

MJ: Currently, the main disadvantage of the Invenio system is, in our opinion, that it does not yet cover the entire school age period. Most of the tests are now designed and standardized only for primary school children, in some cases with little overlap into the lower grades of the secondary education (e.g. grade 6 or grades 6 and 7). We would certainly like to change this in the future. Another disadvantage lies in the screening and group-based fashion of testing itself, which can be negatively affected by, for instance, the classroom setting, distractions from classmates, and so on. At the same time, unlike individual assessment, it is not possible to observe each child during testing, so a valuable source of information is missing. Screening tests can therefore never completely replace individual assessment, but to our mind the two methods can complement each other very well.

You thus represent one of the handful of innovations in the area of applied social research, which – as a matter of fact – is focused on society as a whole. Why is, according to your opinion, this kind of applied results in social sciences so rare? What needs to be changed?

ŠP: Yes, we strive to ensure that our outputs have a real impact on society and are meaningfully applicable in practice. There are several reasons why there are relatively few social science innovations of this kind. There is often a lack of sufficient support for applied research in this area – unlike engineering or science, where applications are more obvious and easier to fund. Another factor is the complexity of translating social science knowledge into practice: the results are often complex, requiring long-term testing and implementation in specific social contexts.

Furthermore, during the several years of development of our diagnostic system, we have repeatedly encountered the fact that university funding still primarily values basic research outputs, especially publications. Applied research, while it may have direct and significant economic and societal benefits, is not adequately recognized by this system. Therefore, I reckon that the research funding and evaluation system should be changed to reflect the real impact of applied projects. This would not only encourage innovation, but would also bring long-term benefits to the society as a whole.

Do you remember the beginning of the development? What did your first game look like?

OS: In our first game we used the principle of balancing the scales, described by Jean Piaget and known in developmental psychology for several decades. We have transferred the task, which may seem a bit tedious in its original form, to an underwater environment and incorporated it into a story in which a child has to help a biology professor named Triton to protect marine animals. The child is tasked with arranging groups of fish and other sea creatures so that they are equally strong and share fairly the food provided. We used this game to give a tryout to the demands of overall game development, which similarly manifested themselves in all further gamified tests. The principle of the test problems must first be piloted in an „off-line“ form with real children; if we find that they do not understand it, or that it is not very attractive to them, it must be modified or changed completely. At the same time, we have verified how important the work of programmers is, as well as that of graphic designer – for example, the current

graphic representation of the game was only achieved on the third attempt. We also set up procedures for standardizing and conducting psychometric analyses on the Triton game. All of this required a huge amount of work, but it paid off; the game has been in live use for over 5 years and is still in high demand.

How is the system employed as of now?

MJ: We currently offer the system exclusively to schools through the so-called Shopping Center of Masaryk University. When a school expresses interest in using Invenio, we arrange the composition of the games and the grades involved, and then provide the school with all the necessary information and illustrative instructions in the form of simple videos. Included in the materials pack is a template letter that the school can customize and send out to parents. In the letter, parents will find information about testing, the benefits of getting involved and a link to register for Invenio. On the registration page they enter basic information about themselves, their child and provide consent for testing and the storage of personal data. As you can see, it´s all done electronically, so the school is not burdened with the hassle of collecting paper consents. We then fix a testing date with the school, send them a document with a list of registered pupils, a link to access the games and a picture code for pupils in the class to log in. A member of the staff will then seat the pupils at their computers or tablets, help them log in if necessary, and that´s pretty much it. The children hear all the instructions in their headphones and play the game independently. After the testing, the system will automatically generate the reports for parents with the results of their child's testing, which is accessible through a profile they created during the registration. We will also produce a report for the school within a few days.

As to paying for testing, there are several ways. Some schools use project money, grants from foundations supporting education, others try to arrange with the region or municipal administration to provide large-scale testing involving more schools. Leaving the payment to the parents is also an option. In this case, however, only those who pay for the testing are tested. But this again runs the risk that only pupils with motivated parents will be involved and that the potential of pupils whose parents are not interested in testing will be overlooked. Therefore, if at all possible, we recommend seeking project funding.

What happens when the testing gets finished? What kind of outputs the system provides and who can further work with them?

OS: On creating the testing model, we have been very much concerned with the issue of providing information and of data protection. There are two principles here that unfortunately go against each other. On the one hand, it is desirable for a school to get as much information as possible about its students and to be able to use it for further pedagogical work with them. On the other hand, data on intellectual abilities are quite delicate. For example, it is understandable that parents may be concerned about providing results to the school if the child's results are average or below average. For this reason, the system is set up so that only parents have primary access to the reports generated by the system. At the same time, however, parents give their consent before the actual testing that, if the child comes out as gifted, this information will be passed automatically to the school. This gives the school the opportunity to start working systematically with identified gifted students shortly after testing and to provide them with an individualized educational approach that reflects their needs. The school will not automatically know about the results of other children unless their parents themselves voluntarily provide the school with the test report. At the same time, in addition to the information on giftedness, the school receives a global report summarizing the results for the class as a whole (without indicating results that could be linked to specific students).

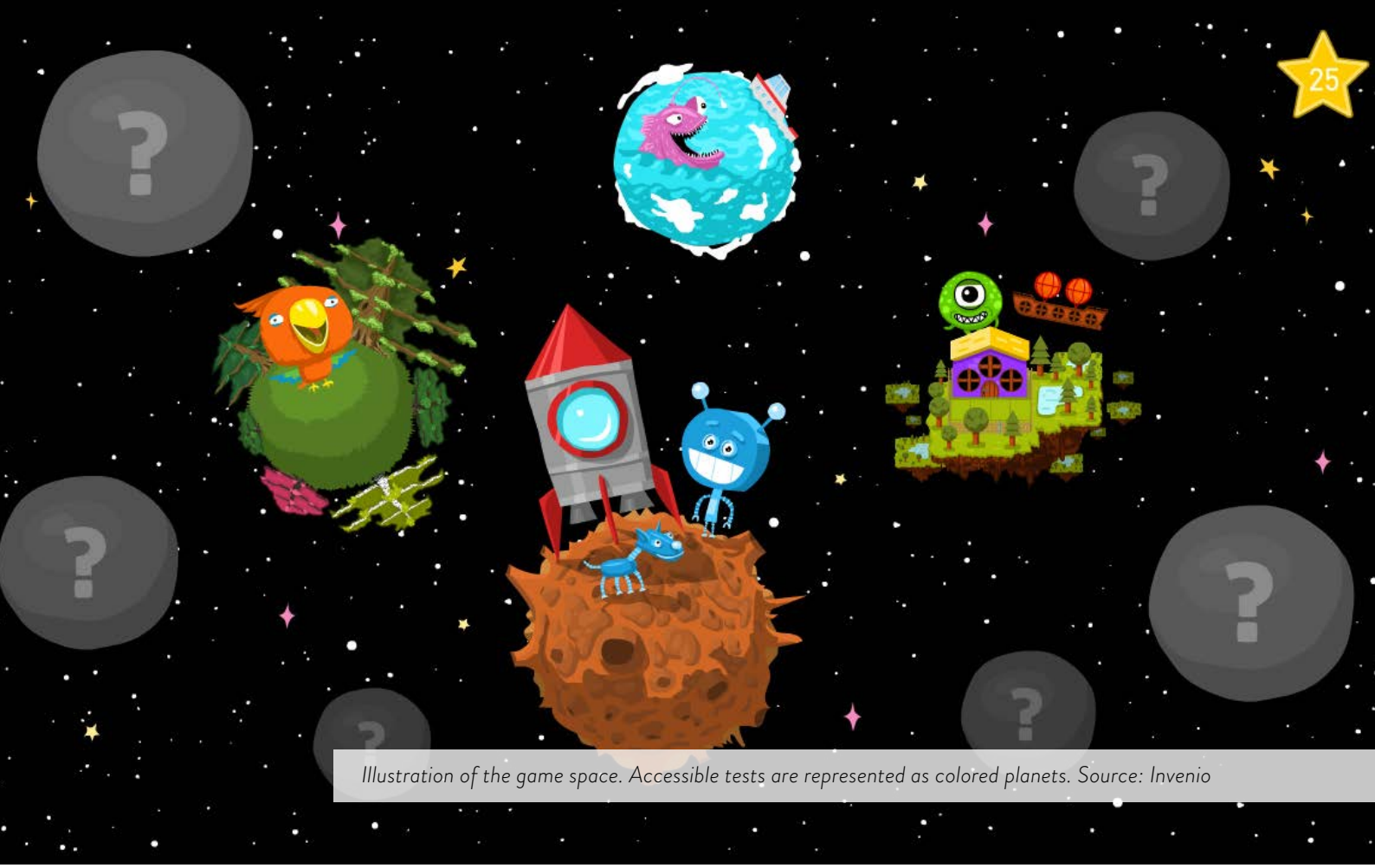
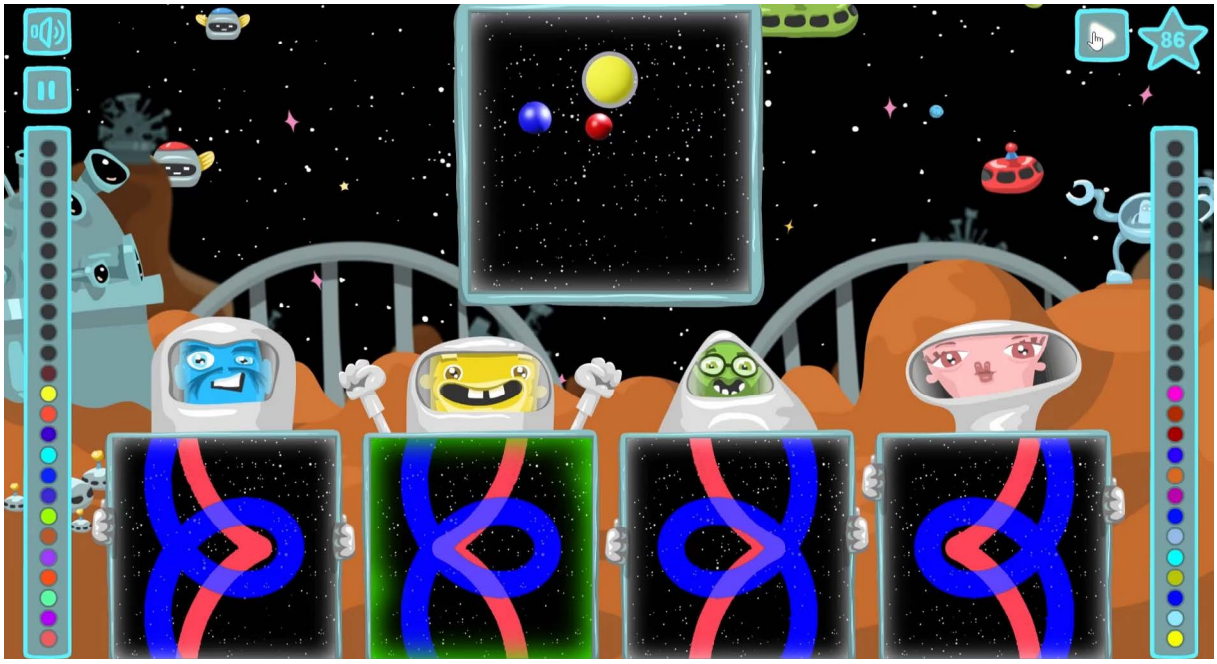


Illustration of the game space. Accessible tests are represented as colored planets. Source: Invenio

Regarding the outputs that are provided to parents, the system generates two types of reports simultaneously. The so-called Report for Parents is written in a more understandable, lay language, and its purpose is to describe in an accessible way which skills were measured during the testing, what results the child has achieved and what recommendations are made for his/her further development. A so-called Expert Report is also generated for parents. This is primarily intended for situations where the parent will seek further professional help for the child, i.e., visit a psychologist, educational specialist, or other professional, whether on account of giftedness or for other reasons. The expert report describes the basic psychometric parameters of the tests used and the child's results in the form of weighted scores, including appropriate confidence intervals. It, therefore, enables professionals to consider the results of Invenio testing in their own diagnostic and counselling work.

Is the Invenio system known to a broader public? Do you receive some feedback?

OS: In 2020, when we completed the test kit, which could be deployed in live operation, we had the opportunity to offer it to all fourth and fifth graders in South Moravia as part of a project funded by the South Moravian Region. In this first phase, many schools did not know what to expect from the testing. Although the testing was free for schools, thanks to the regional funding, it was necessary to approach them actively, explain the benefits of testing, and sometimes almost persuade them to participate. It is gratifying that the feedback from schools was overwhelmingly positive, and after the project had ended, many schools began to actively seek ways to continue testing in the future years, often with parental involvement. As awareness of the Invenio system has gradually spread, more and more individual schools, as well as representatives of local administrations such as municipalities, regional institutions, and local action groups, have approached us with an interest in testing. The Invenio system and the topic of gifted children in general are also becoming attractive to the media, and consequently, in the last two years, individual members of our team gave numerous interviews to the press, as well as to radio and television.



Picture showing a game designed to test spatial abilities. Source: Invenio

ŠP: Positive feedback from the professional community also helps to raise awareness. Recently, our team has received several awards for the Invenio system, which we greatly appreciate. In 2023, a project in which 4 tests of the Invenio system were developed won the TAČR award for the best project in the Society category and was also the overall winner of the year's „Czech Idea" award. In 2024, the Invenio team took 3rd place in the competition organized on the occasion of Transfera Technology Day, focused on projects implementing technology transfer. We are also very pleased with the interest and appreciation from our parent university, which was expressed in the form of the MUNI Innovation Award, bestowed in 2023.

Could you describe in more detail the process of technology transfer – how it is/was carried out in the case of your assessment system?

ŠP: Most of the tests that are part of the Invenio system were developed through the projects supported by the Technology Agency of the Czech Republic (TAČR). This is important from the point of view of technology transfer, because this provider does not put any obstacles to commercializing the outputs of projects funded by it; on the contrary, it supports and appreciates it. From the creation of the first tests to the present day, their distribution has been carried out through Masaryk University, or more specifically, the Faculty of Social Studies, where we work and where the development of the tests was realized. Although this method of distribution is possible, over time, we started to encounter more and more problems, usually of an organizational or bureaucratic nature. The fact that the faculty is not primarily dedicated to business, nor does it have much experience in this field, makes some processes unnecessarily complicated and, consequently, costly. As one example for all, we can mention the necessity to interrupt the distribution of tests always at the beginning of December due to the closing of the accounts for the year. This is a time when schools, as our potential customers, often need to spend surplus money in the budget and we lose these contracts unnecessarily. It is also very problematic to use current profits from testing for longer-term investment in the system development. For these reasons,

we recently decided to create a spin-off and to carry out part of the operation and further development of the system there.

Did you come across any peculiarities resulting from the fact that this transfer of technology took place in the context of social sciences?

MJ: There are, of course, some specifics. One thing we have already mentioned is that because there are so few applied social science outputs, no one has much experience in using them. We have therefore often had to be the first to ‚blaze the trail'. Another specificity is tension between commercial potential and social responsibility. From a purely business point of view, it might be an effective strategy to set testing prices several times higher than they are now and to target only a rather narrow segment of parents for whom such a price would be acceptable. But that would go completely against the point of the large-scale talent searches for which we developed the system. It is a great matter of concern to us that children from, for instance, socially disadvantaged backgrounds should not be excluded from gifted support, as would inevitably happen if testing was on a purely commercial basis. We try to address this discrepancy in various ways - e.g. sponsorship, seeking support from local authorities, etc.

OS: However, we have one advantage over many science and technology applications in that we are not too constrained by the physical distribution of the product, and most importantly, we do not have to deal with patent protection. The fact that the Invenio system is primarily a software tool makes the protection provided by copyright law sufficient.

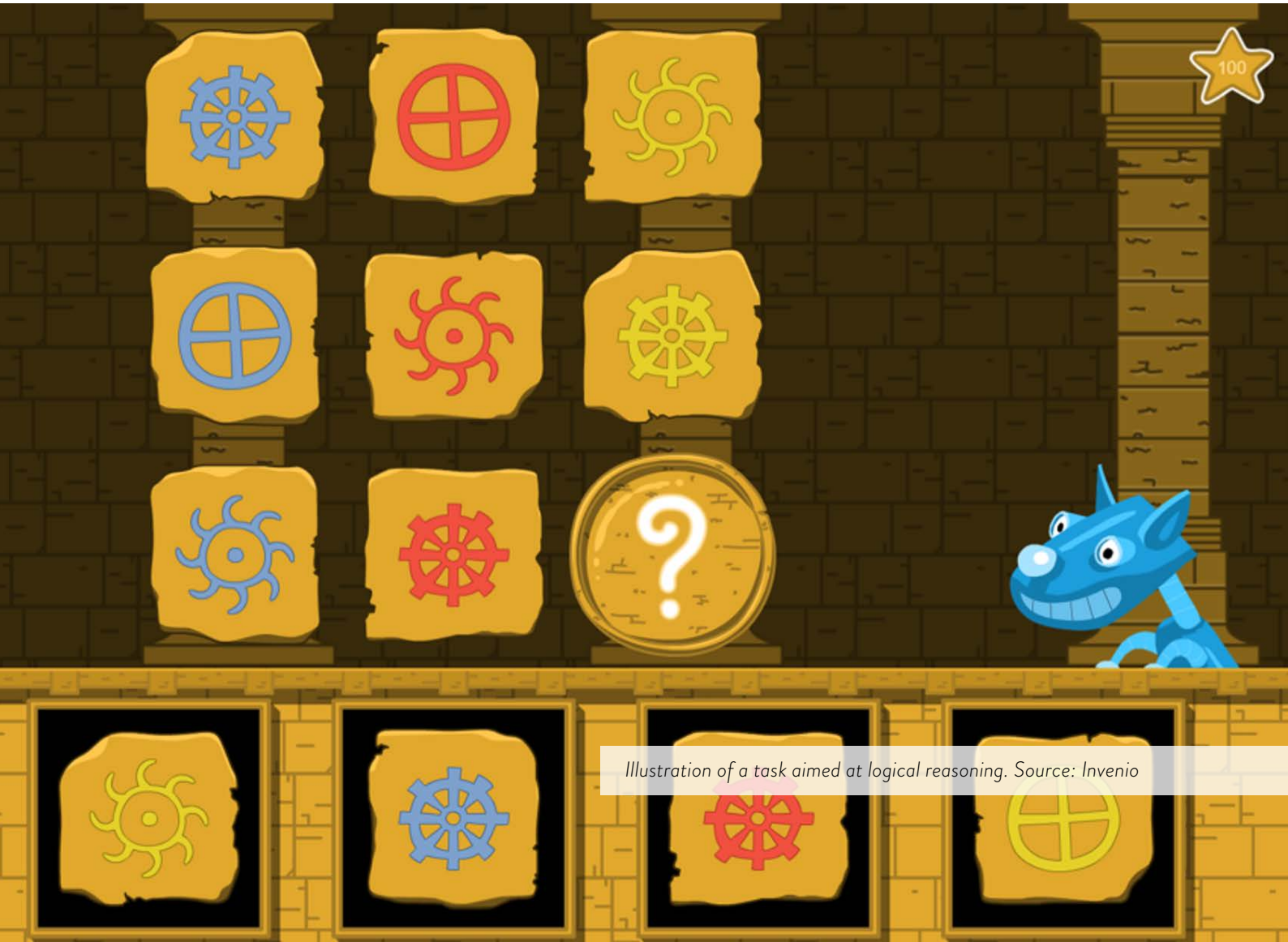


Illustration of a task aimed at logical reasoning. Source: Invenio

What are your next visions towards commercialization? What are your plans for the future?

MJ: As it has already been mentioned, we are currently setting up a spin-off that should partially take over the distribution of tests and further development of the system. For the next 1-2 years, we are planning some major changes. First, we want to expand the distribution models. In addition to the current method where group testing is requested by individual schools, we plan to create a module for home testing. Parents will be able to order a set of tests for their child directly, and the child will then complete the set of games (tests) at home. We are also planning a package of tests, designed primarily for school and counseling psychologists, which will be suitable for individual or small-group administration in addition to standard group testing. Second, we want to expand the age range for which we can offer testing. This will require the adaptation or development of tests designed for children in lower secondary education and possibly also for high school students. Third, we plan to translate some tests and adapt them for foreign countries – we are considering Slovakia as a first step, but we would like to expand to other countries after that.

Do you envision your future also in collaboration with the private sector?

ŠP: By setting up a spin-off company, we will enter the private sector a little bit ourselves... As far as the users of the Invenio system are concerned, the main part of our activities in the future will continue to be in cooperation with schools or their founders, i.e., with public entities in general. At the same time, we believe that our know-how in the field of computer-based cognitive testing is potentially useful for the development of applications intended, for instance, for the recruitment of appropriate employees, for personnel consultancy, and similar purposes. This kind of application would probably be of interest mainly for private companies. In the near term, however, we will not have the space to create this type of application; it is rather an open possibility that may be realized sometime in the future. In any case, such an activity would only be complementary to our main mission, which is to contribute to the development of gifted children.

Authors:
Šárka Portešová, Michal Jabůrek, Ondřej Straka

LOTUS FOIL AKO ÚSPEŠNÉ SPOJENIE VEDY A PRAXE

Odborné znalosti a technologické zázemie, ktoré spoločnosti FORTES interactive, s.r.o. poskytli partneri z akademickej aj súkromnej sféry, zohrali kľúčovú úlohu pri premene pôvodného konceptu na konkrétnu inováciu - ochrannú antimikrobiálnu fóliu pre dotykové obrazovky, ktorá dnes predstavuje účinné riešenie pre bezpečnejšiu interakciu s digitálnymi rozhraniami. O tom, ako prebiehal transfer technológií a o ceste vedúcej od výskumu až ku komercializácii finálnemu produktu, sme sa porozprávali s produktovou manažérkou LOTUS Foil, Ing. Michaelou Fanglovou.

Ste súčasťou tímu, ktorý pracuje na technológii s názvom LOTUS Foil v podstate od jej vzniku. Priblížili by ste nám začiatky jej vývoja?

Myšlenka ochrany dotykových displejů se zrodila v hlavě ředitele společnosti FORTES interactive, s.r.o., Libora Vošického, v době pandemie COVID-19. Tehdy si všiml rostoucích obav zákazníků z kontaktu s veřejnými displeji, což vedlo k hledání inovativního řešení, které by nejen zajistilo jejich ochranu, ale také jim poskytlo větší pocit bezpečí při používání těchto technologií.

Na jej vývoji sa okrem FORTES interactive, s.r.o. podieľali aj ďalšie subjekty. Ako došlo k tejto spolupráci?

Aby pan Vošický svoji vizi přetavil ve skutečnost, obrátil se na pana profesora Michala Veselého z Fakulty chemické VUT v Brně a jeho výzkumný tým. Společně poté oslovili další odborné partnery, kteří disponovali potřebným know-how a technologickým zázemím pro realizaci projektu. Mezi nejvýznamnější patří pardubický výrobní podnik SYNPO a Univerzita Tomáše Bati ve Zlíně, kteří byli zapojeni již v počáteční fázi projektu a Centrum organické chemie z Rybitví, které působilo jako subdodavatel aktivních látek.

Každá z těchto institucí sehrála klíčovou roli ve specifických oblastech výzkumu a vývoje výsledného produktu LOTUS Foil. Společnost SYNPO se zaměřila na výzkum a výrobu vysoce účinného fotoaktivního laku. Odborníci z laboratoře fotochemie na Fakultě chemické VUT přispěli svými znalostmi v oblasti tenkých vrstev, fotochemie a materiálového tisku. Testování antimikrobiálních vlastností fólií probíhalo na

FORTES INTERACTIVE, S.R.O. je európska spoločnosťso sídlom v Brne, ktorá sa špecializuje na výrobu kapacitných dotykových obrazoviek PCAP na mieru s optimalizovaným firmvérom pre jednoduchú integráciu a výnimočný dotykový zážitok. Spoločnosťbola založená v roku 2013 s vášňou pre interaktívne, dotykové a projekčné technológie a od začiatku sa zameriava na vývoj riešení na mieru. V reakcii na pandémiu COVID-19 spoločnosť vyvinula fóliu LOTUS, samočistiacu fóliu pre dotykové obrazovky, ktorá poskytuje nepretržitú ochranu pred vírusmi a baktériami. Táto inovácia sa aktivuje svetlom a je pre používateľov neškodná. | *www.lotusfoil.com*

Výskumný tím FCH VUT a FORTES interactive. Zdroj: Archív FORTES interactive, s.r.o.

Univerzitě Tomáše Bati ve Zlíně. Finální verze fólií následně podstoupily důkladné testy chemické a mechanické odolnosti ve společnosti FORTES interactive, s.r.o., která nyní zajišťuje i jejich komercializaci a uvedení na trh.

Čím je LOTUS Foil špecifický, aké sú jeho vlastnosti? V akých oblastiach predpokladáte jeho aplikáciu a komerčné využitie?

LOTUS Foil je samočisticí antimikrobiální fólie, která ničí více než 99 % virů a více než 99,9 % bakterií na svém povrchu. Antimikrobiální a samočisticí vlastnosti fólie jsou aktivovány světlem, ať už přirozeným tak i umělým, LOTUS tedy účinkuje nepřetržitě. Produkt neobsahuje žádné těžké kovy, nemá negativní vliv na styk s lidskou pokožkou a je plně recyklovatelný. Při jeho použití tedy vidíme velký potenciál. Může být aplikovaný na různé dotykové displeje od samoobslužných kiosků, přes automaty ale například i vyvolávací systémy nebo displeje tiskáren. Naším cílem je umožnit využití fólie na široké spektrum povrchů a materiálů, nejen na fólie, ale i přímo na povrchy konkrétních předmětů, jako jsou madla, kliky nebo nákupní vozíky.

V akej fáze vývoja sa v súčasnosti nachádzate?

Nejvýznamnějším úspěchem projektu je, že neskončil pouze jako teoretická technologie nebo laboratorní vzorek. Výsledná ochranná fólie se dostala do komerční výroby a již dostupná na trhu. Na konci roku 2024 skončil projekt Technologické agentury ČR s názvem Trvalá ochrana dotykových obrazovek pro zamezení ukládání organických polutantů na jejich povrchu, ze kterého vzešel produkt LOTUS Foil. Momentálně máme tedy hotový finální produkt, se kterým jsme počátkem ledna vstoupili na trh a začali ho komercionalizovat a nabízet zákazníkům. Současně však vyvíjíme i další verze LOTUS Foil, které budou mít uplatnění i v jiných oblastech a nebudou určeny jen pro dotykové obrazovky.

Narazili ste na nejaké problémy? Či už počas vývoja alebo procesu transferu technológií?

Během realizace projektu jsme narazili na několik úskalí, která bylo nutné překonat. Jedním z klíčových problémů bylo zajištění dostatečné odolnosti vrstev, což vyžadovalo pečlivou optimalizaci složení a procesu jejich nanášení. Další výzvou byl výběr vhodného podkladního substrátu, který by splňoval jak mechanické, tak chemické požadavky nezbytné pro dosažení požadovaných vlastností finálního produktu. Komplikace nastaly také při aplikaci laku na substrát, zejména při přechodu z laboratorního měřítka do poloprovozního provozu. Tento krok přinesl nové faktory ovlivňující kvalitu a homogenitu nanesené vrstvy, což si vyžádalo úpravy aplikačních parametrů a testování různých metod nanášení.

I přes tato úskalí jsme se dokázali přenést a každá překážka nám přinesla cenné výzkumné poznatky, které významně přispěly k dalšímu rozvoji projektu. Postupem let jsme díky systematickému přístupu, důkladnému testování a optimalizaci technologických procesů dospěli až k finálnímu produktu, který splňuje veškeré požadované parametry a potvrzuje úspěšnost naší práce.

Aké sú vaše vízie do budúcna, najmä v súvislosti s prípadnou spoluprácu so zahraničím?

Jak jsem již dříve zmiňovala, v současné době intenzivně pracujeme i na dalších variantách našeho produktu LOTUS Foil. Přestože se může na první pohled zdát téměř bezchybný, i on má své drobné nedostatky, které se snažíme neustále eliminovat a posouvat tak jeho kvalitu na ještě vyšší úroveň. Paralelně jsme také aktivně zapojeni do projektu Surfprotect, jehož cílem je aplikace inovativních antimikrobiálních vrstev na

Fólia na displeji kávomatu. Zdroj: Archív FORTES interactive, s.r.o.

širokou škálu materiálů – od skla a nerezové oceli až po textilie. Tímto způsobem usilujeme o zlepšení ochrany různých povrchů a rozšíření možností využití našich technologií. Naší dlouhodobou vizí je samozřejmě také rozšíření působnosti za hranice České republiky a navázání spolupráce se zahraničními partnery. V této souvislosti jsme již podnikli významný krok – podali jsme patentovou přihlášku ve Spojených státech amerických, což nám otevírá dveře k expanzi na mezinárodní trhy. Právě zahraniční trh vnímáme jako obrovskou příležitost, na kterou bychom se v budoucnu rádi intenzivně zaměřili a přinesli naše inovativní technologie i zákazníkům po celém světě.

V súčasnosti pôsobíte vo FORTES interactive, s.r.o., ale boli ste aj v pozícii vedeckého pracovníka, čiže máte náhľad do takpovediac vedeckého aj firemného sveta. Vnímate nejaké rozdiely medzi týmito prostrediami?

Přechod z akademického do firemního prostředí znamená změnu v myšlení – z dlouhodobého objevování a výzkumu k orientaci na konkrétní výstupy a ziskovost ku prospěchu firmy. Ve vědecké / akademické sféře je dle mě z pozice bývalé doktorandky hlavním cílem objevovat nové poznatky, publikovat články a přispívat s nadsázkou řečeno k vědeckým objevům. Firemní výzkum je zaměřen na konkrétní výstupy, které musí přinášet firmě určitou hodnotu a vést ke zkvalitňování procesů a inovacím, důležitým faktorem je zde komerční využitelnost a návratnost investic. Z pohledu jakési hierarchie a týmovosti je v akademické sféře práce často samostatná nebo v malých týmech, kdy každý řeší nějakou část problému. Zatímco ve firemní sféře je hodně kladen důraz na týmovou spolupráci, efektivní komunikaci s kolegy z různých jiných než "výzkumných" prostředí a člověk tak získá náhledy do různých odvětví, se kterými se na akademické

sféře nesetkal. Jako poslední bych zmínila kariérní posuny, kdy v akademické sféře je cesta dlouhá a často nejistá, akademici musí publikovat a získávat granty a to může často ovlivnit dostupnost vybavení či materiálů. Ve firemním prostředí má člověk stabilnější postavení a dle mého i lepší finanční ohodnocení a různé pracovní benefity.

Čo by bolo treba podľa Vás zmeniť alebo vylepšiť, aby spolupráce medzi univerzitami a firmami, resp. súkromnou sférou, fungovali lepšie? Či už z pohľadu jednej alebo druhej strany.

Z mého pohledu je současná spolupráce nastavena velmi dobře. Fakulta chemická VUT pravidelně pořádá dny setkávání studentů s firmami, což je, dle mého názoru, studenty velmi oceňováno. Během těchto akcí mají příležitost osobně hovořit se zástupci různých společností, navazovat cenné kontakty a domlouvat vědecké stáže, které se mohou stát odrazovým můstkem pro dlouhodobější spolupráci.

Další klíčovou formou propojení akademického a průmyslového sektoru jsou společné projekty. Školitelé mohou studenty aktivně zapojit do výzkumných či aplikačních projektů, na nichž participují i soukromé firmy. Tímto způsobem dochází k efektivnímu propojování obou světů – akademického a komerčního. Výsledná spolupráce pak závisí nejen na ochotě firem investovat do mladých talentů, ale také na samotných studentech, jejich iniciativě, proaktivitě a chuti se do věci skutečně ponořit.

Co by mohlo dále přispět ke zlepšení komunikace mezi univerzitami a firmami, je vytvoření platformy pro sdílení výzkumných výsledků, nabídky spolupráce či konkrétní poptávky po odbornících. Taková iniciativa by mohla usnadnit vzájemnou interakci a přispět k efektivnějšímu navazování spoluprací. Pokud již něco podobného existuje, bohužel jsem o tom zatím neslyšela, a tak se omlouvám za případnou neznalost.

Autor: **Barbara Tóthová**

ING. MICHAELA FANGLOVÁ

Michaela v súčasnosti pracuje v spoločnosti FORTES interactive, s.r.o. ako produktový manažér inovatívneho produktu LOTUS Foil. Jej profesionálna cesta sa však začala na Chemickej fakulte Vysokého učení technického v Brne, kde po strednej škole začala študovať a následne po získaní potrebných skúseností začala pracovať ako vedecký pracovník. Počas svojej akademickej kariéry sa špecializovala na výskum a vývoj v oblastiach úzko súvisiacich s technológiou, na základe ktorej vznikol LOTUS Foil. Tento výrobok je výsledkom projektu *Trvalá ochrana dotykových obrazovek pro zamezení ukládání organických polutantů na jejich povrchu*, ktorý sa realizoval v spolupráci so spoločnosťou FORTES interactive, s.r.o. a ďalšími partnermi. Práve vďaka tejto spolupráci dostala príležitosť stať sa súčasťou tímu FORTES interactive, s.r.o. a pracovať na ďalšom vývoji tejto jedinečnej technológie. V súčasnosti Michaela zastrešuje väčšinu aspektov súvisiacich s fóliou LOTUS - od výroby, organizácie a koordinácie testovania až po komunikáciu s partnermi a zákazníkmi. Jej práca spája vedecký prístup s praktickým využitím technológie, vďaka čomu môže neustále posúvať hranice jej využitia.

OD ŠTÚDIA PO PRAX. TRANSFER TECHNOLÓGIÍ V INOVATÍVNOM PRIEMYSLE

Fakulta manažmentu, ekonomiky a obchodu (FMEO) Prešovskej univerzity v Prešove je už niekoľko rokov kvalitným a oceňovaným vedeckým pracoviskom, ktoré sa priamo podieľa na zlepšení spolupráce vedy a praxe na Slovensku, a to aj v súvislosti s rozvojom univerzitného transferu technológií. Docent Martin Rovňák, prodekan pre prax, kvalitu, rozvoj a uplatnenie absolventov Fakulty manažmentu, ekonomiky a obchodu PU v Prešove, v rozhovore podrobne opísal tieto aktivity aj oblasti vzdelávania a spolupráce s Národným centrom transferu technológií SR (NCTT SR) i Centrom pre komercializáciu výstupov výskumu a manažment duševného vlastníctva (CKVV) Prešovskej univerzity (PU) v Prešove.

Aké sú aktuálne formy, resp. spôsoby spolupráce fakulty s praxou?

Fakulta manažmentu, ekonomiky a obchodu PU v Prešove sa od svojho založenia snaží o čo najužšie prepojenie s potrebami praxe. Kompetencie v riadení vlastnej kariéry svojich študentov vnímame ako dôležitý aspekt pre ich uplatniteľnosť na trhu práce.

Fakulta má vybudovanú sieť Stredísk študentskej praxe, praktickej prípravy a transferu výskumu, ktorú v súčasnosti tvorí 84 zmluvných firiem, podnikov či organizácií. Aj vďaka týmto zmluvným strediskám fakulta ponúka a umožňuje svojim študentom nielen intenzívny kontakt s podnikmi, ale predovšetkým overenie využitia ich vedomostí v praxi, konfrontovanie získaných vedomostí počas štúdia s praxou. Zástupcovia uvedených stredísk každoročne ponúkajú našim študentom množstvo tém záverečných i diplomových prác. Práve pri ich riešení dochádza k transferu výsledkov výskumu do podnikovej praxe. Neustále zvyšujúci sa záujem podnikov o participáciu študentov fakulty na riešení podnikových problémov a úloh potvrdzuje dobrú pripravenosť a vedomostný potenciál, ktorý fakulta úrovňou výučby dáva svojim študentov.

Všetci študenti fakulty prvého a druhého stupňa dennej i externej formy majú povinnosť v ostatnom semestri štúdia absolvovať odbornú prax na Slovensku alebo v zahraničí v minimálnom rozsahu 240 hodín. Realizujú pritom činnosti a aktivity, ktoré súvisia s profilom absolventa a opisom príslušného študijného programu. Zároveň získavajú pracovné návyky už počas štúdia.

Pri Fakulte manažmentu, ekonomiky a obchodu PU v Prešove pôsobí už od roku 2005 Expertná a podnikateľská rada Fakulty manažmentu, ekonomiky a obchodu (EPR FMEO) PU v Prešove. Jej poradný orgán tvorí 47 úspešných podnikateľov, manažérov a ďalších významných osobností z praxe. Uvedená rada svojimi aktivitami pomáha fakulte a najmä jej študentom pokryť viaceré sféry spolupráce, výskumu a odbornej praxe v oblastiach, ako sú napríklad obchod a marketing, informačné technológie, turizmus,

doc. Ing. Martin Rovňák, PhD. Zdroj: Archív M.R.

hotelierstvo, kúpeľníctvo, environmentálny manažment, stavebníctvo, strojárstvo, automobilový priemysel, služby, ale aj oblasti regionálneho rozvoja, samosprávy a pod. Rada sa významne podieľa na pravidelnom hodnotení realizovaných študijných programov fakulty, ako aj na príprave nových.

Aj vďaka zástupcom EPR FMEO sa ponuka štúdia na fakulte aktuálne rozšírila o dva nové inovatívne študijné programy, ktoré reagujú na súčasné globálne zmeny a výzvy, ako aj na rastúci dopyt po odborníkoch z oblasti udržateľnosti a ekoinovácií.

O ktoré študijné programy konkrétne ide?

Ide o bakalársky študijný program ***Zelená ekonomika a podnikanie***, ktorý pripraví študentov na zodpovedné podnikanie, tvorbu udržateľných obchodných modelov a rozvoj zelených inovácií. Študenti sa môžu užšie špecializovať na oblasť zeleného podnikania alebo na manažment environmentálnych rizík a politík. Ďalší je inžiniersky študijný program ***Ekonomika a manažment v udržateľnom inovatívnom priemysle***, ktorý je zacielený na rozvoj vedomostí v oblasti strategického riadenia udržateľnosti v priemyselných procesoch, implementácie environmentálnych riešení v podnikoch a v oblasti tvorby cirkulárnych produkčných modelov. Študenti si môžu zvoliť trajektóriu vzdelávania so zameraním na inovačný manažment a podnikanie alebo digitálnu transformáciu v priemysle.

Prostredníctvom moderného interdisciplinárneho vzdelania úzko prepojeného s praxou je cieľom nových študijných programov pripravenosť absolventa prinášať dlhodobé riešenia podporujúce udržateľný rast podnikov aj celých odvetví, čím sa zároveň otvárajú široké kariérne príležitosti v národnom i medzinárodnom prostredí. Uvedené študijné programy budú už od akademického roka 2025/2026 ponúkané v dennej aj externej forme, pričom pre zahraničných študentov budú dostupné i v anglickom jazyku.

Stretnutie so zástupcami Expertnej a podnikateľskej rady FMEO PU v Prešove. Zdroj: Archív M.R.

Snaží sa FMEO využiť úzke prepojenie s praxou aj v oblasti vedeckovýskumnej spolupráce?

Áno. Jedným z ostatných výsledkov takejto spolupráce je implementácia zahraničného projektu aplikovaného výskumu v rámci programu Rozvoj obchodu, inovácií a MSP, ktorý fakulta realizovala v spolupráci so súkromným sektorom (firmou BAMIDA, s. r. o.). Projekt s názvom Aplikovaný výskum pre zlepšenie akustických vlastností mobilných protihlukových bariér a ekologické využitie odpadu vzniknutého pri ich výrobe získal grant v sume 1 197 226 eur prostredníctvom Grantov EHP a rozpočtu Slovenskej republiky. Implementácia projektu sa začala v auguste 2022. Projekt bol zameraný na aplikovaný výskum akustických vlastností mobilných protihlukových bariér a následné ekologické využitie odpadov vznikajúcich pri výrobe. Cieľom bolo zlepšiť prevenciu šírenia hluku a prašných emisií do životného prostredia najmä v mestskom prostredí, resp. všade tam, kde je potrebné znižovať vplyv emisií hluku na životné prostredie. Ďalším cieľom bola upcyklácia odpadu, ktorý vznikol pri výrobe akustických bariér, a jeho opätovné využitie v obehovom hospodárstve. Zo vzniknutého odpadu boli vyrobené plávajúce bariéry (tzv. norné steny), ktoré zachytia odpad a zabránia jeho šíreniu vo vodných tokoch a na vodných plochách. Zo strednodobého a z dlhodobého hľadiska bolo snahou projektového tímu priniesť na trh inovatívny produkt, ktorý dokáže zlepšiť stav životného prostredia a zároveň minimalizuje negatívne dosahy na životné prostredie pri jeho výrobe. Z tohto dôvodu je vyrobený zo vzniknutého odpadu.

Kde sa realizovali výskumné, výrobné i testovacie činnosti?

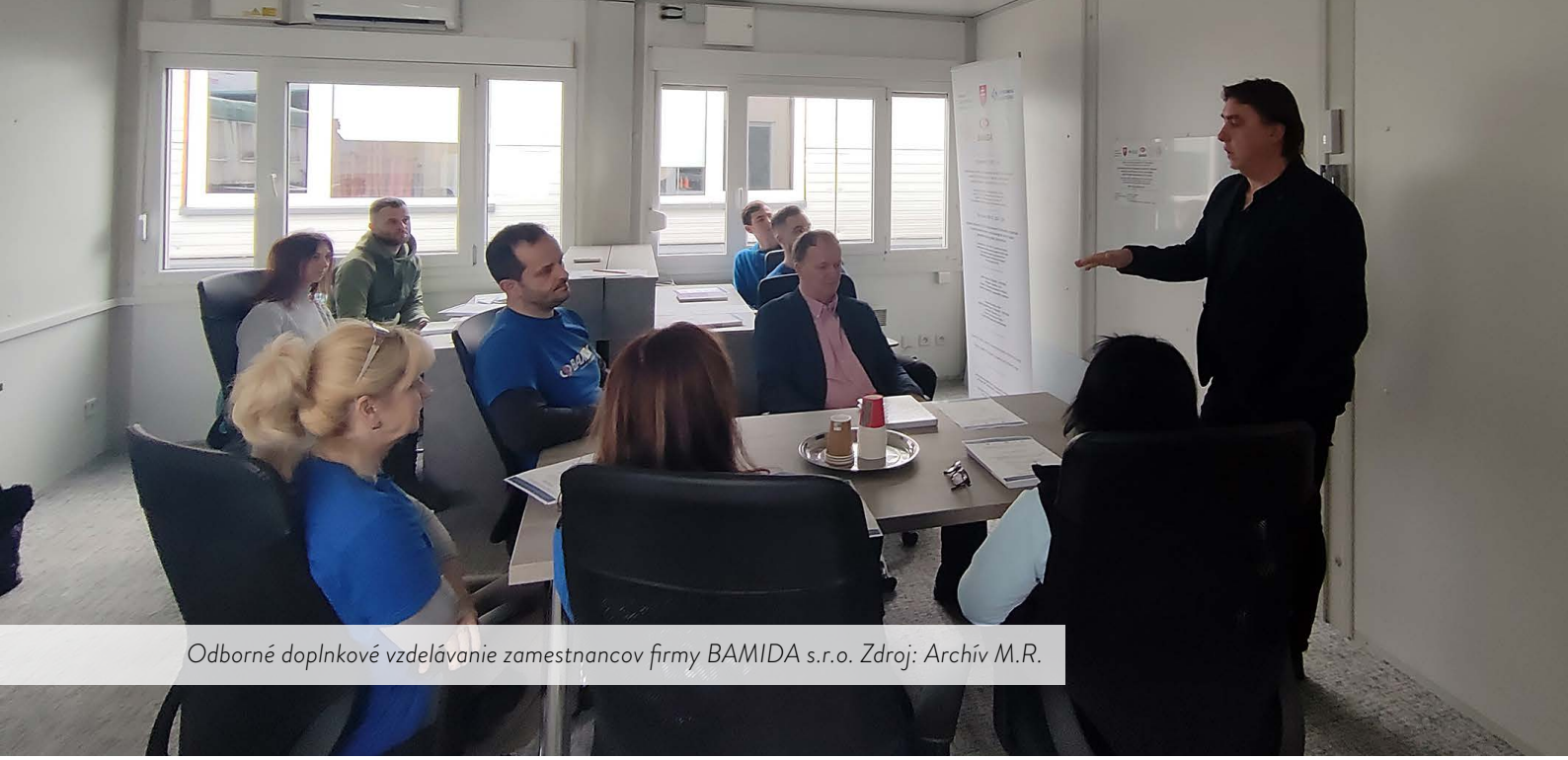
Áno, konkrétne v priestoroch žiadateľa, t. j. firmy BAMIDA, s. r. o., v Prešove. Výskum vrátane laboratórnych meraní a ich vyhodnotení prebiehal v Laboratóriu hodnotenia faktorov prostredia Fakulty manažmentu, ekonomiky a obchodu Prešovskej univerzity v Prešove, čiže partnera projektu. V rámci dosiahnutých výsledkov implementovaného projektu boli na Úrad priemyselného vlastníctva SR podané dve žiadosti o priemyselné vlastníctvo.

Okrem snahy členov projektového tímu žiadateľa i partnera projektu o časové aj obsahové naplnenie stanovených cieľov a míľnikov uvediem, že zástupcovia fakulty realizovali odborné vzdelávanie zamestnancov žiadateľa, ktorým bola firma BAMIDA, s. r. o. Vzdelávanie bolo zamerané na oblasti: ekopodnikanie a ekoinovácie; odpadové hospodárstvo, obehová ekonomika a udržateľný rozvoj; spoločenská zodpovednosť podnikov; systémy environmentálneho manažérstva; posudzovanie vplyvov na životné prostredie; hluková záťaž vo výrobnom procese a jej vplyvy na zdravie; využitie obnoviteľných zdrojov energie v malých a stredných podnikoch.

Po úspešnom ukončení projektu, ktorého výsledky vzbudili záujem akademického i hospodárskeho prostredia doma i v zahraničí, sme dostali hneď niekoľko ponúk na praktickú spoluprácu v oblasti aplikovaného, priemyselného či strategického výskumu, čo nás veľmi teší a zaväzuje zároveň. Vďaka tomuto úspechu a na základe celkového hodnotenia úrovne vedeckej činnosti získala Fakulta manažmentu, ekonomiky a obchodu Prešovskej univerzity v Prešove už štvrtýkrát po sebe prestížny status *Excelentné výskumné pracovisko*.

V predošlom roku ste podali dve žiadosti o ochranu priemyselného vlastníctva formou úžitkových vzorov. Opíšte, prosím, o čo šlo.

V prvom prípade išlo o návrh špeciálneho riešenia tzv. nornej steny, ktorá je určená na zachytávanie plávajúcich pevných odpadov z vodných plôch a vodných tokov. V praxi sa dnes používajú rôzne typy norných stien, ako napríklad penou plnené norné steny, samonafukovacie a nafukovacie norné steny, norné steny používajúce sa na odstraňovanie požiarov alebo norné steny využívajúce sa na zachytávanie odpadu a ne-



Odborné doplnkové vzdelávanie zamestnancov firmy BAMIDA s.r.o. Zdroj: Archív M.R.

žiaducich prvkov plávajúcich na vodnej hladine. Podľa spôsobu použitia sa tieto typy stien mierne odlišujú vzhľadom aj technickým prevedením. Cieľ majú však rovnaký – zastavenie zväčšujúcej sa plochy kontaminácie na vodnej ploche a vodných tokoch.

Druhým riešením, ktoré bolo predmetom žiadosti o priemyselné vlastníctvo, bola modulárna protihluková bariéra s PVC obalom a pórovitým absorpčným jadrom. Ide o inovatívne riešenie protihlukovej bariéry pozostávajúcej z precízneho vrstvenia rôznych typov materiálov, čo v konečnom dôsledku spôsobuje dosiahnutie výsledného efektu, t. j. elimináciu emisií hluku a prachu.

Každý z modulov je tvorený PVC technickou textíliou, tabuľovou vrstvou zloženou z recyklovaných textilných vlákien, membránovou nánosovou textíliou, PVC sieťovanou štruktúrnou tkaninou a kovovými krúžkami určenými na uchytávanie segmentov protihlukovej bariéry o konštrukciu a zároveň slúžiacimi na spájanie protihlukových bariér do jednej neprerušovanej sústavy.

V týchto prípadoch bola pre vás kľúčová aj spolupráca s CKVV a NCTT SR. Ako presne prebiehala?

Spolupráca s Centrom pre komercializáciu výstupov výskumu a manažment duševného vlastníctva (CKVV) Prešovskej univerzity v Prešove prebiehala od okamihu podania oznámenia o vzniku predmetu priemyselného vlastníctva (PV). Centrum nám bolo nápomocné pri príprave zmlúv o podieloch na vytvorení predmetu PV. Nimi sa stanovil percentuálny podiel každého pôvodcu zohľadnením vedeckého, znalostného, časového, finančného či iného prínosu, ktorým prispel pôvodca k vzniku predmetu priemyselného vlastníctva. Zadaním požiadavky do systému Národného centra transferu technológií SR (NCTT SR) požiadalo CKVV o spoluprácu pri vytvorení zmluvy o spolumajiteľských podieloch k predmetu priemyselného vlastníctva medzi spolumajiteľmi, t. j. Prešovskou univerzitou v Prešove a firmou BAMIDA, s. r. o. Touto zmluvou sa stanovili percentuálne podiely zmluvných strán, upravili sa práva a povinnosti pri zabezpečovaní a udržiavaní priemyselnoprávnej ochrany technického riešenia, ako aj ďalšieho nakladania s ním. Na základe toho CKVV informovalo listom vedenie univerzity o vytvorení vzniku predmetu priemyselného vlastníctva, o pôvodcoch, ktorí sa na ňom podieľali, a ich o plnení si pracovnoprávnych povinností ako zamestnancov. CKVV takisto zabezpečilo dokumentáciu, ktorou si Prešovská univerzita v Prešove uplatnila právo na technické riešenie. Pokiaľ ide o evidenciu úžitkového vzoru, centrum bolo zároveň aj hlavným komunikačným kanálom s Úradom priemyselného vlastníctva SR. Na základe splnomocnenia zastupovalo v tejto súvislosti i spoločnosť BAMIDA, s. r. o.

Na ktorú oblasť sa sústreďujete v rámci výskumu v spomínanom Laboratóriu hodnotenia faktorov prostredia?

Laboratórium hodnotenia faktorov prostredia sa zameriava na meranie, analýzu, interpretáciu výsledkov takých faktorov prostredia (životného a pracovného), ktoré ovplyvňujú zdravie, kvalitu života, ekosystémy, a na návrh opatrení v súlade s princípmi udržateľného rozvoja. Jeho činnosť je interdisciplinárna a zahŕňa oblasti spoločenských, technických a prírodných vied. Osobitnú pozornosť upriamuje na prepojenie environmentálnych faktorov s ekonomicko-manažérskymi témami, napríklad sa venuje hodnoteniu environmentálnych nákladov a prínosov, zelenej energetickej transformácii, implementácii obehového hospodárstva v podnikaní či strategickému riadeniu udržateľného rozvoja organizácií. V rámci laboratória spolupracujeme s rôznymi partnermi, pričom kladieme dôraz na prepojenie vedeckých prístupov s praktickou aplikovateľnosťou, so snahou poskytnúť hodnotné riešenia podnikateľským subjektom aj verejnej správe.

V rámci aktuálnych výziev jednotlivých podporných schém v kontexte činnosti Laboratória hodnotenia faktorov prostredia v súčasnosti pripravujeme projektové zámery pre oblasť využitia InSAR monitoringu

DOC. ING. MARTIN ROVŇÁK, PHD., je riaditeľom Laboratória hodnotenia faktorov prostredia a pôsobí na Fakulte manažmentu, ekonomiky a obchodu Prešovskej univerzity v Prešove od r. 2008. Od r. 2019 je prodekanom pre prax, kvalitu, rozvoj a uplatnenie absolventov fakulty. V rokoch 2011 – 2019 pôsobil ako vedúci katedry environmentálneho manažmentu. Vysokoškolské štúdium úspešne ukončil v inžinierskom študijnom programe automatizácia a riadenie v strojárstve na Strojníckej fakulte Technickej univerzity v Košiciach. Doktorandské štúdium absolvoval taktiež na Strojníckej fakulte v študijnom odbore environmentalistika. Po ukončení týchto štúdií úspešne absolvoval doplňujúce pedagogické štúdium pod názvom vysokoškolská pedagogika pre inžinierov na Katedre priemyselného a digitálneho inžinierstva Technickej univerzity v Košiciach. Ako hlavný riešiteľ, resp. spoluriešiteľ sa podieľal na riešení viac ako 30 domácich a zahraničných vedeckovýskumných, rozvojových či vzdelávacích projektov. Ako projektový manažér v roku 2014 získal a následne aj viedol vzdelávací projekt Reforma vzdelávania na FMEO PU v Prešove, spolufinancovaný zo štrukturálnych fondov EÚ, a projekt Vybrané aspekty environmentálneho manažmentu v krajinách V4 v rámci Medzinárodného vyšehradského fondu. V r. 2024 bol pod jeho vedením úspešne ukončený zahraničný výskumný projekt na podporu inovácií a rozvoja obchodu malých a stredných podnikov BIN 02_2021_024 Applied research for the improvement of acoustic properties of mobile noise barriers and ecological use of waste generated during their production, ktorý získal grant z Islandu, Lichtenštajnska a Nórska vo výške 1 197 226 eur prostredníctvom Grantov EHP.

V rámci svojej pedagogickej a vedeckovýskumnej činnosti sa zameriava na oblasť prípravy a riadenia projektov vrátane počítačovej podpory ich riadenia, ďalej na oblasť systémov a technológií ochrany životného prostredia a informačných a komunikačných technológií s akcentom na oblasť životného prostredia vrátane podpory GIS.

stability územia, ktoré môžu pomôcť v rozhodovacích procesoch na rôznych úrovniach a v rozličných inštitúciách, napríklad v poisťovniach, samosprávach, ale aj environmentálnym manažérom, pretože ponúkajú nástroje na presnejšie hodnotenie a predikciu rizík.

Druhý zámer sa sústreďuje na výskum a vývoj inovatívnych riešení pre klimaticky odolné mestá. Vzhľadom na charakter a rozsah výskumu, pilotného testovania a vyhodnocovania by sme tento projekt chceli implementovať v spolupráci so súkromným sektorom.

Prepájate vzdelávací proces s praxou aj pomocou svojich zahraničných partnerov?

Samozrejme. Ako som už spomínal, na fakulte máme vytvorenú sieť stredísk študentskej praxe, praktickej prípravy a transferu výskumu, t. j. 84 zmluvných partnerov pôsobiacich na Slovensku. Okrem toho máme vytvorenú sieť svojich oficiálnych partnerov pre zahraničnú prax. V súčasnosti majú študenti možnosť absolvovať zahraničnú prax v 8 krajinách, a to v USA, na Malte, v Írsku, Španielsku, Grécku, Taliansku, na Cypre a v Česku, konkrétne v Prahe. Okrem toho môžu študenti fakulty absolvovať stáž v zahraničí aj v iných krajinách Európy, a to najmä prostredníctvom programu Erasmus+. Fakulta má uzatvorené zmluvy napríklad s American Hospitality Academy na Floride (USA) a agentúrou Across Agency, s. r. o., ktoré zastupujú hotely a iné organizácie po celých Spojených štátoch amerických, s agentúrou M.K. Malta Recruitment Agency, ktorá ponúka stáž a prax v hoteloch na Malte, s agentúrou TALIANSKO – EUROPE3000 zastupujúcou hotely v Taliansku a s ďalšími agentúrami.

K intenzívnejšiemu prepojeniu vzdelávania a praxe prispievajú tiež pravidelné prednášky známych osobností z oblasti manažmentu, sveta obchodu i verejného života. Tie sa na fakulte pravidelne realizujú popri prednáškach interných fakultných profesorov a docentov, resp. za prispenia takmer 100 interných pracovníkov a doktorandov.

Autor:
Martin Karlík

CHALLENGER SCIENCE AS A PATHWAY TO COMMERCIALIZATION OF RESEARCH

Civitta is an international consulting company in the field of strategies and innovations that aims to support the commercialization and transfer of technologies. This coincides with the principles and activities of the Challenger science program. Martin Veselý, Project Manager at Civitta Slovakia, told us more about it.

What was the intent and focus of the Challenger science program?

Challenger Science is an educational program that supports the development of talented scientists in Slovakia. The program focuses on the development of entrepreneurship and related soft skills and enables participants from various scientific disciplines to recognize opportunities to transfer scientific knowledge into practice. The key ambition is to cultivate an entrepreneurial mindset within the scientific community, support the commercialization efforts of Slovak scientists, and enhance the visibility of Slovak science's societal contributions.

What tasks did CIVITTA perform within this project?

Civitta is the main organizer of the Challenger Science program and covers all its key aspects, from initial concept design and participant selection to expert and mentor coordination, ensuring the program's comprehensive implementation and successful execution.

Civitta, as an innovative consulting company with extensive experience in the field of innovation and entrepreneurship support, has been organizing educational programs for students, startups, and scientists in Slovakia and Europe for several years, such as Challenger Accelerator, HealthCare Lab, and Ajujaht, and innovative events such as Climathon and Startup Awards. Hundreds of students and scientists and over 500 startups have gone through these programs. Successful alumni of our accelerator programs include companies such as MultiplexDX, Glycanostics, Sensoneo (Startup Awards), and Bolt (Ajujaht). In this way, we try to transfer know-how, contacts, and experience from successful scientific entrepreneurs back to those who are at the beginning of the journey and often just need to show direction and motivation.

What platforms, institutions, and organizations have been involved in the project and in what way?

The main partner of the program is the ESET Foundation, which has long been supporting the popularization of science and research through various projects, such as the ESET Science Award initiative. The joint

vision of the ESET Foundation and Civitta aimed at increasing the practical impact of science on society by supporting the commercialization of research, makes the ESET Foundation an ideal partner for this program.

The program is supported by the European Institute of Health Innovation and Technology (EIT Health) with the goal to support innovators in the health sector and thereby improve the provision of healthcare in Europe. It is also thanks to EIT Health that we organized a complementary program for the wider scientific community within the Challenger Science program with activities aimed at raising awareness of the possibilities of commercializing innovations in the field of health. The Faculty of Medicine of the Comenius University in Bratislava is also a key partner of these activities. The Faculty of Medicine's focus is initiating a new wave of innovation support at academic institutions in Slovakia and thereby increase the qualifications of the next generation of researchers in the field of health. The Faculty of Medicine of the Comenius in Bratislava participated in the implementation of the complementary program through content provision of activities, provision of Slovak and international experts, organization of activities, and establishing contacts between innovators, the academic community, MedTech companies, and investors. The public seminars were focused on inspirational stories in healthcare, clinical trials and validation of scientific research, as well as patent processes and strategies. The complementary program culminated in Health Innovation Day, a conference connecting participants with successful, experienced, and emerging researchers, entrepreneurs, educators, and students.

Important Slovak institutions participated in the recruitment of participants to the program, including the Slovak Academy of Sciences, Slovak University of Technology in Bratislava, Comenius University in Bratislava, Alexander Dubček University of Trenčín in Trenčín, Slovak Agricultural University in Nitra, Žilina University in Žilina, Technical University in Košice, Technical University in Zvolen, Matej Bel University in Banská Bystrica and Pavel Jozef Šafárik University in Košice.

Source: Civitta Slovakia & Natália Jakubcová

Source: Civitta Slovakia & Natália Jakubcová

Please define the project from the point of view of technology transfer and the necessary cooperation between science and practice

Using a systematic approach, Challenger Science contributes to solving two key barriers that prevent effective technology transfer in Slovakia. These are the low awareness of scientists about the potential of translating their research into practice and the insufficient universal skills of scientists in the field of commercialization of their discoveries.

The first key phase is the recruitment of Slovak scientists into the program. Through our network of universities and research institutions, we have identified active researchers and research teams that have the interest, motivation, and potential to commercialize their scientific research.

Subsequently, the selected participants had the opportunity to work on their specific scientific ideas through regular expert-led workshops. The workshops were divided into four key phases: change of mindset and inspiration, identification of opportunities for commercialization, building and validation of the business model, and presentation of the final projects. We design the program in cooperation with foreign experts, adapt it to the needs and skills of researchers, and thus create space for scientists to develop new scientific startups and spinoffs.

What else does the program focus on?

Recognizing the individual challenges of scientists in research commercialization, financing, and establishing networks, the program provides a personalized approach to solving these challenges through individual coaching sessions. Participants benefited from the guidance of six experienced coaches from the startup and technology transfer sectors, enabling them to effectively utilize and implement workshop insights into their scientific projects. Following three months of intensive education in Bratislava, the

Source: Civitta Slovakia & Natália Jakubcová

participants presented their projects to an expert jury from the business, startup, and investor sectors. This public final offered a unique opportunity to showcase their scientific projects and acquired knowledge to a wider Bratislava audience.

What were the results of the project, and how will they be implemented in the process of university technology transfer and cooperation between science and the private sector?

In the first year of Challenger Science 2024, a total of 42 applications (75 applicants) were received from 14 Slovak educational and research institutions, from which 35 doctoral students and senior researchers were selected for the program. At the end of the program, feedback was collected to assess the overall satisfaction of the participants with the course and organization of the program, and the results showed that almost every participant would recommend this program to their colleagues. The participants repeatedly emphasized several key benefits of the program: awareness of one's strengths and weaknesses, identification of potential business opportunities, acquisition of new business tools and skills, acquisition of new professional contacts, and, above all, change of mindset.

What facts have the scientists mastered that they will be able to implement in practice?

In total, the participants completed 12 professional workshops, during which they acquired skills that can be used in various aspects of their careers, as well as in the popularization of science. Professional workshops focused on topics such as entrepreneurial thinking, design thinking in science, building relationships with partners and customers, identifying suitable opportunities for commercialization, building a business model, protecting intellectual property, and obtaining financing, but also preparing presentations for partners and investors.

As part of the program, we also prepared the so-called founder stories, which were delivered by successful Slovak and foreign entrepreneurs: Pavol Čekan (CEO, MultiplexDX), Ján Tkáč (COO, Glycanostics),

Michal Pohludka (CEO, GeneSpector) and Martin Herman (CEO, PowerfulMedical), who told the participants about their experiences in commercializing their scientific research and lessons learned.

During the program, the participants adopted the perspective of innovators and entrepreneurs, gained inspiration from Slovak and foreign experts, recognized opportunities to transfer scientific knowledge into practice, and acquired skills for career development and the popularization of science.

Do you already see the impact of the program in existing success stories?

Yes. We have received information just two months after the end of the program. Some participants have actively started the process of commercializing their research, and notably, one research team has successfully established a company, with at least two more in progress. These individuals are proactively engaging with technology transfer representatives at their institutions to explore opportunities for commercializing their research.

Actors from the academic environment were actively involved in the very process of creating, recruiting, and implementing the program. Our ambition is to support universities to be able to implement such programs independently. We are trying to provide them with a pilot model and show best practices on how to support entrepreneurship and the commercialization of research in Slovakia. Therefore, we can also consider the positive impact of the program on the interest of Slovak institutions in supporting the commercialization of research, which was evident from the feedback of the participants, who mentioned a few examples of how their institution facilitated and helped them on the way to commercialization thanks to the Challenger Science program.

Last but not least, the program successfully enhanced the visibility of Slovak science's contributions to society and increased the emphasis on the commercialization of research and innovation activities at

CIVITTA

Civitta is an international consulting company in the field of strategy, innovation, financing and digital transformation in Central and Eastern Europe. Our mission is to be the catalyst of the new knowledge-based economy in Slovakia. One of our long-term goals is to support commercialization and tech transfer in countries with a lower index of entrepreneurship and commercialization of research, which includes Slovakia. One example is the Startup Awards Slovakia, also known as the Oscars for Slovak startups, whose goal is to improve our country by supporting young and active people. One of the main competition categories is Science, where we look for commercial solutions based on scientific research and thus provide support and connections with investors for startup researchers.

Another example is HealthCare Lab, an international acceleration program for start-up digital health projects in Europe. Our mission is to connect, develop, and support an international community of innovators, researchers, and healthcare providers to bring disruptive healthcare innovations to market faster. Last but not least, Civitta provides strategic support to the Slovak academic institutions themselves, including, for example, through the development program for scientific workers of the Slovak Academy of Sciences, for which we prepared a series of 15 workshops for the development of soft skills. More than 300 participants took part in the training, including doctoral students, senior researchers, and directors of individual institutes.

Source: Civitta Slovakia & Natália Jakubcová

scientific and research institutions across Slovakia. We managed to get the topic of commercialization and technology transfer to thousands of students and researchers through social networks, press releases, and publications on university websites.

Are you planning similar projects or specific activities in the future?

Driven by the demand from universities, scientific institutions, and scientists themselves, coupled with the positive response and continued support from the ESET Foundation and other partners after the first year's results, motivates us to continue empowering the scientific community towards entrepreneurship and contribute to the growth of entrepreneurial science in Slovakia. We are already planning the second year of the Challenger Science program with the ambition to generate even more success stories that will inspire others to embrace change and actively participate in the commercialization of Slovak science.

Authors:
Adam Bystroň, Martin Karlík

MARTIN VESELÝ

Martin Veselý graduated from the University of Oxford, where he studied Biochemistry and found his passion for innovation and technology transfer. Martin currently works as a Project Manager at Civitta Slovakia, leading innovation consultancy and innovation ecosystem building in Slovakia, where he leads projects focused on creating and accelerating innovative businesses. Martin worked as the Project Lead at HealthCare Lab, an international acceleration program for digital healthcare ventures, where he was in charge of the selection committee choosing the top 9 HealthTech startups from over 200 applications ranging from CEE and Turkey. His responsibilities in the program also included composing and running the acceleration program to accelerate startups and increase the investability of selected HealthTech startups.

American Space Launch System Takes Off. 3D Illustration. Source: iStock.com/ 3DSculptor

SPACE INDUSTRY. A NEW WORLD WHERE SCIENCE MEETS PRACTICE

Satellites, space suits, communication or licensed environmental research. The space industry and its special technology transfer section are developing at the workplaces of leading universities such as Stanford, MIT, and the University of Tokyo. In addition to research, there are also unique forms of cooperation between the private sector and the academic field.

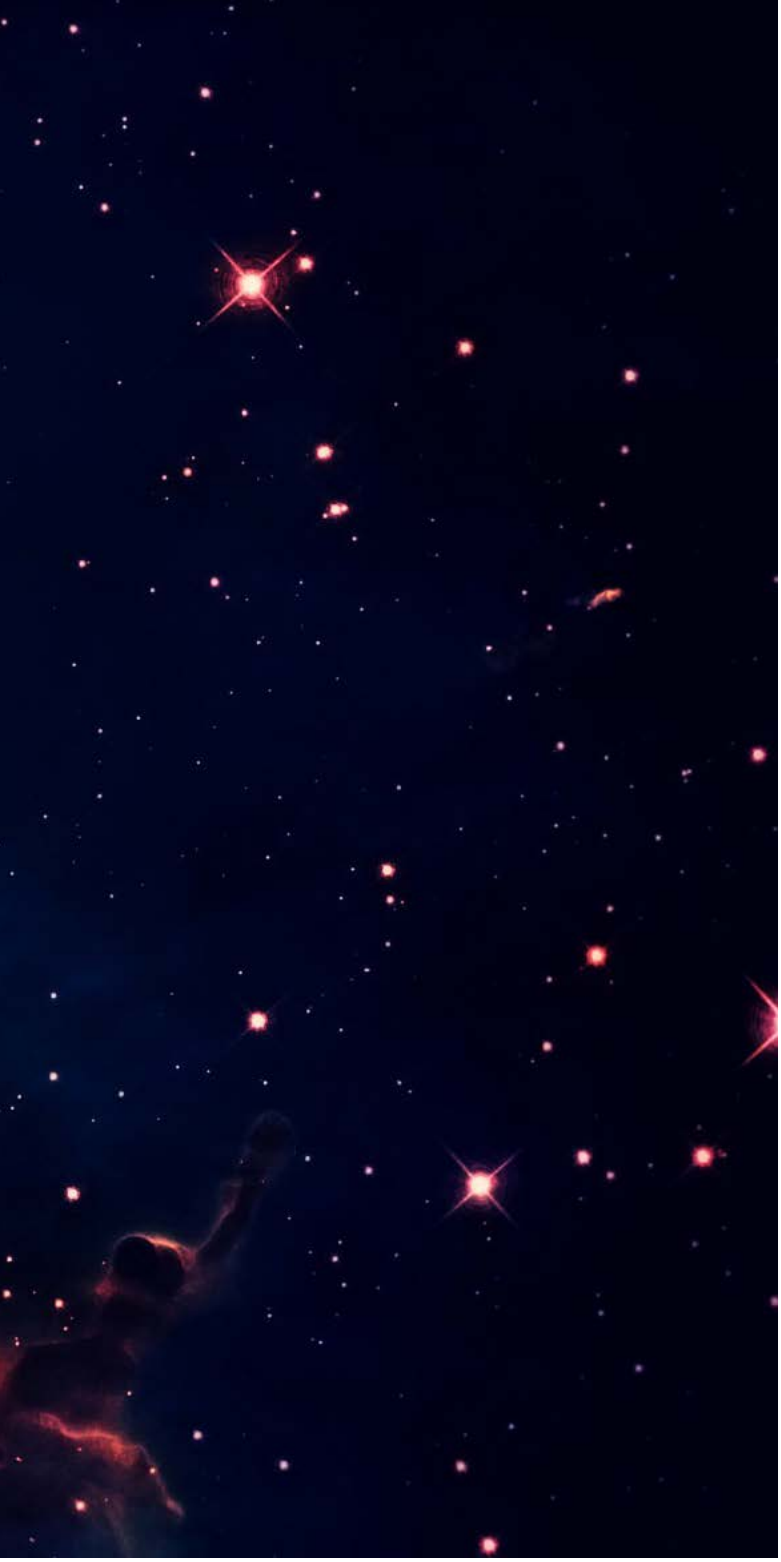
Prestigious world universities have space research among their priorities. We present some of them, which, in addition to their own participation in the space program, also uniquely support this specific type of technology transfer.

Source: Image by WikiImages from Pixabay

STANFORD UNIVERSITY AND COLLABORATION WITH PLANET

Stanford is known for its innovative approach to university technology transfer, working with companies to commercialize technologies such as satellite systems, artificial intelligence, and autonomous systems for space. An example is its collaboration with Planet to develop and launch small satellites for remote sensing of the Earth.

The Stanford University-Planet space industry collaboration is an example of how academia and the private sector can join forces to achieve significant scientific and technological advances. Planet operates one of the largest satellite constellations on Earth, providing daily imagery of the entire planet. Its technology allows for real-time monitoring of changes on Earth, which has wide-ranging applications in areas such as agriculture, forestry, urban planning, and disaster response.



The Stanford University-Planet collaboration focuses on using data from Planet's satellites for scientific research and education.

The collaboration between Stanford University and Planet, founded by three NASA scientists in 2010, has grown as Planet's satellite constellation and data services have expanded. The collaboration focuses on three main areas: climate change research, environmental monitoring, and education.

Climate change research and environmental monitoring

Stanford scientists use satellite imagery to track changes in forests, glaciers, and other ecosystems to better understand the impacts of climate change. Specifically, satellite data is used to track changes in forests, such as deforestation and fires, which helps understand their impact on climate and biodiversity. Tracking changes in glaciers, such as their melting and retreat, is important for understanding the impacts of climate change on water resources and sea levels. In addition, the collaboration focuses on monitoring deforestation, pollution, and other environmental issues, as well as urban growth and its impact on the environment.

Stanford University uses Planet data to educate students in remote sensing and geospatial technologies. This data gives students access to up-to-date information about the state of our planet, allowing them to better understand and contribute to solving complex environmental processes.

JAPAN'S SPACE PROGRAM AND TECHNOLOGY TRANSFER

The main driving force behind Japan's space program is certainly the University of Tokyo.
As a world-leading research institution with extensive contacts in the industry, including the space sector, the University of Tokyo has a wide range of collaborations with companies in the space industry. This collaboration includes joint research and development, technology transfer, and commercialization.

Joint research and development

The University of Tokyo works closely with organizations such as JAXA (Japan Aerospace Exploration Agency), Mitsubishi Electric, and NEC to develop innovative technologies for space missions, satellites, and space exploration. They work together to develop advanced propulsion systems, new materials for space applications,

Name plate view of Japan aerospace exploration agency Chofu Aerospace Center / Chofu Tokyo, Japan. Source: iStock.com/oasis2me

and technologies for space debris collection. The university actively transfers its research results to industry through licensing, spin-offs, and collaborations with existing companies. An example is the development and commercialization of new types of sensors for satellites that have been developed in partnership with the industry.

Education and Innovation Support

The university offers specialized education programs in space engineering and science that prepare students for successful careers in this dynamic sector. It also supports startups and innovative projects in the space industry through its incubation centers and funds.

Collaboration in university technology transfer over the past 3 years

In the past three years, the University of Tokyo has intensified its efforts in the field of technology transfer, including the space sector. It has established several spin-off companies that focus on commercializing space technologies developed at the university. It has entered into strategic partnerships with major companies in the space industry to accelerate technology transfer and implementation into practice. As part of technology transfer, the university has collaborated with companies to develop small satellites for Earth monitoring, space communication technologies, and robotic systems for space exploration.

Key aspects of the collaboration

A strong link between academic research and industry, the promotion of innovation and entrepreneurship, investment in cutting-edge research facilities and infrastructure, and an emphasis on international collaboration are key factors in the success of this collaboration. The University of Tokyo is thus playing a key role in the development of Japan's space industry and contributing to global progress in space research and technology.

This collaboration is an example of how modern technology and scientific research can work together to better understand and protect our planet.

TECHNICAL UNIVERSITY OF MUNICH AND EUROPEAN SPACE PROGRAM

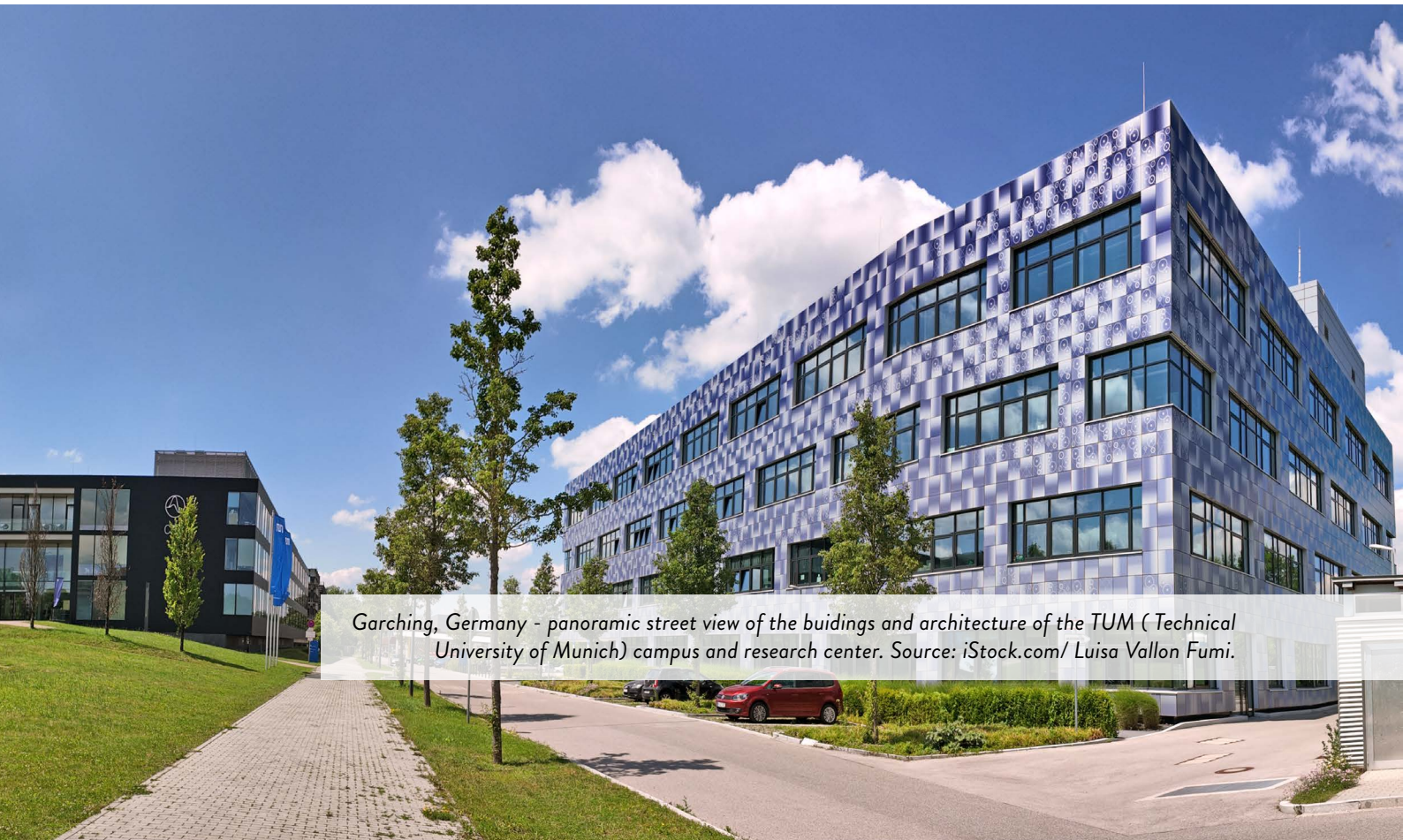
The Technical University of Munich (TUM) is a major player in the space industry and actively cooperates with various companies on technology transfer. Over the past 5 years, this cooperation has intensified, leading to several innovative projects and successful commercializations.

Development of satellite technologies and applications

TUM has a strong background in satellite technology, especially in areas such as remote sensing, navigation, and communication. The university works closely with companies such as Airbus Defence and Space and OHB on the development of new satellite systems and applications. Together, they work on projects aimed at improving the accuracy and efficiency of satellite Earth observations, developing advanced navigation systems for autonomous vehicles, and creating new communication technologies for space missions. As part of technology transfer, TUM licenses its patented technologies to companies that then commercialize them. For example, TUM developed an innovative algorithm for processing satellite data that enables more precise monitoring of changes in forests and agricultural land. This technology was licensed to a company that integrated it into its satellite image analysis software.

Robotics and Autonomous Systems for Space

TUM is a leading research center in the field of robotics and autonomous systems, which is crucial for the development of the space industry. The university collaborates with companies such as DLR (German Aerospace Center) and BMW to develop robotic systems for space exploration and satellite maintenance. Together, they work on projects aimed at developing autonomous robots that can perform complex tasks in the harsh conditions of space. TUM also supports startups that focus on developing innovative robotic technologies for space. For example, a TUM spin-off company developed a robotic system for collecting space debris, which received significant investment from private investors.



Garching, Germany - panoramic street view of the buidings and architecture of the TUM (Technical University of Munich) campus and research center. Source: iStock.com/ Luisa Vallon Fumi.

Space Materials and Propulsion Systems

TUM is also involved in the research and development of new materials and propulsion systems for space applications. The university collaborates with companies such as MT Aerospace and ArianeGroup to develop lightweight and durable materials for rockets and satellites, as well as efficient and environmentally friendly propulsion systems. As part of technology transfer, TUM provides companies with access to its laboratories and testing facilities, as well as expert advice. For example, TUM has developed a new type of composite material that is lighter and stronger than traditional materials used in rocket technology. This technology has been licensed to a company, which has used it to produce new rocket components.

TUM cooperation within the European Space Program

The Technical University of Munich (TUM) and the European Space Agency (ESA) have a long-standing collaboration on various projects in the space industry, with technology transfer playing a key role. This collaboration is evident in several areas.

One example is the development and commercialization of advanced navigation systems. TUM has a strong background in satellite navigation and has developed innovative algorithms and technologies that have been licensed to ESA and subsequently integrated into the European navigation system, Galileo. This technology transfer allows ESA to improve the accuracy and reliability of Galileo, which has a significant impact on various applications such as transportation, agriculture, and emergency services.

Another example is the collaboration in the field of Earth remote sensing. TUM has developed advanced sensors and algorithms for processing satellite data, enabling more accurate monitoring of environmental changes such as deforestation, pollution, and climate change. These technologies have been transferred to ESA and are used in various

Earth observation programs such as Copernicus. This technology transfer contributes to a better understanding and monitoring of our planet, which is crucial for making informed decisions in the field of the environment.

Materials and technologies

TUM and ESA also collaborate on the development of new materials and technologies

European Space Agency. Source: iStock.com/ Victor Golmer

for space missions. TUM has extensive experience in the research and development of lightweight and durable materials that are essential for space applications. These materials have been transferred to ESA and are used in the production of rockets, satellites, and other space equipment. This technology transfer enables ESA to develop more efficient and reliable space systems.

In addition, TUM and ESA collaborate on the education and training of the next generation of space engineers and scientists. TUM offers specialized educational programs in the field of space engineering and science, which are supported by ESA. The collaboration also includes the exchange of students and researchers between TUM and ESA. This transfer of knowledge and experience is crucial for the future development of the European space industry.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY AND THE SPACE EXPLORATION INITIATIVE

The American MIT – Massachusetts Institute of Technology is a home of education, research and innovation that thrives in research collaboration with Howard Hughes Medical Institute, Whitehead Institute for Biomedical Research or Charles Stark Draper Laboratory. The Institute's entrepreneurs (alumni) make a global impact by "producing estimated annual revenues on par with the gross domestic product of the 10th-largest economy in the world".

MIT accelerates the nation's industrial revolution through effective technology transfer. Hundreds of technologies are available for licensing as of now in the fields of biotechnology, photonics, computer science, artificial intelligence, agriculture and more.

"Earth is the cradle of humanity, but one cannot remain in the cradle forever."

The MIT Space Exploration Initiative (SEI) founded in 2016 shows a new horizon by building, testing and flying the technologies and tools for cosmos with the intent to "democratize access to space exploration" to millions and eventually billions of people.

Collaboration with Alchemist and the space bread of tomorrow

The SEI builds their portfolio of projects underway across the Lab. Space habitats, parabolic flights, zero gravity musical instruments or even cooking bread in space. As unbelievable as it may sound, Gravity Proof - the mission to prepare bread, which travelled from the face of the Earth, entered its experimental space phase in May 2021, when Maggie Coblentz – MIT researcher - brought and studied dough's behaviour in an experimental parabolic flight.

For this project, special bread recipe and even a custom baking spacesuit was developed. Space travel has never smelled so delicious. Cobletz launched a collaboration with the two Michelin star restaurant Alchemist and its Chef Rasmus Munk. Alchemist takes pride in "providing a culinary experience" by offering a holistic cuisine, that redefines and broadens the understanding of the concept of dining. Launching MIT's mission, the restaurant worked closely with the research team, development kitchen, and design studio. Together they created "Space Soda Bread" resembling a traditional brioche with a more runny dough and addition of baking powder.

Zero-gravity baking with Söder Studio

For the development of the custom baking spacesuit, Söder Studio came to the scene. The company, working for some of London's most respected designers, promotes sustainable fashion through utilizing recycled plastic bottles to create luxury womenswear. The spacesuit for MIT's Maggie Cobbletz was made with the same intent, although not the most important. This special piece of astro-clothing needed to be suitable for zero gravity and functional for kneading dough in a spacecraft. The final product contains tool belt to store ingredients, and a floating apron that transforms into a wearable countertop.

Dining from the sky

The year 2024 was particularly successful for MIT's Space Exploration Initiative. A special "space menu", in the works for more than two years, reached its final stage in March 2024. In collaboration with the MIT's Media Lab and the Michelin star Alchemist with SpaceVip, a stellar meal was created specifically for a planned journey across Earth's atmosphere, that'll happen this year. This mission is supposed to take place aboard the Neptune spacecraft – a luxury balloon-shaped vehicle that will offer not only a dining experience, but also breathtaking panoramic views of our universe. Meals like "Memory of Sakura" are designed to recall the changing seasons on our planet or reflect the history of space exploration.

Astronaut in outer space. Source: iStock.com/ dima_zel

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Authors:
Juliana Bezáková, Martin Karlík

Podnikatelia, potrebujete ochrániť svoje inovácie alebo nájsť partnera pre výskum a vývoj?

V Centre transferu technológií pri CVTI SR vám s tým pomôžeme!

Ak ste podnikateľ alebo uvažujete o podnikaní, u nás ste na správnom mieste. **Pomôžeme vám** pri **ochrane vašich inovácií** alebo pri **vyhľadaní partnera pre výskum a vývoj z univerzít a iných vedeckovýskumných inštitúcií**. Centrum transferu technológií pri CVTI SR (CTT CVTI SR) prevádzkuje Stredisko patentových informácií PATLIB, ktoré poskytuje informácie a služby z oblasti duševného vlastníctva kľúčové pre vaše podnikanie.

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https://patlib.cvtisr.sk

patlib@cvtisr.sk

+421 918 807 145

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