TRANSFER TECHNOLÓGIÍ bulletin

TECHNOLOGY TRANSFER IN THE USA FROM AIR FORCE AND NAVAL RESEARCH

MAJOR FACTORS THAT AFFECT THE PROCESS OF KNOWLEDGE TRANSFER AT INSTITUTIONS

HOW PATENTS AND INVENTIONS CHANGED THE WORLD OF CINEMA

2/2024

MINISTERSTVO ŠKOLSTVA, VÝSKUMU, VÝVOJA A MLÁDEŽE SLOVENSKEJ REPUBLIKY

CENTRUM VEDECKO-TECHNICKÝCH INFORMÁCIÍ SR

CENTRUM TRANSFERU TECHNOLÓGIÍ CVTI SR

NCTSR NÁRODNÉ CENTRUM TRANSFERU TECHNOLÓGIÍ SR

CHRÁŇTE A KOMERČNE ZHODNOŤTE VÝSLEDKY VÝSKUMU VYTVORENÉ VO VEDECKOVÝSKUMNEJ INŠTITÚCII

Národné centrum transferu technológií SR (NCTT SR) je združenie vedeckovýskumných inštitúcií, ktorých spoločným cieľom je ochrana a následná komercializácia výsledkov výskumu, vývoja a inovácií, ktoré vznikli pri plnení povinností zamestnancov a študentov voči vedeckovýskumnej inštitúcii.

PROSTREDNÍCTVOM CENTIER TRANSFERU TECHNOLÓGIÍ V INŠTITÚCIÁCH, KTORÉ SÚ ČLENMI NCTT SR, POSKYTUJEME:

REŠERŠNÉ SLUŽBY

- na stav techniky, aktivity konkurencie, právny stav ochranných dokumentov, dizajny a ochranné známky,
- poskytované jednorazovo a/alebo priebežne,
- poskytované pred, počas alebo po výskumnej činnosti,
- ich súčasťou je poradenstvo súvisiace s využívaním informačných zdrojov a vyhľadávaním v databázach predmetov priemyselného vlastníctva.

EXPERTNÉ PODPORNÉ SLUŽBY V PROCESE OCHRANY DUŠEVNÉHO VLASTNÍCTVA

- identifikácia a posúdenie výsledkov výskumu,
- zabezpečenie služieb patentového zástupcu,
- podávanie patentových a iných prihlášok,
- úhrada správnych (patentových) poplatkov.

EXPERTNÉ PODPORNÉ SLUŽBY V PROCESE KOMERCIALIZÁCIE

- marketingové služby,
- vyhľadanie vhodných partnerov na komercializáciu,
- príprava licenčných zmlúv,
- 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

TRANSFER TECHNOLÓGIÍ bulletin
Číslo 2/2024, 5. ročník
Vychádza 2x ročne
Dátum vydania: október 2024
Vydalo: Centrum vedecko-technických informácií SR (CVTI SR)
IČO 00 151 882
Bratislava, www.cvtisr.sk

Adresa reakcie:
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

ISSN 1339-2654
Evidenčné číslo: EV 6092/22/PT

Časopis bol v rokoch 2020-2023 financovaný z projektu Národná infraštruktúra pre podporu transferu technológií na Slovensku II – NITT SK II
Investícia do vašej budúcnosti
Tento projekt bol podporovaný z Európskeho fondu regionálneho rozvoja
www.opii.gov.sk.

OBSAH

Vážení čitatelia,

som rád, že nám zachovávate priazeň a svet univerzitného transferu technológií vám znova môžeme podať v tej najzaujímavejšej podobe. Či ste už na nás natrafili v prestížnych databázach (DOAJ, EBSCO, PROQUEST, OPENAIRE) alebo ste dlhoroční záujemcovia o svet komercializácie duševného vlastníctva, určite v novom čísle oceníte zatiaľ najväčšie množstvo anglicky písaných článkov. Písali ich jedni z najlepších autorov z oblasti transferu technológií na svete. Máme tak i vďaka zvyšujúcej sa prestíži a vedeckosti článkov ambíciu uchádzať sa v budúcnosti o členstvo vo zväčša striktne vedeckých databázach, akou je napríklad Web of Science.

I naďalej rozvíjame aktivitu na zvýšenie povedomia o výhodách publikovania pre potenciálnych autorov z akademického, vedeckého či podnikateľského prostredia. Stručný prehľad výhod publikovania nájdete na domovskej stránke ttb.sk prekli-kom na banner v pravom hornom rohu a na spodnej časti textu v priečinku Politika publikovania.

Druhé vydanie tohtoročného časopisu TTb začíname rozhovorom s úspešným právnikom Mikulášom Vargi-com z advokátskej kancelárie Kristýna & Mikuláš, s nadpisom **„Rozmanitosť práva v prostredí českého transferu technológií“.**

Hlavnú rubriku recenzovaných odborných článkov otvára svetový expert na transfer technológií Joshua M. Pearce. Jeho článok s názvom **„Do universities investing in technology transfer via patenting lose money?“** oboznamuje čitateľa, okrem iného, aj s novou metodikou kvantifikácie investícií do duševného vlastníctva, ktorá zahŕňa nielen technologické náklady na zamestnancov, ale aj priame náklady súvisiace s fakultou.

Nemenej zaujímavý pohľad na transfer technológií ponúka aj Polona Juvančič z Univerzity v Ljubljane v odbo-rom recenzovanom článku **„Failure, anomalies, and serendipity: navigating the complexities of technology transfer through storytelling“.**

Právnik a expert na transfer technológií Rudolf Leška sa spolu s autorkami Monikou Slovákovou a Kristínou Bernáthovou zameral na **„Licencovanie a transfer duševného vlastníctva v majetku štátu podľa slovenskej a českej úpravy“.** Tento kvalitný recenzovaný odborný článok detailne pomenováva problémy v licencovaní a transfere duševného vlastníctva verejných organizácií s vlastnou autonómiou. Významným expertom na transfer technológií je aj Dániel Magyar, riaditeľ Inovačného centra Univerzity Eötvös Loránd, ktorý spracoval článok s názvom **„Factors affecting the effectiveness of the knowledge transfer process at institutions“.** Venuje sa v ňom kľúčovým faktorom, ktoré ovplyvňujú efektivitu činností prenosu znalostí v univerzitách a výskumných ústavoch.

„U.S. Government technology transfer for foreign-owned companies“ je nadpis článku z rubriky *Zo zahraničia*, od dlhoročnej riaditeľky Diagnostic and Defense Technology Analysts Inc. (DTA), Arabely Carey Adolfsson. Ponúka veľmi zaujímavý pohľad na výskum amerického námorníctva a letectva a jeho prepojenie s praxou. Na článok odkazuje aj titulná strana tohto čísla časopisu TTb.

Katarzyna Papiez-Pawełczak je predsedkyňou predstavenstva spoločnosti SPIN-US, ktorú zriadila Sliezska

univerzita v Krakove. Je teda jedna z najpovolanejších expertiek na univerzitnú spinoff politiku v Poľsku, čo dokazuje aj v článku s názvom **„Foreign expansion of academic spinoffs. A Polish perspective“.**

Slovensky písané články sú síce v novom čísle časopisu TTb v menšine, no nepochybne zaujmú aj čitateľov svojou rôznorodosťou. Autorom jedného z nich je Lukáš Tobola, ktorý v rubrike *Zaujalo nás* rozoberá **„Špecifiká spolupráce v makerspaces a fablabs“** s podtitulom: **„Príležitosti a prekážky pre miestny rozvoj“.** Rovnakú rubriku rozširuje o poznatky z technologického transferu na prestížnej Stanfordskej univerzite redakčný článok s názvom **„Odhalenie rakoviny pomocou umelej inteligencie urýchlil transfer technológií na Stanfordskej univerzite“.**

Rozsiahly článok od Juliany Bezákovej a Martina Karlíka mapuje vznik filmového priemyslu cez pohľad patentovej ochrany vynálezov. Anglický text s názvom **„How patents and inventions changed the world of cinema“**, by mal hlavne zaujať fanúšikov tohto druhu umenia.

Vážení čitatelia,

dúfam, že vás predchádzajúce riadky presvedčili, že v rukách držíte výnimočné číslo časopisu TTb. Dokazuje to množstvo uznávaných svetových autorov, zatiaľ najvyšší počet anglických článkov a množstvo nových poznatkov z interdisciplinárneho sveta transferu technológií.

Prajeme vám príjemné čítanie a množstvo inšpirácie!

Mgr. Martin Karlík, šéfredaktor časopisu TRANSFER TECHNOLÓGIÍ bulletin

Dear readers,

I am pleased, you're still in our favor and that we can once again present the world of university technology transfer to you in the most interesting form. Whether you have already come across us in prestigious databases (DOAJ, EBSCO, PROQUEST, OPENAIRE), or if you have been interested in the world of commercialization of intellectual property for many years, you will appreciate the wide range of English written articles in the new issue. Some are written by the world´s best authors in the field of technology transfer.
Thanks to the increasing prestige and scientific nature of the articles, in the future we have the ambition to apply for membership in mostly entirely scientific databases, such as the Web of Science.

We continue developing activities to raise awareness of the benefits of publishing articles in our magazine for potential authors from the academic, scientific, or business environment. You can find a brief overview of our publication policies on the home page https://ttb.sk/en/ by clicking on the banner in the upper right corner and at the bottom of the text in the folder Policies.

The second issue of this year's TTb magazine begins with an interview with successful lawyer Mikuláš Vargic from the Kristýna & Mikuláš law firm entitled **„Diversity of law in the environment of Czech technology transfer".**

The main column of peer-reviewed professional articles is opened by world expert on technology transfer, Joshua M. Pearce. His article entitled **„Do universities investing in technology transfer via patenting lose money?"** introduces the reader, among other things, to a new methodology for quantifying investments in intellectual property which includes not only technology costs for employees but also direct costs related to faculty.

Polona Juvančič from the University of Ljubljana offers an equally interesting view of technology transfer in her peer-reviewed article **„Failure, anomalies, and serendipity: navigating the complexities of technology transfer through storytelling".**

Lawyer and technology transfer expert Rudolf Leška, together with authors Monika Slováková and Kristína Bernáthová, focused on **„Licensing and transfer of intellectual property in state property according to Slovak and Czech regulations".** This high-quality, peer-reviewed professional article names in detail the problems related to licensing and transfer of intellectual property of public organizations with their own autonomy.

Dániel Magyar, director of the Innovation Center of Eötvös Loránd University, is also an important expert on technology transfer who wrote an article entitled **„Factors affecting the effectiveness of the knowledge transfer process at institutions".** It deals with the key factors influencing the effectiveness of knowledge transfer activities in universities and research institutions.

"U.S. Government technology transfer for foreign-owned companies" is the title of an article from the *"From Abroad"* column, written by the long-time director of Diagnostic and Defense Technology Analysts

Inc. (DTA), Arabella Carey Adolfsson. It offers a very interesting look at the US Navy and Air Force research and its connection to practice. The cover page of this TTb magazine issue also refers to the article.

Katarzyna Papiez-Pawełczak is the chairman of the board of the research and technology commercialization company SPIN-US, which was founded by the University of Silesia in Krakow. Therefore she is one of the most qualified experts on university spinoff policy in Poland, which is also proven in the article entitled **„Foreign expansion of academic spinoffs. A Polish perspective".**

Although articles written in Slovak are in the minority in the new issue of the TTb magazine, they will undoubtedly interest readers with their diversity. The author of one of such articles is Lukáš Tobola, who discusses **„Specifics of cooperation in makerspaces and fablabs"** with the subtitle: **„Opportunities and obstacles for local development"** in the *"An interesting story"* column. The editorial article entitled **„Cancer detection using artificial intelligence accelerated technology transfer at Stanford University"** expands the same column with the knowledge from technology transfer at the renowned Stanford University.

An extensive article by Juliana Bezáková and Martin Karlík maps the evolution of the film industry. The authors look at the film industry in terms of patenting inventions. The English text entitled **„How patents and inventions changed the world of cinema"** should mainly interest fans of this kind of art.

Dear readers,

I hope the previous lines have convinced you that you are holding an exceptional issue of TTb magazine. This is demostrated by a plethora of world-renowned authors, the highest number of English articles so far and a bunch of new knowledge from the interdisciplinary world of technology transfer.

We wish you pleasant reading and lots of inspiration!

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

ROZMANITOSŤ PRÁVA V PROSTREDÍ ČESKÉHO TRANSFERU TECHNOLÓGIÍ

Mikuláš Vargic je úspešným právnikom, ktorého pole pôsobnosti je veľmi špecifické. Jeho česká advokátska kancelária Kristýna & Mikuláš sa špecializuje na spoluprácu s akademickými spinoff spoločnosťami, ale i samotnými univerzitami. V rozhovore pre časopis TTb nám, okrem iného, priblížil aj kooperáciu s niektorými úspešnými firmami i špecifiká spolupráce s Technickou univerzitou v Liberci.

Pôsobíte ako právnik špecializujúci sa na transfer technológií. Čo to v praxi znamená? Na čo konkrétne si vás klienti (firmy, univerzity) môžu najať a aké je vlastne vaše pole pôsobnosti?

V praxi sa zameriavame na tri druhy spolupráce: prácu pre verejné výskumné inštitúcie, prácu pre spinoff spoločnosti a prácu pre investorov.

V prvom type spolupráce spravidla pomáhame pri nastavení a uzatváraní zmlúv o výskumnej spolupráci s podobnými inštitúciami v zahraničí alebo priemyselnými partnermi, licencovaní ich patentov komerčným partnerom a zakladaní spinoff spoločností. Menej častá je pomoc pri nastavení celého procesu transferu alebo komercializácie ich duševného vlastníctva (vrátane založenia dcérskych spoločností s týmto cieľom).

Asi najväčšou časťou našej praxe je pomoc začínajúcim startup spoločnostiam s vedeckým základom s rozbehom ich podnikania. Ide teda o druhý menovaný druh spolupráce. Práca pre spinoff spoločnosti. To zahrňuje nastavenie interných vzťahov (dohody medzi spoločníkmi), pracovnoprávne veci, obchodné zmluvy, riešenie stretu záujmov zamestnancov alebo kontrolu dodržovania pravidiel verejnej podpory (status malého a stredného podniku a pod.). V neposlednom rade je to pomoc s tzv. ESOP plánmi (motivácia kľúčových osôb prostredníctvom akcií alebo opcií) a pomoc s príchodom investorov pri tzv. finančných kolách (financing round), keď sa vnútorné pomery a organizácia značne menia.
Nakoniec sa venujeme aj práci pre investorov. Keďže investorov v regióne, ktorí by mali záujem o oblasť life sciences (vývoj liečiv alebo diagnostických metód, vývoj zdravotníckych prostriedkov a pod.), je málo, je to väčšinou nárazové transakčné poradenstvo, kde veľká časť našej práce spočíva v právnej previerke (due diligence), keď kontrolujeme práve startupy, do ktorých chcú investori poslať peniaze. Ak je táto časť úspešná, pomáhame s prípravou transakčnej dokumentácie vrátane nastavenia celej transakcie.

Ste právnický expert na transfer technológií v ČR. Aké sú aktuálne špecifiká univerzitného transferu technológií v Českej republike v oblasti zakladania inovatívnych spoločností? Aké sú úskalia v týchto procesoch, ktorým je nutné z právneho hľadiska predísť, a v čom je výhoda takýchto spoločností?

Veľkým špecifikom, ktoré ale nemá právny charakter, je pomerne značná nedôvera veľkej časti vedeckej obce a štátneho aparátu k tejto forme komercializácie výsledkov výskumu. To sa prejavuje predovšetkým


SENNHEISER

pri interných schvaľovacích procesoch na univerzitách a výskumných ústavoch. Interné predpisy sú často prísnejšie ako tie zákonné a schvaľovací proces má niekoľko kôl (napríklad musíte nechať schváliť zámer na rektoráte, následne akademickom senáte a správnej rade. Potom je znovu nutné absolvovať to isté kolo s konkrétnym právnym úkonom, ktorý vedie k založeniu – spravidla podpisu spoločenskej zmluvy). Celý proces tak trvá bežne aj viac ako 18 mesiacov. Za tú dobu ale vedci stratia motiváciu, investor záujem a konkurencia je „o parník ďalej". Zároveň technológia starne, takže zámer, ktorý počítal na začiatku s exkluzivitou patentu napríklad 15 rokov, má už len na dosiahnutie komerčného úspechu 13 rokov a cesta na trh ešte nejaký čas potrvá. To výrazne zmení celý obchodný plán a potenciál projektu.

Ako je teda na tom legislatívny proces v ČR v súvislosti s TT a konkrétne zakladaním inovatívnych spoločností (univerzitných spinoffov, spinoutov) a v čom je nutné ho zmeniť, respektíve zdokonaliť?

Priznám sa, že príprava legislatívy nie je úplne „moja parketa" a do pripomienkovania procesu sa veľmi nezapojujem.
Špeciálnu legislatívu k tomuto variantu transferu považujem za celkom adekvátne nastavenú. Problémom je skôr výklad niektorých inštitúcií a nastavenie výrazne prísnejších interných pravidiel, ktoré celému procesu škodia. Samozrejme, vždy sa dá zjednodušiť aj samotný proces legislatívne, ale tu je nutné mať na pamäti, že transfer technológií zahŕňa poskytnutie oprávnení k patentom alebo iným právam duševného vlastníctva, ktoré vznikli za verejné peniaze. Takže forma, v ktorej musia schvaľovať orgány Akademie věd alebo Správna rada univerzity, je asi adekvátna. Neadekvátny je ale prístup, keď sú tieto zámery podrobené značným požiadavkám na podklady, plány a dokumentáciu nutnú pre ich schválenie, ktoré sú často zbytočné alebo úplne nereálne. Ako príklad uvediem interné pravidlá jednej univerzity, ktoré žiadali po vedcoch predloženie zahajovacej rozvahy novozakladanej spoločnosti, audit účtovníctva všetkých osôb, ktoré budú v novom startupe

Mikuláš Vargic na podujatí COINTT 2023.

MIKULÁŠ VARGIC

Mikuláš je českým advokátom špecializujúcim sa na akademické spinoff spoločnosti. Vo svojej praxi sa zameriava výlučne na právnu pomoc biotechnologickým spinoff spoločnostiam, licencovaniu a transferu technológií. Pomáha klientom vo všetkých fázach prípravy, zakladania a financovania spinoff spoločností. Jeho hlavnou devízou je prehľad o technických a obchodných aspektoch každej transakcie. Medzi jeho klientov patrí rad úspešných spinoff spoločností, investorov alebo výskumných inštitúcií a univerzít. Podieľal sa na založení investičného fondu i&i Biotech Fund, príprave finančných investícií do spinoff spoločností od súkromných investorov, priemyslových korporácií, investičných fondov alebo business angels. Mikuláš hovorí česky, slovensky a anglicky a môže poskytnúť poradenstvo v ktoromkoľvek z týchto jazykov. Mikuláš vyštudoval právo na Masarykovej univerzite v Brne a na Univerzite v Antverpách v Belgicku.

spoločníkmi a ďalšie podobné dokumenty. Zároveň prikazovali vedcom predkladať po založení dokumenty (napríklad účtovné výkazy) v lehotách, ktoré nie je možné stihnúť. V tomto smere vidím veľký priestor na zlepšenie a optimalizáciu procesov – napríklad nastavenie štandardného zoznamu dokumentov vrátane ich vzorov a rozsahu, nastavenie schvaľovacích lehôt pre príslušné orgány a pod. Veľmi by to pomohlo predvídateľnosti, transparentnosti a efektivite celého procesu.
Veľké možnosti zlepšenia ale existujú v rámci všeobecných predpisov, ktoré upravujú podnikanie ako také (predovšetkým flexibilita zákona o obchodných korporáciách, fungovanie elektronickej komunikácie s úradmi a pod.). Veľmi zastaralé nastavenie niektorých prvkov obchodných spoločností alebo nevhodné nastavenie ESOP programov sú určite veci, ktoré je nutné rýchlo zmeniť, ak chceme ostať konkurencieschopní. Často je vidieť v inovatívnych spoločnostiach, že svoje podnikanie presunú do zahraničia a v rámci ČR majú len dcérsku spoločnosť. Dôvodom je predovšetkým kvalitne nastavený právny systém, predvídateľnosť rozhodovania štátnych orgánov a nastavené štandardy.
V tomto smere ma milo prekvapili niektoré legislatívne zmeny na Slovensku, kde je vidieť inšpiráciu ČR a snahu poučiť sa z chýb alebo nevhodných nastavení. Som síce Slovák, ale právnické vzdelanie aj celkovú prax mám v ČR, takže som slovenské právne prostredie v tomto smere nesledoval a až diskusie s kolegami v rámci COINTT 2023 mi trochu pomohli sa zorientovať.

Popíšte, prosím, priebeh spolupráce s CasInvent Pharma a. s.

Spoločnosť Casinvent Pharma sme pomáhali zakladať v rámci biotechnologického inkubátora i&i Prague už vo fáze projektu, keď tím inkubátora pracoval na overení myšlienky, vedeckého základu a business modelu a my sme sa snažili nájsť vhodný formát na založenie spoločnosti, nastavenie corporate governance alebo sme navrhovali riešenia vhodné na to, aby univerzita mohla mať v tejto spoločnosti podiel. Následne sme pomáhali pripravovať licenciu k patentom a know-how a časom sme sa stali poradcami spoločnosti a pomáhame im s celou právnou agendou.

Aktuálne to zahrňuje prípravu zmlúv s obchodnými partnermi z verejného aj súkromného sektora, prípravu pracovnoprávnej dokumentácie vrátane interných predpisov, vyjednávanie a prípravu zmlúv s investormi a pod.

Ide o podobné procesy ako v spolupráci s VDI Technologies, s.r.o. ?

V prípade tejto spoločnosti nás najal priamo tím, ktorý celý zámer založiť inovatívny startup v rámci Ústavu přístrojové techniky pripravoval. Našou prvou úlohou bolo posúdiť ich zámer po právnej stránke, navrhnúť vhodné riešenie a formát založenia spoločnosti a pripraviť spoločnosť na vstup investora a materskej inštitúcie. Následne sme spoločnosti pomáhali s procesom schvaľovania v rámci Akademie věd a dohodovali zmluvy o spolupráci, licenčné zmluvy a ďalšie dohody nutné na bezproblémové fungovanie podnikania.
Spoločnosti v tejto fáze pomáhame s certifikáciou ich unikátneho zdravotníckeho prostriedku, zaistením ďalšieho financovania a celou právnou agendou v rámci ČR.

Spolupracujete aj s mnohými univerzitami, medzi ktoré patrí napríklad aj Technická univerzita v Liberci. Aké má takáto spolupráca špecifiká?

Spolupráca s univerzitou je v tomto prípade špecifická, pretože väčšina univerzít v ČR sa snaží o to, aby zodpovednosť za zakladanie inovatívnych spoločností bola prenesená na dcérske spoločnosti, založené výhradne za týmto účelom. Tento variant je osvedčený zo zahraničia, rieši niektoré problémy spojené s dlhým schvaľovacím procesom a pomáha efektivite zakladania. Univerzity ale bojujú s tým, že presadiť si vnútorne založenie špecializovanej entity býva veľmi komplikované a často sa tiahne dlhé roky. The university Company TUL je v tomto prípade špeciálna, pretože svoju spoločnosť už mala od začiatku 90. rokov, akurát slúžila na iné účely, z ktorých väčšina v priebehu rokov prestala byť potrebná.
Najvhodnejšie sa preto zdalo zmeniť účel tejto spoločnosti na transfer technológií, nastaviť jej interné procesy a vzťah s univerzitou, a vybrať vhodnú formu financovania a riadenia. To sa nakoniec podarilo a spoločnosť tak začala fungovať inak. Ondřej Moš, ktorý spoločnosť TUL vedie, už k tomuto procesu poskytol rozhovor a určite o vnútornom nastavení vie povedať oveľa viac. Aktuálne sa im snažíme pomôcť s prípravou dokumentácie pre spinoff spoločnosti, riešením niektorých interných procesov alebo, napríklad s preškolením zamestnancov v špecifických právnych oblastiach.

Autor:
Martin Karlík

Foto:
CVTI SR

DO UNIVERSITIES INVESTING IN TECHNOLOGY TRANSFER VIA PATENTING LOSE MONEY?

ABSTRACT Substantial investments are made in universities patenting new developments to pursue a return. To gauge the impact of the holistic costs of patenting at universities, this study provides a new methodology for quantifying the investment in intellectual property (IP) that includes not only technology transfer staff costs but also direct and opportunity faculty-related costs. It then uses the novel methodology and publicly accessible data on an average American research university case study. The results found all component costs were higher than the IP-related income, with the opportunity cost for writing patents instead of grants being more than 33 times the income realized through IP protection. Overall, the case study university loses over $9 million per year on IP with a negative ROI of -97.6%. Research universities have opportunities to increase research income >10% by ignoring IP. It is clear that Bayh-Dole Act and similar national legislation, is harming university economics. It can be concluded that as generally practiced in the U.S. now, it is not rational to continue to support university technology transfer by patents. Instead, to improve the economic bottom lines of universities, as well as increase the good that research and development does for society, universities can open source all innovations.

INTRODUCTION

The Patent and Trademark Law Amendments Act (known as the Bayh-Dole Act) standardized U.S. federal policy to encourage university grant recipients to patent inventions in order to encourage commercialization of tax-funded research (1980). One result of the Bayh-Dole Act was an explosion of technology transfer offices (TTOs) to support the commercialization of research and development first in the U.S. and then throughout the rest of the world as there was early economic success from a handful of universities (Bertha, 1996; Siegel & Wright, 2007; Holgersson & Aaboen, 2019). Generally, TTOs focus on IP protection including patenting (Chapple, et al., 2005; Rothaermel, et al. 2007), licensing and in some case spin-off companies (Siegel, et al., 2007). Bayh–Dole proponents argue that academic patent licensing has created $30 billion per year in the U.S. and created hundreds of thousands of new jobs (Pressman et al., 2017). Evidence for these claims is weak, however, as in general, research has found little impact from the Bayh-Dole Act for universities to actually increase technology commercialization (Henderson et al., 1998; Mowery et al., 2001; Mowery & Ziedonis, 2002). A constant stream of researchers critique the established view of IP being managed by universities (Sorensen & Chambers, 2008; Kenney & Patton, 2009; Greenbaum & Scott, 2010; Hall, et al., 2014; Kochenkova, et al., 2016; Holgersson & Aaboen, 2019) and even begun to reconsider the Bayh-Dole Act's impact on invention at universities as a whole (Kenney & Patton, 2009). In addition, in a detailed review of the evidence Ouellette & Weires (2019) found many authors argued that Bayh–Dole costs simply outweigh the benefits (e.g. monopolistic inefficiencies (Granstrand, 1999) including raising the price of knowledge goods for both consumers and follow-on innovators (Pearce, 2012), many of whom already paid for the initial research through taxes. This bridges into the wider debate over whether intellectual property or 'intellectual monopolies' (Boldrin & Levine, 2002; 2005; 2008; 2009) of

any kind are even a benefit to innovation (Takalo & Kanniainen, 2000) or the public good are far from complete (Pagano, 2014).

The question of benefits from pursuing IP at the individual university level should be far clearer. What if university decision makers only consider the economics from the university point of view? Graphs provided by the Association of University Technology Managers (AUTM) surveys show massive aggregate revenues form licensing IP growing year after year with but tiny nearly flat legal fees over decades (Ouellette & Weires, 2019). A non-critical look at these simple graphs makes it appear that there is a financial gain for the universities in pursuing IP. Thus, it is not surprising to observe the proliferation of TTOs throughout the world. The AUTM survey data on the costs to the universities for IP, however, is woefully incomplete as it only considers legal fees. It does not include litigation expenses or the technology and transfer office operating expenses (Ouellette & Weires, 2019). There have been some indications of the actual economics of IP protection, as the survey of AUTM members found that just under half brought in more revenue than their operating costs (Abrams et al., 2009). These analyses are obviously potentially embarrassing to technology transfer offices and are no longer provided in the latest surveys by their Association (AUTM, 2020). Even these surface analyses, however, were incomplete as they ignored other real costs to universities for patenting such as the opportunity costs for faculty to participate in the time-consuming patenting process.

This leads to an important question: Do investments by universities including their technology transfer offices for patenting intellectual property developed by the university provide a rate of return? To provide a concrete answer to that question and begin to gauge the impact of a more holistic costs of university patenting this study provides a new methodology for quantifying the investment of universities in IP. It then uses the novel methodology on a case study using real numbers from the average research university in the U.S. The results are discussed in the context of appropriate research policy for universities regardless of Bayh-Dole Act or similar national legislation in other countries.

METHODS

A university investment in IP is determined by four parts. First, there is the cost of legal fees excluding litigation, which has already been shown to be trivial (Ouellette & Weires, 2019). Second the cost of litigation, which is highly variable. On average, a university accrues $2 million in legal expenses (Merrill, Migliozzi & Decker, 2016). The final two costs, however have not been quantified previously, which include the direct investment in technology transfer office staff and their overhead as well as the direct costs of faculty time as well as their opportunity costs. These values can all be determined from publicly-available data.

To calculate the technology transfer office staff costs (C_{staff}) equation (1) is used:

$$C_{staff} = \sum_{k=1}^{n} s_k \times \left(1 + b_k + o\right)$$

[USD] (1)

Where s is the salary of a IP-focused staff member k, n is the number of staff members in the technology transfer office, b_k is the fringe benefits rate (%) for staff member k and o is the overhead rate, which is also referred to the facilities and administrative (F&A) cost (%). The staff can generally be found on the university's public technology transfer website and for many publicly-funded universities their salaries, benefits and the university's F&A rates are available. It should also be noted that the often-inflated values of the executive team's salaries, which often oversee university IP were not included (Pearce, 2016a), again to be conservative.

Love (2014) points out that university patent programs reduce both the quantity and quality of university research by interfering with professors' ability to obtain research funding, to collaborate and to disseminate their work. Quantifying all of these costs will be left for future work, however, here the first of

these costs will be estimated. As a first approximation it is assumed that that IP related documents (DIP) that are public record including patent disclosures, nondisclosure agreements, patents and license agreements all took the equivalent amount of time for a professor to write as for a peer-reviewed article (DPR) each to produce. Similarly, it is assumed that the time to write an IP related document is equivalent to writing grant proposal.

The number of peer-reviewed articles for a given year for a particular university can be found from Google Scholar. Thus, as it is assumed that faculty research time in total is made up of generating documents for patents, papers and grants the percent of research time invested for all the faculty at a given university for generating IP (P_{IP}) is given by:

$$P_{IP} = \frac{D_{IP}}{D_{IP} + D_{PR} + D_g}$$

[%] *(2)*

This value can then be used to determine the direct costs and opportunity costs related to IP protection by expending faculty research time. The direct costs for this IP generating investment from faculty (C_{fac}) can be determined by:

$$C_{fac} = \left(S_{ave} \times \left(1 + b_{fac}\right)\right) \times r \times P_{IP} \times n_{fac}$$

[USD] *(3)*

Where S_{ave} is the average faculty salary, b_{fac} is the average faculty benefits (%) and r is the research percent of the total faculty working time (normally divided between teaching, research and outreach).
In addition to the direct cost (I_{fac}), there is an opportunity cost to faculty writing patents instead of grants given by the average grant value times the average success rate and the number of IP related documents:

$$I_{fac} = \left(\frac{G}{D_g}\right) \times D_{IP} \times \frac{g_w}{D_g}$$

[USD] *(4)*

Where G is the total revenue in a year from grants in USD, g_w is the number of grants won and D_g is the number of grants submitted. The number of grants submitted, won and the value can normally be obtained from the research office of a university.

Thus, the overall cost of the investment in IP in a year for a university is given by:

$$I_{IP} = C_{staff} + C_{fac} + I_{fac} + \alpha + \beta$$

[USD] *(5)*

Where α is the cost of legal fees and β is the cost of litigation. To be extremely conservative, these costs are often obscured by university administrators, and as some schools do not litigate around their IP, these legal costs will not be included in the representative case study here.

Finally, the direct economic benefits of university IP protection are given by:

$$B_{IP} = \sum_{i=1}^{m} s_i + \sum_{j=1}^{o} l_j$$

[USD] *(6)*

Where m is the total number of patents sold in a year, s_i is the value in USD for sales of patent i, o is the total number of licenses in a year and l_j is the license income from j intellectual property. B_{IP} can generally be found in university marketing documents as this is a positive value.

Thus, the return on investment (ROI) for IP at universities is:

$$ROI = \frac{B_{IP} - I_{IP}}{I_{IP}}$$

[%] *(7)*

CASE STUDY

Michigan Technological University (MTU) is a U.S. public research university founded in 1885. It was selected as it is about average for research expenditures for research universities in the U.S. as determined by the National Science Foundation (NSF, 2019). The performance of most research universities would be expected to be below it for IP income as would all non-research related universities.

The relevant staff were identified from the University's research staff page (MTU, 2021a). The salaries of the identified staff were determined from the public posted annual salaries (MTU, 2021b). Note, to remain conservative again the secretarial staff were not included only the main IP-related staff. The research expenditures, IP-related income and costs were available from a Vice President of Research (VPR) Annual Report (Reed, 2020).

The values for the IP-related staff are summarized in *Table 1* and all other input parameters are shown in *Table 2* along with their sources. It should be noted that all data is for 2020 other than the grants received where 2019 was used to more realistically represent the income that generated the IP in 2020.

Staff Needed for IP	**Salary**
Associate Vice President for Research Administration	$168,300
Manager of Agreements and Operations, Innovation & Commercialization	$65,225
Director of Technology Commercialization, Innovation & Commercialization	$79,549
Director of Technology Business Incubation	$61,973
Total (Σ s_k)	$375,047

Table 1. *IP-related staff and salaries (MTU, 2021b).*

Variable	**2020 Values**	**Sources**
Fringe rates faculty (b_k,b_{fac})	0.426	(MTU, 2021c)
Overhead (o)	0.546	(MTU, 2021d)
IP output (D_{IP})	164	(Reed, 2020)
Disclosures Received	25	(Reed, 2020)
Nondisclosure Agreements	97	(Reed, 2020)
Patents Filed or Issued	26	(Reed, 2020)
License Agreements	16	(Reed, 2020)
Grants submitted 2019 (D_g)	982	(Reed, 2020)
Non IP output - D_{PR}	2,250	(Google Scholar, 2022)
Average faculty salary (S_{ave})	$96,243	(UStats, 2021)
Percent of time on research (r)	0.4	Faculty performance review
Number of faculty (n_{fac})	396	(UStats, 2021)
Research Income (G)	$ 71,814,095	(Reed, 2020)
Grants written 2019 (D_g)	982	(Reed, 2020)
Grants won 2020 (g_w)	609	(Reed, 2020)
License income all sources (B_{IP})	$221,391	(Reed, 2020)

Table 2. *Input data for MTU.*

RESULTS

It is clear from a precursory evaluation of the input parameters that the economic gain from IP protection is dwarfed by the costs. The IP-related staff costs alone are more than 3 times what the case study university sees in IP-related income. A deeper look at the analysis shows that IP-economic performance is much worse than that because the staff costs are actually a smaller piece of the investment pie as the results of calculating equation 1, 3 and 4 show in *Figure 1*. Somewhat surprisingly, the direct cost of faculty investing their time in writing patents (blue area) is larger than the entire staff costs associated with intellectual property protection (green area). Perhaps even more striking is that the indirect costs of faculty time associated with IP chasing dwarf all the other costs. This is the opportunity cost lost when faculty invest time in patents. Thus, the yellow area in *Figure 1* is the additional grant income the university would expect to receive if the faculty wrote grants instead of patents based on their current success rate. This value is more than 33 times the income realized through IP protection!

Figure 2 shows the total cost of IP investments (black box) compared to the IP-related economic benefits (green box). As can be seen in *Figure 2*, the case study university loses more than $9 million per year pursuing IP. The ROI for this investment is -97.6%.

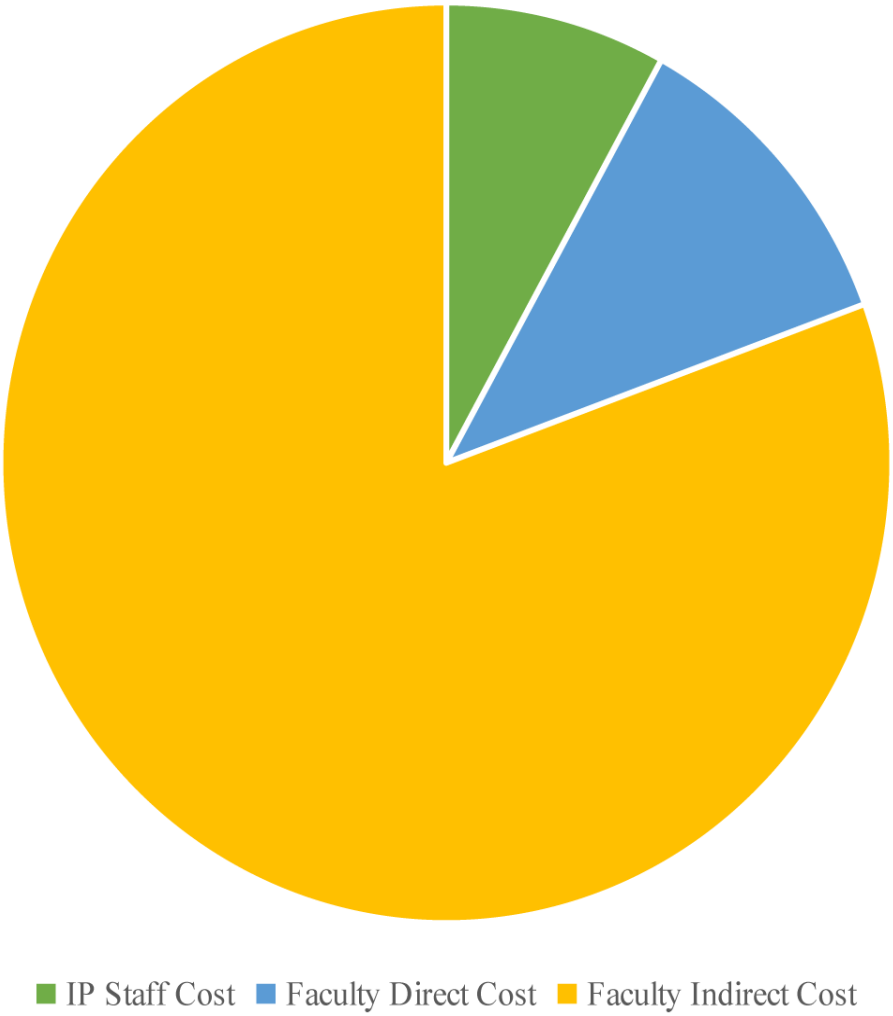


Figure 1. *The share of costs (investment) associated with university intellectual property in case study.*

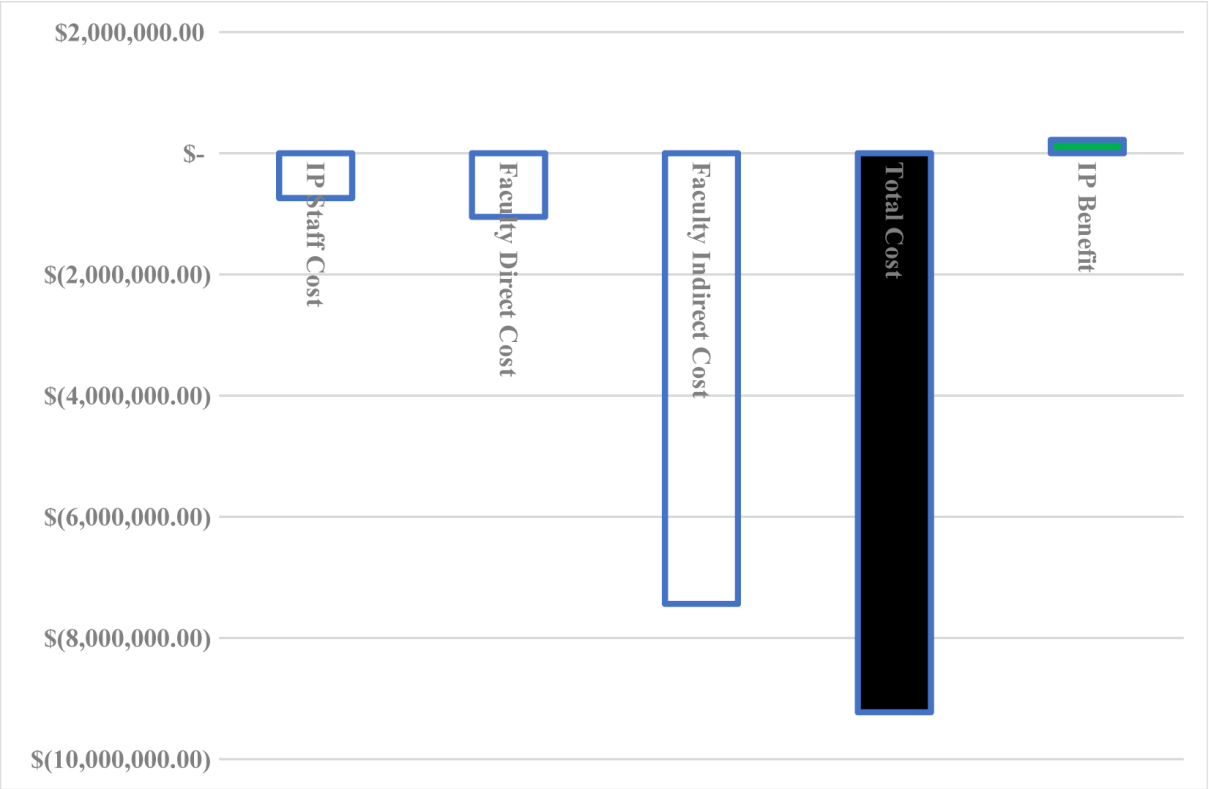


Figure 2. *Investment costs and benefits for IP protection at case study university.*

DISCUSSION

It is clear from the results of this case study that it is not rational for the case study university to invest in IP at all. It can be inferred that at least half of the U.S. universities are in the same situation, where the investment costs completely overrun any form of IP related income. This study adds to the volume of literature that questions the utility of the Bayh-Dole Act. In addition, for the first time, this study showed how important the faculty costs (both direct and opportunity) are for making decisions about investing in IP. Future work is needed to apply the methods shown here to the top tier universities that demonstrate high patent-related incomes as well as universities throughout the globe that have emulated the IP-strategies championed in the U.S.

In addition, to the abysmal negative returns observed in the results here, there is also considerable evidence that even when universities do make some IP-related net income, very little of it is useful for actual technology transfer. For example, Love et al., found that only 11% of academic U.S. patent sales bear the hallmarks of technology transfer (e.g. purchased with the intent to commercialize) and the other purchases appear to have been either defensive acquisitions by operating technology companies or purchases by nonpracticing entities (e.g. patent trolls) (2020). Future work is needed to determine the cost to society for universities providing IP to patent trolls.

There is also evidence that the entire incentive structure underpinning Bayh-Dole does not work. Although some studies had reported that higher inventor royalties lead to more university licensing income, Ouellette & Tutt (2020) found that the earlier results were driven by coding errors. In addition, they found "no compelling empirical evidence that increasing university inventors' royalty share has a significant effect on any of the outcomes." These results are supported by two recent interview

studies, one in the U.S. (Pearce et al., 2022) and one in Canada (Pearce, et al., 2022b) that showed the vast majority of university researchers would support giving away all of their IP for access to an open source endowed chair. Given the results shown here that appears to be a rational decision based on economic grounds alone.

For all the concerns about the negative implications of universities acting like corporations (Washburn, 2008), universities have so far remained blinded to the fact that pursuing patents is generally a money losing proposition (Merrill, Migliozzi & Decker, 2016). Instead, VPR offices pretend that gaining IP rights is the success factor rather than generating revenue (like a business) or benefits to society (like a non-profit) (Kirchberger & Pohl, 2016). For example, using the case study university again, the annual reports proudly display the invention disclosures per $10 million of research expenditures (Michigan Tech. 2022), which compares favorably to other universities. This ratio, is meaningless, not only because of the tiny fraction of invention disclosures that result in patents and the even smaller number that result in any form of revenue, but generating invention disclosures has no inherent value. As these invention disclosures are not peer-reviewed, using them to track innovation is of little more substance than quantifying TikTok or Instagram posts. Interestingly, the same cognitive error appears to be occurring among university administrators that has millions of teenagers hoping to become rich by becoming influencers on social media platforms (Fietkiewicz, et al., 2018), while only a tiny fraction will ever have enough followers to earn a real salary (Scipioni, 2021). Similarly, although a few universities have seen income from IP, the vast majority do not (Merrill, Migliozzi & Decker, 2016; Abrams, et al., 2019), and as this study has shown are likely losing millions of dollars a year.

Abrams, et al., found that overall, universities spend only 0.59% of their research budgets, which exceed $50 billion annually, on converting research to IP (2009). The results of this study are in line with this even though the constituents of IP investing were different (here it was 0.3%) and it still does not make economic sense for universities to pursue IP. Abrams, et al., found that in the U.S. only 16% of universities kept enough of the income from IP they generated to cover their costs (2009). They did not, however, calculate the faculty direct and indirect costs as shown here, so their results were massively overly optimistic. Yet, despite these poor numbers even from optimistic estimates, gushing support of Bayh-Dole that was published in Science by Loise & Stevens actually arguing that these numbers "simply verifies the institutional mission of the research enterprise: getting science into the public's hands." (2010). They are literally arguing that is praise-worthy for universities to lose money creating money-losing locked-down IP. This is unfounded and incorrect in light of the overwhelming evidence that proprietary IP is not necessary to commercialize innovations and 'get it into the public's hands' (Key, 2017). A plethora of studies, demonstrated business models and current IP management practices in the private sector that endorse alternative to patenting, such as openly publishing new inventions and releasing inventions with free and open source licenses (Goth, 2005; Krishnamurthy, 2005; Bonaccorsi, et al., 2006; Henkel, 2006; Chang, et al., 2007; Munga, et al., 2009; Perr et al., 2010; Holgersson, et al., 2018; Ziegler, et al., 2014; Pearce, 2017; Franz & Pearce, 2022). Open source strategies are particularly well-positioned for publicly-funded research (Parth & David, 1994; Bogers, et al., 2018; David, 2003) and can provide strategic national policy objectives (Heikkinen, et al., 2020). Finally, Greenbaum & Scott (2010) point out that most TTOs "will never turn a profit, drain limited university resources and potentially hinder innovation and knowledge transfer" (p. 55). The results of this study further bolster this conclusion, but shows that universities have the opportunity to increase their research income by more than 10% (case study showed 12.7%) by cutting costs (eliminating all IP protection-related investments). It is clear that following the U.S. lead to lock down university IP is an economic mistake. Universities in other countries should carefully do full cost accounting on their own IP investments.

Instead of investing in IP, for both their bottom line and the good of society universities can open source all innovations developed. Even for open hardware, based on downloaded substitution value alone (Pearce, 2015), the funding of open source development generally provides a very high return on investment (Pearce, 2016b) as compared to the deeply negative returns found here. For example, free and open source scientific hardware represents an 87% savings over proprietary offerings per instrument (Pearce, 2020) and its development can be scaled through lateral distributed manufacturing (Dupont et al., 2021).

CONCLUSIONS

This study provided a new methodology for calculating the full costs of intellectual property protection at universities. The results of applying this methodology to an average research university in the U.S. showed that it is not economic to invest in IP protection and patents. As generally practiced in the U.S. now it is not economically rational to continue to support TTOs. Instead, to increase the economic bottom line of the university as well as increase the good that university research does for society universities can open source all their innovation.

Availability of data and material: Available upon Request
Funding: This study was supported by the Thompson Endowment.
Acknowledgments: None
Declarations of interest: None.

REFERENCES

Abrams,I. Leung, G. Stevens, A. J. How US academic licensing offices are tasked and motivated—Is it all about the money? *Research Management Review* **17** (2009). https://www.wpi.edu/sites/default/files/docs/Offices/Intellectual-Property/How_are_US_Academic_Licensing_Offices_Organized_Tasked_Financed_and_Motivated_--_Final.pdf

AUTM. AUTM 2020 Licensing Activity Survey. https://autm.net/AUTM/media/SurveyReportsPDF/FY20-US-Licensing-Survey-FNL.pdf

Bayh-Dole Act, Pub. L. No. 96-517, 94 Stat. 3019 (1980) (codified as amended at 35 U.S.C. §§ 200-211).

Bertha, S.L., 1996. Academic research: policies and practice. *Journal of ethnopharmacology*, *51*(1-3), pp.59-73.

Bogers, M., Chesbrough, H. and Moedas, C., 2018. Open innovation: Research, practices, and policies. *California management review*, *60*(2), pp.5-16.

Boldrin, M. and Levine, D., 2002. The case against intellectual property. *American Economic Review*, *92*(2), pp.209-212.

Boldrin, M. and Levine, D.K., 2005. The economics of ideas and intellectual property. *Proceedings of the National Academy of Sciences*, *102*(4), pp.1252-1256.

Boldrin, M. and Levine, D.K., 2008. Against intellectual monopoly.

Boldrin, M. and Levine, D.K., 2009. Does intellectual monopoly help innovation?. *Review of Law & Economics*, *5*(3), pp.991-1024.

Bonaccorsi, A., Giannangeli, S. and Rossi, C., 2006. Entry strategies under competing standards: Hybrid business models in the open source software industry. *Management science*, *52*(7), pp.1085-1098.

Chang, V., Mills, H. and Newhouse, S., 2007. From Open Source to long-term sustainability: Review of Business Models and Case studies. In *Proceedings of the UK e-Science All Hands Meeting 2007*. University of Edinburgh/University of Glasgow (acting through the NeSC).

Chapple, W., Lockett, A., Siegel, D. and Wright, M., 2005. Assessing the relative performance of UK university technology transfer offices: parametric

and non-parametric evidence. *Research Policy, 34*(3), pp.369-384.

David, P.A., 2003. The economic logic of "open science" and the balance between private property rights and the public domain in scientific data and information: a primer. *The role of the public domain in scientific and technical data and information*, pp.19-34.

Dupont, L., Kasmi, F., Pearce, J.M. and Ortt, R., 2021. " Do-It-Together": Towards the Factories of the Future.

Fietkiewicz, K.J., Dorsch, I., Scheibe, K., Zimmer, F. and Stock, W.G., 2018, July. Dreaming of stardom and money: Micro-celebrities and influencers on live streaming services. In *International Conference on Social Computing and Social Media* (pp. 240-253). Springer, Cham.

Franz, J., Pearce, J.M. (2022). Making the Tools to Do It Together: Open-Source Compression Screw Manufacturing Case Study. *Journal of Innovation Economics & Management* (in press).

Google Scholar., 2022. https://scholar.google.com/scholar?q=%22michigan+technological+university%22&hl=en&as_sdt=0%2C5&authuser=1&as_ylo=2020&as_yhi=2020

Goth, G., 2005. Open source business models: ready for prime time. *IEEE Software, 22*(6), pp.98-100.

Granstrand, O., 1999. The economics and management of intellectual property. *Books*.

Greenbaum, D. and Scott, C., 2010. Hochschullehrerprivileg—A modern incarnation of the professor's privilege to promote university to industry technology transfer. *Science, Technology and Society, 15*(1), pp.55-76.

Hall, J., Matos, S., Bachor, V. and Downey, R., 2014. Commercializing university research in diverse settings: moving beyond standardized intellectual property management. *Research-Technology Management, 57*(5), pp.26-34.

Henderson, R., Jaffe, A.B. and Trajtenberg, M., 1998. Universities as a source of commercial technology: a detailed analysis of university patenting, 1965–1988. *Review of Economics and statistics, 80*(1), pp.119-127.

Henkel, J., 2006. Selective revealing in open innovation processes: The case of embedded Linux. *Research policy, 35*(7), pp.953-969.

Heikkinen, I.T.S., Savin, H., Partanen, J., Seppälä, J. and Pearce, J.M., 2020. Towards national policy for open source hardware research: The case of Finland. *Technological Forecasting and Social Change, 155*, p.119986.

Holgersson, M., Granstrand, O. and Bogers, M., 2018. The evolution of intellectual property strategy in innovation ecosystems: Uncovering complementary and substitute appropriability regimes. *Long Range Planning, 51*(2), pp.303-319.

Holgersson, M. and Aaboen, L., 2019. A literature review of intellectual property management in technology transfer offices: From appropriation to utilization. *Technology in Society, 59*, p.101132.

Kenney, M. and Patton, D., 2009. Reconsidering the Bayh-Dole Act and the current university invention ownership model. *Research Policy, 38*(9), pp.1407-1422.

Key, S. (2017) In Today's Market, Do Patents Even Matter? *Forbes*. https://www.forbes.com/sites/stephenkey/2017/11/13/in-todays-market-do-patents-even-matter/

Kirchberger, M.A. and Pohl, L., 2016. Technology commercialization: a literature review of success factors and antecedents across different contexts. *The Journal of Technology Transfer, 41*(5), pp.1077-1112.

Kochenkova, A., Grimaldi, R. and Munari, F., 2016. Public policy measures in support of knowledge transfer activities: a review of academic literature. *The*

Journal of Technology Transfer, *41*(3), pp.407-429.

Krishnamurthy, S., 2005. An analysis of open source business models.

Loise, V. and Stevens, A.J., 2010. The Bayh-Dole Act turns 30. *Science translational medicine*, *2*(52), pp.52cm27-52cm27.

Love, B.J., 2013. Do university patents pay off-evidence from a survey of university inventors in computer science and electrical engineering. *Yale JL & Tech.*, *16*, p.285. https://openyls.law.yale.edu/bitstream/handle/20.500.13051/7793/Love_2_Revised.pdf?sequence=2&isAllowed=y

Love, B.J., Oliver, E. and Costa, M., 2020. US patent sales by universities and research institutes. In *Research Handbook on Intellectual Property and Technology Transfer*. Edward Elgar Publishing.

Merrill, D. Migliozzi, B. & Decker, S. 2016. Billions at Stake in University Patent Fights, Bloomberg.com. https://www.bloomberg.com/graphics/2016-university-patents/

Michigan Tech. 2022. 2020 Invention Disclosures Per $10 Million of Research Expenditures https://www.mtu.edu/research/about/stats-data/

Mowery, D.C., Nelson, R.R., Sampat, B.N. and Ziedonis, A.A., 2001. The growth of patenting and licensing by US universities: an assessment of the effects of the Bayh–Dole act of 1980. *Research policy*, *30*(1), pp.99-119.

Mowery, D.C. and Ziedonis, A.A., 2002. Academic patent quality and quantity before and after the Bayh–Dole act in the United States. *Research policy*, *31*(3), pp.399-418.

MTU (2021a) Research Staff https://www.mtu.edu/research/people-departments/staff/

MTU (2021b) Michigan Technological University Annual Salary of Faculty and Staff Postions. https://www.mtu.edu/hr/docs/salaries.pdf

MTU, 2021d. https://www.mtu.edu/fso/reports/rates/pdfs/fy21-24-f-and-a-rates.pdf

MTU, 2021c. F&A Rates. Fringe rates https://www.mtu.edu/fso/reports/rates/pdfs/pred-fringe-rates-fy22.pdf

Munga, N., Fogwill, T. and Williams, Q., 2009, October. The adoption of open source software in business models: a Red Hat and IBM case study. In *Proceedings of the 2009 Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists* (pp. 112-121).

National Science Foundation (2019) Rankings by total R&D expenditures https://ncses-data.nsf.gov/profiles/site?method=rankingBySource&ds=HERD&o=y10&s=a

Ouellette, L.L. and Tutt, A., 2020. How do patent incentives affect university researchers?. *International Review of Law and Economics*, *61*, p.105883.

Ouellette, L.L. and Weires, R., 2019. University patenting: Is private law serving public values?. *Mich. St. L. Rev.*, p.1329.

Pagano, U., 2014. The crisis of intellectual monopoly capitalism. *Cambridge Journal of Economics*, 38(6), pp.1409-1429.

Partha, D. and David, P.A., 1994. Toward a new economics of science. *Research policy*, *23*(5), pp.487-521.

Pearce, J.M., 2012. Make nanotechnology research open-source. *Nature*, *491*(7425), pp.519-521.

Pearce, J.M., 2015. Quantifying the value of open source hardware development. *Modern Economy*, *6*, pp.1-11.

Pearce, J., 2016a. Are you overpaying your academic

executive team? A method for detecting unmerited academic executive compensation. *Tertiary Education and Management, 22*(3), pp.189-201.

Pearce, J.M., 2016b. Return on investment for open source scientific hardware development. *Science and Public Policy, 43*(2), pp.192-195.

Pearce, J.M., 2017. Emerging business models for open source hardware. *Journal of Open Hardware, 1*(1), p.2.

Pearce, J.M., 2020. Economic savings for scientific free and open source technology: A review. *HardwareX, 8*, p.e00139.

Pearce, J.M., Pascaris, A.S., Schelly, C., 2022a. Professors Want to Share: Preliminary Survey Results on Establishing Open Source Endowed Professorships. https://doi.org/10.21203/rs.3.rs-1098989/v1

Pearce,J.M. Shardul Tiwari, S., Pascaris, A.S., Schelly, C., 2022b. Canadian Professors' Views on Establishing Open Source Endowed Professorships. To be published

Perr, J., Appleyard, M.M. and Patrick, P., 2010. Open for business: emerging business models in open source software. *International Journal of Technology Management, 52*(3/4), pp.432-456.

Pressman, L., Yuskavage, R. and Okubo, S., 2017. The economic contribution of university/nonprofit inventions in the United States: 1996-2015. *Biotechnology Industry Organization. Retrieved from https://www. autm. net/AUTMMain/media/ Partner-Events/Documents/Economic-_Contribution_ University-Nonprofit_Inventions_US_1996-2015_BIO_ AUTM. pdf, date, 18*, p.2018.

Reed, D. 2020. https://www.mtu.edu/research/about/stats-data/docs/bot-2020-december.pdf

Rothaermel, F.T., Agung, S.D. and Jiang, L., 2007. University entrepreneurship: a taxonomy of the literature. *Industrial and corporate change, 16*(4), pp.691-791.

Scipioni, J., 2021. Here's how many social media followers you need to make $100,000 [WWW Document]. CNBC. URL https://www.cnbc.com/2021/04/30/how-much-money-you-can-make-off-social-media-following-calculator.html Accessed 2.12.22

Siegel, D.S. and Wright, M., 2007. Intellectual property: the assessment. *Oxford Review of Economic Policy, 23*(4), pp.529-540.

Siegel, D.S., Veugelers, R. and Wright, M., 2007. Technology transfer offices and commercialization of university intellectual property: performance and policy implications. *Oxford review of economic policy, 23*(4), pp.640-660.

Sorensen, J.A.T. and Chambers, D.A., 2008. Evaluating academic technology transfer performance by how well access to knowledge is facilitated––defining an access metric. *The Journal of Technology Transfer, 33*(5), pp.534-547.

Takalo, T. and Kanniainen, V., 2000. Do patents slow down technological progress?: Real options in research, patenting, and market introduction. *International Journal of Industrial Organization, 18*(7), pp.1105-1127.

Ustats. (2021) Michigan Technological University https://www.univstats.com/salary/michigan-technological-university/

Washburn, J., 2008. *University, Inc.: The corporate corruption of higher education*. Basic Books.

Ziegler, N., Gassmann, O. and Friesike, S., 2014. Why do firms give away their patents for free?. *World Patent Information, 37*, pp.19-25.

Author:
Joshua M. Pearce [1],*
1. Ivey Business School and Department of Electrical & Computer Engineering, Western University, London, ON, Canada N6A 3K7

* https://orcid.org/0000-0001-9802-3056

FAILURE, ANOMALIES, AND SERENDIPITY: NAVIGATING THE COMPLEXITIES OF TECHNOLOGY TRANSFER THROUGH STORYTELLING

„Life can only be understood backwards; but it must be lived forwards."

Søren Kierkegaard

ABSTRACT The definitions of technology transfer have evolved over time. In fact, the terminology has shifted from technology to knowledge transfer or even knowledge valorization. This change reflects the (r)evolution that has happened: we now understand that the process is about so much more than just the one-directional movement of technology. Instead, the process is now frequently described as sharing and using of knowledge in its various forms as they vary across different scientific disciplines. What all these descriptions share is the understanding that technology transfer is inherently complex, dealing with advanced technologies that are not always easily adapted. One way of better addressing several aspects of these complexities, is through the use of storytelling.

One might argue that since the Bayh-Dole Act in the 80s enabled and propagated formal technology transfer, we have inadvertently overlooked other forms of technology transfer. Several authors note that despite expanded definitions in literature, the prevailing processes within universities remain very formal and IPR-centered (Link et al., 2007). Such an IPR-centric view can limit the understanding and scope of what technology transfer truly entails, potentially overlooking other valuable forms of knowledge and innovation that do not fit neatly within traditional IPR definitions.

KNOWLEDGE TRANSFER OFFICE AT THE UNIVERSITY OF LJUBLJANA

Formal processes at the Technology Transfer Offices are organized as a linear process, starting with scientific discovery and culminating in market entry. The Knowledge Transfer Office at the University of Ljubljana is no exception. We expect our researchers to disclose their invention; then their invention is assessed, and protected, and steps are taken towards commercialization. There are internal mechanisms in place to help speed up and streamline this process, such as an internal P.O.C fund, collaborations with mentors, incubators, and more.

However, in our office's everyday dealings, this one-directional narrative exists only on paper. The reality is far more complex. The second most significant breakthrough, after the scientific discovery itself, is determining where and how the invention can be applied. The actual process is revealed to be

The main building of the University of Ljubljana. Source: iStock.com/ShevchenkoAndrey.

fraught with failures, anomalies, and moments of serendipity, and it is in no way a straight road. Rather than concluding at market entry, a new aspect of the technology transfer process begins there, and commercialization can be seen as the first step in realizing the full potential of the invention.

UNDERSTANDING THE PROBLEM: A COMPARISON TO STARTUPS

This aligns with the startup world and the lean method it personifies, where the process starts with identifying the problems of the customers and then creating and selling the solution. Startup founders do market research before starting any product development, often pre-selling products that only exist on paper or in their heads. Market feedback is used to further refine the product. The process is iterative and non-linear by definition, involving numerous feedback loops and collaborative efforts across various sectors.

In contrast to formal processes, these can also be described as informal technology transfer, which expands beyond contractual dealings and involves more personal and less structured interactions. Both formal and informal mechanisms are crucial for effective technology transfer, as they complement each other by enhancing the overall quality and applicability of the transferred technology (Link et al., 2007; Grimpe & Hussinger, 2008). Azagra-Caro (2020) recognizes even works of literary fiction as a form of knowledge transfer. Building on Link et al. 2007 taxonomy, she suggests a third way knowledge is transferred – non-formal. This includes literary fiction or storytelling that can serve as a very efficient medium for conveying very complex scientific ideas and achievements in a format accessible to the public. They can also have a significant impact.

EXAMPLES OF NON-LINEAR APPROACHES

A prime example of a non-linear approach was Steve Jobs, an icon in the technology world. He was famous for being vehement about creating the market need rather than simply recognizing it. On the day he unveiled the Macintosh, a reporter from Popular Science asked Jobs what type of market research he had done. Jobs responded by scoffing, „Did Alexander Graham Bell do any market research before he invented the telephone?" (Isaacson, 2011).

Technology transfer offices must move beyond the linear progression as implied by the Bayh-Dole Act and the reversed process of product development in the startup world. Inventions cannot be simply transferred to the market, nor can they really count on market research, as they are ahead of the market. Instead, in technology transfer, both processes are intertwined, creating a more complex and dynamic approach.

THE ROLE OF FAILURE AND SERENDIPITY

When we factor in patent search reports, feasibility studies, clinical trials, and other assessments, the process becomes even more intricate and subject to several feedback loops all influencing each other. In this complex environment, failures, errors, and moments of serendipity are not just obstacles but integral components that reshape, reinforce, and refine the original ideas, making them stronger in the process.

As such, failure is not just inevitable but a crucial learning opportunity, where we use the knowledge gained at failure to make a better next attempt. This iterative cycle mirrors the experimental nature of the scientific method itself. Mistakes reveal the limitations of current approaches and provide invaluable insights for future endeavors. Early failures highlight fundamentally flawed assumptions, and the further along the complex journey from the lab to the market, the more we move from barely functional to perfect.

KNOWLEDGE OPPORTUNITY: A NEW LAYER OF COMPLEXITY

As if this process was not difficult enough, there is, however, (at least) another layer of complexity in the technology transfer realm. Namely, great scientific discoveries often redefine our very understanding of the world. Let us consider the case of „dark oxygen," a scientific discovery that has dominated the news and my social media recently. A multidisciplinary team of scientists led by Andrew K. Sweetman reported that oxygen can be generated in the seafloor under conditions where such production was deemed impossible. Before this discovery, the scientific community considered photosynthesis to be the Earth's only notable source of oxygen (Sweetman et al., 2024).

The discovery of „dark oxygen" has fundamentally transformed our understanding of oxygen production, and by extension, the origins of life on Earth itself. No wonder the lead scientist himself suspected faulty sensors when they first got the data back. Major scientific discoveries like this lend themselves well to the „paradigm-shifting" language of Thomas Kuhn. According to Kuhn, scientific progress is not a linear accumulation of knowledge but rather a series of transformative shifts in our understanding of the world. These shifts occur through a process that begins with „normal science," where the dominant paradigm governs research and problem-solving activities.

Over time, anomalies—observations or problems that cannot be explained by the existing paradigm—accumulate. These anomalies become more and more difficult to explain within the existing paradigm – but the normal scientists, as Kuhn calls them, are usually unable to see beyond it. As these anomalies become more significant, so do the solutions explaining them away. The ever more complicated solutions start to erode confidence in the current paradigm, leading to a crisis. Eventually, a new paradigm emerges, offering a more comprehensive understanding and solving the anomalies, thereby establishing a new period of normal science. It is not unusual for the new paradigm to come from an outsider, somebody willing to do things differently, undisturbed and unbiased by the prevailing paradigm.

These shifts that Kuhn describes are not gradual; they are revolutionary. They turn the world upside down until the revolutionary novelty in understanding becomes the new paradigm. In this environment, technology transfer professionals must be adept at managing both the push and pull forces while anticipating and navigating the paradigm shifts that redefine the landscape. This involves not just moving innovations from the lab to the market but also preparing the market for the transformative impact of these innovations.

Navigating New Horizons: Collaborative Visits to Port Luka Koper by Students, Startups, and Researchers
Source: Uniminds.si.

THE ROLE OF STORYTELLING IN TECHNOLOGY TRANSFER

Another lengthy quote by Steve Jobs further illustrates this point: „Some people say, 'Give the customers what they want.' But that's not my approach. Our job is to figure out what they're going to want before they do. I think Henry Ford once said, 'If I'd asked customers what they wanted, they would have told me, 'A faster horse!' People don't know what they want until you show it to them. That's why I never rely on market research. Our task is to read things not yet on the page" (Isaacson, 2011).

As we have seen, in Jobs' eyes, a true innovator is not just a particularly lucid observer of the paradigm shift but, to a large extent, a catalyst for it. Innovators create something that fundamentally alters the existing paradigm, causing the shift to happen. Innovators are visionaries, capable of seeing and creating outside their immediate context. If we want to see more groundbreaking technologies reach the market, then it must be the job of technology transfer officers to complement those skills if the inventors are lacking in them.

THE TIMING OF INNOVATION

The more inventions are pioneering, the more they outpace customer demand, and their impact on the market can only be assessed in hindsight. The innovative process thus demands being one step ahead, with the understanding that the appreciation and success might take quite some time, depending on how long the world will need to catch up to the vision. Here, let me draw on Kierkegaard's aphorism, „Life can only be understood backwards; but it must be lived forwards," as it perfectly describes the paradox of retrospective understanding and forward-facing action that we face daily in technology transfer.

That is to say, innovation often outpaces the solutions to current problems, not (yet) solving challenges that we have and addressing challenges that we cannot even recognize yet. This mismatch in timing illustrates the complexity of the world technology transfer. Technology transfer is sailing willingly into uncharted territory, equipped only with our understanding of the past journeys, not the waters we are currently navigating.

THE PRACTICALITY OF STORYTELLING

In essence, storytelling not only serves as a practical tool but also resonates with the deeper understanding of how we navigate and make sense of innovation. As Kierkegaard's philosophy suggests, while the full impact of these technological advances may only be understood in retrospect, the forward-looking narrative crafted through storytelling can bridge the gap between invention and market readiness, ultimately guiding innovations through the tumultuous and often serendipitous path from the lab to real-world application.

But why is this so important? In the context of inventions and technology transfer, we often find ourselves at the forefront of these paradigm shifts. Our role involves identifying, developing, and commercializing innovations that may still be in the anomaly phase, ahead of widespread acceptance. In technology transfer, aligning research with market needs is key, but as Jobs showed, true success comes when technology reveals the needs that society didn't know it had.

This pioneering position inherently presents significant challenges. The market is frequently unprepared for these advanced technologies, leading to resistance and slow adoption. The difficulty lies not in the innovation itself but in the timing—technology transfer professionals must navigate the precarious gap between groundbreaking scientific advancements and market readiness, often pushing the envelope before a paradigm shift fully takes hold. This underscores the critical need for strategic foresight and robust support systems to bridge the divide and facilitate smoother transitions from innovative discovery to mainstream application.

STORYTELLING AS A TOOL FOR ENGAGEMENT

This brings us to storytelling. Steve Jobs was celebrated not only for his visionary approach to technology but also for his exceptional storytelling abilities. Many have noted that Jobs' storytelling was a key element of his success, turning complex technology into accessible and emotionally engaging stories that helped define Apple's identity.

Storytelling can be a powerful tool that helps make sense of these complicated and conflicted realities, but it is often underused. The effectiveness of storytelling is not just anecdotal; it is backed by substantial scientific evidence from various fields: from neuroscience to cognitive psychology.

First, storytelling helps in framing anomalies in a positive light, making them more palatable and even desirable to investors and collaborators. The same is true for failures. Take, for instance, the discovery of penicillin. What is now considered a great discovery that revolutionized medicine was actually a somewhat failed experiment that resulted in a mold (penicillium notatum) in petri dishes. Alexander Fleming observed that the bacteria surrounding the mold had died. Despite this significant finding, penicillin was not commercially produced until World War II due to the lack of a procedure for its mass development and other obstacles that are all too well known to anyone trying to bring something from the lab to the market. No doubt that the immense need arising from war casualties incentivized and sped up its production.

THE UNEXPECTED PATHS TO SUCCESS

Another famous example is Viagra, one of the most influential and controversial drugs of the last 30 years. Initially, one of the main ingredients was developed to treat heart conditions. However, what was first observed as an unpredicted side effect turned out to be a blockbuster drug. Both cases showcase that embracing and reframing the unexpected can lead to significant success. Stumbling upon unexpected breakthroughs or pivoting from initial failures can ultimately lead to significant advancement.

The cases also show the importance of foresight in tech transfer, particularly in recognizing when an anomaly could lead to a paradigm shift. While researchers are easily trapped inside „normal science," technology transfer professionals need to practice staying ahead of these shifts.

Cultivating Innovation: Researchers, Students, and Industry Unite for Collaborative Growth at a tomato producer Paradajz. Source: Uniminds.si.

THE EMOTIONAL IMPACT OF STORYTELLING

Secondly, neuroscience has shown that our brains are wired to respond to stories. When we hear a story, our brains release oxytocin, a hormone associated with empathy and emotional connection. This makes stories not just memorable but also emotionally engaging. According to research by Paul Zak, a professor of economics, psychology, and management, oxytocin is produced when we are trusted or shown kindness, and it motivates cooperation with others. Stories that build emotional and empathetic connections can significantly enhance the engagement and recall of information (Zak, 2015).

Furthermore, cognitive psychology supports the idea that narratives are an automatic way for humans to organize and understand information. Jerome Bruner, a cognitive psychologist, argues that humans think, perceive, and remember in terms of narratives (Bruner, 1986). Stories can significantly enhance the understanding and retention of complex information by structuring it in a way that aligns with how our brains naturally process experiences and knowledge (Dudley et al., 2023). This makes storytelling especially useful for technology transfer, which has proven to be difficult to understand both in terms of technologies and the process itself.

THE IMPORTANCE OF FIRST IMPRESSIONS

In the dynamic realm of technology transfer, the first impression often makes or breaks the opportunity for a successful collaboration. Yet, many presentations within this field fall into the trap of being monotonous and uninspiring, failing to captivate or persuade their audience. This lackluster delivery can turn a potentially groundbreaking idea into a missed opportunity, as it may not engage the crucial stakeholders who could drive the technology forward. A tech transfer officer's role is not merely administrative but also deeply strategic; they must possess the keen eye of a diamond appraiser, recognizing and nurturing the raw potential in ideas before they are polished into their final form. Effective presentations are essential in this process, serving as the first crucial link in a chain that can lead to successful commercialization and innovation. By mastering the art of storytelling and presentation, tech transfer officers can ensure that promising ideas are understood and accepted.

Thirdly, the business world has long recognized the value of storytelling, emphasizing that storytelling is not just for marketing but should be cultivated throughout organizations to improve engagement and influence. It is widely accepted that it adds value to business across different specters, from increasing brand recognition to managing change in the company. It is particularly present in the startup world, where it has become almost synonymous with recruitment, funding, and sales processes, and

founders use it almost routinely when "pitching" (Mills, 2022). Research into the use of storytelling in business confirms that stories are crucial for both internal (employees) and external (customers) engagement. Stories help convey complex ideas in a relatable way, making them an effective tool for change management and innovation (Kemp et al., 2023). Startup founders dedicate a significant amount of their time to innovation storytelling (Taylor et al., 2023) Research has also established that storytelling is crucial for innovations to succeed, yet innovators (especially outside businesses) are not efficient in using it (Taylor et al., 2023).

BRIDGING THE GAP

The implications of these findings are profound for technology transfer. By incorporating storytelling into technology transfer strategies, we can bridge the gap between the lab and the market more effectively. Stories can help potential partners, investors, and customers understand the significance and potential impact of new technologies even in the anomalies phase, before the paradigm shift. This narrative approach can make complex and technical information more accessible, engaging, and persuasive, and it also helps us understand our own processes better.

Innovators and technology transfer professionals must thus not only recognize the potential of the new technology but, more importantly, have the vision and strategic insight to contribute to the conditions that will allow the technology to redefine the market and/or industry. In this light, technology transfer professionals become more than mere facilitators. They become key players, guiding and shaping innovation to the point where it can spark significant change. But, more importantly, their role is much more complicated than what it appears to be at first glance, just like the process itself.

CONNECTING THE DOTS IN STORYTELLING

Whether serendipitously, or by forgetting to reference Kierkegaard, Jobs also said, reflecting on how seemingly disconnected events of his life were essential to his later success: „You can't connect the dots looking forward; you can only connect them looking backwards. So you have to trust that the dots will somehow connect in your future." Indeed, storytelling helps frame failures and anomalies in a positive light, making them more palatable and even desirable to investors and collaborators.

In summary, storytelling is more than a communication technique; it is a scientifically supported method that leverages the natural tendencies of the human brain to enhance understanding, retention, and emotional connection. In the context of technology transfer, storytelling can transform how innovations are perceived and adopted, making it an indispensable tool for navigating the complexities of bringing new technologies to market. The personal narrative detail that is often at the heart of a good story is one of the most powerful forms of communication that exists. Several experts, and indeed scientists themselves, agree that we live in a time where it is crucial that scientists take an active role in communicating with the public about what and why they do and how this matters (Suzuki et al., 2018).

Therefore, technology transfer should use storytelling intentionally. It should capitalize on suspense, on failures, and cliffhangers. This demands a certain kind of personality traits of the tech transfer officer, more than just the right mixture of technical knowledge and business savvy. This person must weave together the threads of innovation, failure, and coincidences into a compelling narrative that captures the imagination of potential partners, investors, and markets, always one step ahead, already stepping forward while making sense for everybody else backwards. Tech transfer requires the heart of a storyteller, envisioning not just what a technology is but what it could become. By imagining and telling this story to oneself and to others, we bridge the gap between invention and impact, turning raw potential into a shared vision of the future.

THE IMPORTANCE OF COMMUNITY

This kind of foresight is impossible without community. Storytelling lies at the heart of community building because it fosters shared understanding and collective identity. In Slovenia, this is exemplified in a government initiative that connects all technology transfer offices of public research institutions in two consortia. Such an approach not only facilitates the exchange of resources and expertise but also addresses the gaps left by the traditional linear models of tech transfer. This network is instrumental in enhancing the skills of tech transfer professionals, particularly in the realms of resilience, adaptability, and narrative construction. As we navigate the intricacies of technology transfer, it becomes evident that mastering the art of storytelling is crucial. Effective storytelling can transform the perception of failure into a narrative of growth and can help us create the vision required for this profession. This essay, with its own narrative shortcomings, underscores the point—perhaps not the finest example of storytelling itself, the lack of it actually serves as a heightened argument for the need for further training in this essential skill.

REFERENCES

Azagra-Caro, J., Fernández-Mesa, A., & Robinson-Garcia, N. (2020). 'Getting out of the closet': Scientific authorship of literary fiction and knowledge transfer. *The Journal of Technology Transfer*, 45, doi: 10.1007/s10961-018-9672-6.

Bruner, J. (1986). *Actual Minds, Possible Worlds*. Harvard University Press.

Chesbrough, H. (2003). Open Innovation: The New Imperative for Creating and Profiting from Technology. Harvard Business School Press.

Dudley, M. Z., Squires, G. K., Petroske, T. M., Dawson, S., & Brewer, J. (2023). The use of narrative in science and health communication: A scoping review. *Patient Education and Counseling, 112*, Article 107752. doi: 10.1016/j.pec.2023.107752.

Isaacson, W. (2011). *Steve Jobs*. Simon & Schuster.

Kemp, A., Gravois, R., Syrdal, H., & McDougal, E. (2023). Storytelling is not just for marketing: Cultivating a storytelling culture throughout the organization. *Business Horizons, 66*(3), 313-324. doi: 10.1016/j.bushor.2023.01.001.

Kuhn, T.S. (1962). *The Structure of Scientific Revolutions*. University of Chicago Press.

Link, A. N., Siegel, D. S., & Bozeman, B. (2007). An empirical analysis of the propensity of academics to engage in informal university technology transfer. Industrial and Corporate Change, 16(4), 641–655. doi: 10.1093/icc/dtm020.

Mills, A., & Key, T.M. (2022). Strategic storytelling. *Business Horizons*, 65(3), 309-318. doi: 10.1016/j.bushor.2022.01.005.

Rogers, E.M. (2002). Diffusion of Innovations. Free Press.doi: 10.4324/9780203710753-35.

Sweetman, A. K., Smith, A. J., De Jonge, D. S. W., Hahn, T., Schroedl, P., Silverstein, M., Andrade, C., Edwards, R. L., Lough, A. J. M., Woulds, C., Homoky, W. B., Koschinsky, A., Fuchs, S., Kuhn, T., Geiger, F., & Marlow, J. J. (2024). Evidence of dark oxygen production at the abyssal seafloor. *Nature Geoscience, 17*(8), 737–739. https://doi.org/10.1038/s41561-024-01480-8.

Taylor, K.T., Taylor, S., Greulich, K., Singleton, M., O'Shea,, C., & Surrao, A. (2023). The Impact of Storytelling on Innovation Success. *Research-Technology Management, 66*, 17 - 27. doi: 10.1080/08956308.2023.2212567.

Teece, D. J. (2010). Business models, business strategy and innovation. *Long Range Planning, 43*(2–3), 172–194. doi: 10.1016/j.lrp.2009.07.003.

Zak P. J. (2015). Why inspiring stories make us react: the neuroscience of narrative. *Cerebrum : the Dana forum on brain science*, 2015.

Author:
Polona Juvančič

LICENCOVANIE A TRANSFER DUŠEVNÉHO VLASTNÍCTVA V MAJETKU ŠTÁTU PODĽA SLOVENSKEJ A ČESKEJ ÚPRAVY

ABSTRAKT Uspokojovanie verejných potrieb v oblasti vedy a výskumu zabezpečuje v niektorých prípadoch z rozmanitých historických príčin v Česku i na Slovensku tiež priamo štát, a to popri súkromných i verejných (no na štáte nezávislých) inštitúciách. Robí tak prostredníctvom svojich príspevkových organizácií, ale tiež prostredníctvom rozpočtových organizácií či tzv. organizačných zložiek štátu (v Česku). Na rozdiel od slovenských rozpočtových organizácií však české organizačné zložky štátu nie sú právnickými osobami, ale len zložkami štátu ako právnickej osoby sui generis a ak navonok menom organizačnej zložky poverená osoba koná, jej konanie sa pripisuje priamo štátu.

ABSTRACT The satisfaction of public needs in the field of science and research is in the Czech Republic and Slovakia provided not only by various private and public bodies but also directly by the state – due to various historical reasons. The state acts through its so called "contributory organizations" (in Slovak príspevkové organizácie, in Czech příspěvkové organizace), but also through "budgetary organizations" (in Slovakia: "rozpočtové organizácie") or so-called "organizational units of the state" (in the Czech Republic: "organizační složky státu"). However, unlike Slovak budgetary organizations, Czech organizational units of the state are not legal entities, but only parts of the state as a sui generis legal entity, and if an authorized person acts on behalf of the organizational unit, its actions are attributed directly to the state.

Spoločným menovateľom príspevkových a rozpočtových organizácií je, že nemajú majetkovú autonómiu (niekedy sa vraví o obmedzenej právnej subjektivite, pretože im zákon upiera spôsobilosť vlastniť majetok) a hospodária s majetkom, ktorý patrí inej osobe – štátu. Treba povedať, že do značnej miery ide najmä pri príspevkových organizáciách o historické dozvuky deformovaného socialistického správneho práva a ich organizácia sa ukazuje v mnohom prekonaná, to však nie je predmetom tejto úvahy.

ROZPOČTOVÉ ORGANIZÁCIE

Do množiny rozpočtových organizácií na Slovensku spadajú ministerstvá, štátne vysoké školy (Akadémia policajného zboru v Bratislave, Akadémia ozbrojených síl generála Milana Rastislava Štefánika), ale tiež Slovenská akadémia vied. Naproti tomu Slovenská zdravotnícka univerzita v Bratislave je tak trochu nevšedne príspevkovou organizáciou Ministerstva zdravotníctva SR; to platí i pre celý rad ďalších inštitúcií, ktoré sa v menšej či väčšej miere venujú aj výskumu a transferu, ako sú napríklad múzeá a galérie, majúce spravidla formu príspevkových organizácií. Problém s licencovaním, pravda, nevzniká len v súvislosti s výskumom, ale aj bežnou činnosťou príspevkových organizácií, ako sú napríklad divadlá či Slovenský filmový ústav bežne poskytujúci licencie na použitie predmetov ochrany držaných štátom. Ako určitá zaujímavosť sa môže zo slovenského pohľadu ukazovať, že nielen ministerstvá, ale ani česká Policajná akadémia či Univerzita obrany nemajú

právnu subjektivitu, pretože sú vyššie spomenutými organizačnými zložkami štátu a ak ich reprezentanti vystupujú v právnych vzťahoch, vystupujú menom Českej republiky. To pochopiteľne vlastný transfer technológií značne komplikuje, ako načrtneme ďalej.

Popri rozpočtových a príspevkových organizáciách existujú samostatné právnické osoby verejného práva založené na verejné účely, ktoré hospodária s vlastným majetkom. V oblasti vedy a výskumu majú najčastejšie formu verejných výskumných inštitúcií a verejných vysokých škôl. Na tieto subjekty sa nevzťahujú pravidlá hospodárenia a nakladania so štátnym majetkom a pri komercializácii duševného vlastníctva majú v zásade voľné pole pôsobnosti.

DÔLEŽITÉ POROVNANIE

Tento článok si kladie za cieľ predstaviť a porovnať aktuálnu právnu úpravu licencovania a prevodu duševného vlastníctva v majetku štátu podľa slovenskej a českej právnej úpravy s dôrazom na právne postavenie inštitúcií bez majetkovej autonómie.

Hospodárenie so štátnym majetkom v Česku upravuje zákon č. 219/2000 Sb., o majetku Českej republiky a jej vystupovaní v právnych vzťahoch („zákon o majetku ČR“). Podľa prechodných ustanovení sa tento zákon vzťahuje nielen na organizačné zložky štátu (vyššie spomenutá Policajná akadémia a Univerzita obrany, ale tiež Akadémia vied ČR[I]), ale aj na štátne príspevkové organizácie (napr. Národné divadlo, Národné múzeum, Národná galéria). Základnou podmienkou pre nakladanie s majetkom štátu, či už vo forme licencovania alebo prevodu, je vydanie rozhodnutia o dočasnej alebo trvalej nepotrebnosti tohto majetku.[II] Podľa dôvodovej správy k novele zákona o majetku ČR z roku 2016 použil zákonodarca termín „majetok“, aby sa tak vyhol prípadným pochybnostiam o tom, že sa ustanovenie týka i vecí nehmotných,[III] ktorými sa podľa nového českého občianskeho zákonníka rozumejú aj práva priemyselného vlastníctva a niektoré práva súvisiace s právom autorským. Nehmotnou vecou je aj licencia sama o sebe. Rozhodnutie o dočasnej alebo trvalej nepotrebnosti vydáva vedúci príslušnej organizačnej zložky, prípadne ním poverený vedúci zamestnanec v písomnej forme. Skutočnosť, že zákon uvádza len demonštratívny výpočet prípadov nepotrebnosti možno chápať tak, že je v zásade na uvážení vedúceho organizačnej zložky, aký majetok označí za nepotrebný. Takto nepotrebný majetok musí príslušná organizačná zložka prednostne ponúknuť iným organizačným zložkám a až v prípade jeho celkovej nevyužiteľnosti, môže s majetkom voľne nakladať a ponúknuť ho tretím osobám.[IV]

NEDOSTATKY ZÁKONOV

Zásadným nedostatkom zákona o majetku ČR je absencia zvláštnej úpravy hospodárenia s duševným vlastníctvom štátu, ktoré má svoje zrejmé špecifiká. Na rozdiel od hmotných statkov sa vyznačuje tzv. potenciálnou ubikvitou (všadeprítomnosťou). Vydávať rozhodnutie o nepotrebnosti môže mať určitú logiku (aj keď malú) pri transfere, teda prevode chránených riešení, no žiadnu logiku celkom isto nemá pri prostom licencovaní, predovšetkým pri nevýhradnom licencovaní. Zatiaľ čo konkrétnu nehnuteľnosť môže v jednom okamihu používať obmedzený počet osôb, pri počítačovom softvéri alebo inom autorskom diele či predmete priemyselných práv nič nebráni tomu,

[I] *Akadémia vied Českej republiky je síce organizačnou zložkou štátu a jej činnosť je financovaná zo štátneho rozpočtu, ale samotný výskum uskutočňuje prostredníctvom pracovísk, ktoré majú formu verejných výskumných inštitúcií s vlastnou právnou subjektivitou a vlastným majetkom.*

[II] *§ 14 ods. 7 zákona o majetku ČR.*

[III] *Dôvodová správa k zákonu č. 51/2016 Zb., ktorým sa mení zákon o majetku ČR: „Současně se i zde promítá nezbytné zohlednění změny chápání věci podle OZ - jednoznačnost interpretace ustanovení by mělo posílit užití širšího pojmu „majetek“ namísto dosavadní „věci“ (užité dosud ve smyslu „hmotná věc“), tak aby nevznikaly případné pochybnosti o tom, že se ustanovení [§ 14 ods. 7 – pozn. aut.] týká i věcí nehmotných. V tomto kontextu je ovšem nutno připomenout, že výčet případů „nepotřebnosti“ byl a nadále zůstává pouze demonstrativní, a to právě s ohledem na různorodost spektra možných důvodů v praxi.“*

[IV] *§ 19b ods. 4, 5 zákona o majetku ČR.*

aby ho naraz využívalo množstvo subjektov. Vo výsledku tak povinnosť vydať rozhodnutie o dočasnej či trvalej nepotrebnosti nehmotného statku – ak ju vykladáme doslova – v Česku nedôvodne bráni komercializácii duševného vlastníctva v majetku štátu.

Terminologicky možno práva duševného vlastníctva podradiť pod tzv. „iné práva a majetkové hodnoty" podľa § 37 ods. 2 zákona o majetku ČR, ktorý stanovuje, že nakladanie s nimi sa riadi obdobne ako v prípade pravidiel pre nakladanie s pohľadávkami. V praxi sú však pravidlá o postúpení pohľadávky, jej pomernom uspokojovaní či upustení od vymáhania absolútne neaplikovateľné v oblasti práv duševného vlastníctva. Zámer zákonodarcu v tomto smere nevysvetľuje ani dôvodová správa.

PROBLEMATIKA LICENČNÝCH ZMLÚV

Jednou z najčastejších foriem nakladania s právami duševného vlastníctva je udeľovanie licencií. Zákon o majetku ČR žiadnu zmienku o licencii neobsahuje. Podľa Štancla sa na uzatváranie licenčných zmlúv s organizačnými zložkami štátu analogicky použijú ustanovenia o nájme veci.[V] Tento výklad vzhľadom na špecifiká nehmotných statkov považujeme za problematický a s odkazom na § 2 ods. 1 zákona o majetku ČR sa prikláňame k názoru, že sa subsidiárne použije úprava licencie v občianskom zákonníku.[VI] Obdoba českého predpisu, slovenský zákon č. 278/1993 Z. z. o správe majetku štátu, taktiež upravuje pravidlá nakladania so štátnym majetkom. Tento zákon sa aplikuje pre správu majetku štátnych vysokých škôl, teda vojenských, policajných a zdravotníckych vysokých škôl.

Pri nakladaní s majetkom verejných vysokých škôl, ktorých je prevažná väčšina, sa však uplatňuje odlišná a na tento prípad osobitne vyhotovená právna úprava zákona č. 176/2004 Z. z. o nakladaní s majetkom verejnoprávnych inštitúcií.

Žiaden z oboch uvedených zákonov však neobsahuje osobitnú právnu úpravu týkajúcu sa duševného vlastníctva vysokých škôl a nakladania s ním. Rovnako, ako pri právnej úprave Českej republiky, však môžeme pod pojmom majetok rozumieť aj priemyselné práva[VII] ako tzv. iné majetkové práva,[VIII] poprípade iné majetkové hodnoty.[IX]

ODLIŠNOSTI V NAKLADANÍ S MAJETKOM VYSOKÝCH ŠKÔL

Ako je čitateľom zrejme dobre známe, právne režimy nakladania s majetkom vysokých škôl sú pre verejné a štátne vysoké školy veľmi odlišné. Zásadný rozdiel spočíva najmä v tom, že zákon o správe majetku štátu SR stanovuje konkrétne pravidlá pre nakladanie s majetkom štátu, od ktorých sa nie je možné odchýliť, zatiaľ čo zákon o nakladaní s majetkom verejnoprávnych inštitúcií verejné vysoké školy v tomto smere nijako podstatne neobmedzuje (čo je predovšetkým zapríčinené neexistenciou špecifickej právnej úpravy zameranej na nakladanie s duševným vlastníctvom).[X]

Vzhľadom na to, že témou tohto článku je licencovanie a transfer duševného vlastníctva v majetku štátu, zameriavame nasledovný výklad najmä na štátne vysoké školy, na ktoré sa vzťahuje zákon o správe majetku štátu SR.

[V] *ŠTANCL, M. Nakládání s majetkem státu. Praha: Wolters Kluwer ČR, 2020, s. 128.*

[VI] *Ustanovenia §§ 2358-2389 zákona č. 89/2012 Sb., občianskeho zákonníka.*

[VII] *Zložitejšie to bude s právom autorským nerozlučne spätým s osobou tvorcu, avšak aj tu je možné uvažovať o práve autorskom ako inej majetkovej hodnote, v prípade zamestnávateľa alebo nadobúdateľa licencie priamo o majetkovom práve odvodenom od originálneho nositeľa práva autorského. Analogicky to platí pre práva k umeleckému výkonu, nie však k ostatným právam súvisiacim s právom autorským.*

[VIII] *§ 2 ods. 1 zákona o správe majetku štátu a § 2 ods. 1 písm. c) zákona o nakladaní s majetkom verejnoprávnych inštitúcií.*

[IX] *§ 118 ods. 1 občianskeho zákonníka.*

[X] *V tomto smere poukazujeme na staršiu prehľadovú štúdiu Tomáša Klinku a ďalšie príspevky na stránkach tohto časopisu: Klinka 1/2020, Klinka 2/2022, Bačárová 2/2021, Levarská 2/2023.*

Štátne vysoké školy vykonávajú správu štátneho majetku, ktorý im bol do správy zverený.[XI] Ako už bolo spomenuté vyššie, česká právna úprava pracuje s pojmom dočasne alebo trvalo nepotrebného majetku. V slovenskom zákone o správe majetku štátu sa používa podobný pojem prebytočný majetok štátu, pod ktorým sa rozumie majetok, ktorý neslúži a ani v budúcnosti nebude slúžiť na plnenie úloh v rámci predmetu činnosti štátnych vysokých škôl alebo v súvislosti s ich predmetom činnosti.[XII]

Zákon štátnym vysokým školám výslovne ukladá povinnosť nakladať s prebytočným majetkom štátu a rovnako tak aj s dočasným prebytočným majetkom štátu [XIII]. Rovnako ako v Česku, aj slovenské štátne vysoké školy (a všetky ostatné inštitúcie, na ktoré sa vzťahuje zákon o správe majetku štátu) musia o prebytočnosti majetku rozhodnúť písomným rozhodnutím. Následne je štátna vysoká škola povinná takýto prebytočný majetok ponúknuť na prevod správy v registri ponúkaného majetku štátu[XIV] iným inštitúciám, ktoré spravujú štátny majetok.

Po porovnaní českej a slovenskej právnej úpravy zákona o majetku ČR a zákona o správe majetku štátu je možné konštatovať, že je v skúmanom rozsahu prakticky totožná. Obe právne úpravy veľmi komplikujú, možno dokonca povedať, že znemožňujú transakcie týkajúce sa práv duševného vlastníctva v správe štátnych vysokých škôl, ale aj ďalších dotknutých organizácií hospodáriacich s majetkom štátu. Každodenná právna prax našich organizácií však nasvedčuje tomu, že sú celkom bežne udeľované licencie k duševnému vlastníctvu štátu (autorským dielam, ochranným známkam vlastnených štátom a pod.), často bezodplatne a v rozpore s rigidnými pravidlami stanovenými týmto predpisom.[XV]

Pokiaľ ide o Slovenskú akadémiu vied, je rozpočtovou organizáciou štátu.[XVI] Slovenská akadémia vied však svoju výskumnú činnosť vykonáva prostredníctvom verejných výskumných inštitúcií, ktoré zakladá podľa zákona č. 243/2017 Z. z. o verejnej výskumnej inštitúcii.

ZÁKON O VEREJNEJ VÝSKUMNEJ INŠTITÚCII (VVI)

Zákon o VVI, rovnako ako zákon o správe majetku štátu a zákon o nakladaní s majetkom verejnoprávnych inštitúcií, rozumie pod pojmom majetok aj iné majetkové práva vrátane práv duševného vlastníctva.[XVII]

Zákon o VVI pracuje s pojmom trvalo nepotrebného majetku a dočasne nepotrebného majetku v podobnom význame ako zákon o správe majetku štátu pracuje s pojmom prebytočného majetku štátu. Vyluču-

[XI] *§ 3 ods. 1 zákona o správe majetku štátu SR.*

[XII] *§ 3 ods. 3 zákona o správe majetku štátu SR.*

[XIII] *Dočasne prebytočným majetkom štátu sa rozumie majetok, ktorý prechodne neslúži na plnenie úloh v rámci predmetu činnosti štátnej vysokej školy alebo v súvislosti s ňou (§ 3 ods. 4 zákona o správe majetku štátu).*

[XIV] *Register ponúkaného majetku štátu je verejne prístupná evidencia prebytočného majetku štátu ponúkaného v rámci ponukového konania, osobitného ponukového konania alebo elektronickej aukcie na predaj a dočasne prebytočného majetku štátu ponúkaného do nájmu. Register je informačným systémom verejnej správy, ktorý spravuje Ministerstvo financií SR.*

[XV] *Čitateľ by našiel množstvo takých zmlúv v centrálnom registri zmlúv. Medzi príklady patrí bezodplatná licenčná zmluva ku kartografickému dielu medzi Ministerstvom obrany SR a Pamiatkovým úradom SR zo dňa 13. 12. 2022, celkom bizarná licenčná zmluva medzi Ministerstvom vnútra SR ako poskytovateľom a Univerzitou Mateja Bela v Banskej Bystrici ako nadobúdateľom licencie zo dňa 21. 8. 2023 k učebnici, v ktorej platí poskytovateľ licencie odmenu nadobúdateľovi, odplatná licenčná zmluva k radu ochranných známok SLOVAKIA medzi Ministerstvom zahraničných vecí a európskych záležitostí SR a Slovenskou akadémiou vied zo dňa 21. 9. 2023, v ktorej je odplatou „nepeňažné plnenie vo forme propagácie značky Slovensko" alebo obdobná licenčná zmluva k ochranným známkam medzi týmto ministerstvom a Slovenskou národnou galériou. Podľa všetkého sú všetky tieto a mnoho podobných zmlúv absolútne neplatných pre rozpor so zákonom.*

[XVI] *§ 1 ods. 2 zákona č. 133/2002 Z. z. o Slovenskej akadémii vied.*

[XVII] *§ 29 ods. 1 písm. c) zákona o VVI.*

je však jeho aplikáciu na práva duševného vlastníctva, čo je značnou výhodou v porovnaní s obmedzeniami nakladania s majetkom duševného vlastníctva v organizáciách hospodáriacich s majetkom štátu.

Vylúčenie aplikácie trvalo alebo dočasne nepotrebného majetku pre práva duševného vlastníctva vyplýva z § 32 ods. 5 zákona o VVI, ktorý hovorí, že obmedzenia týkajúce sa postupov nakladania s majetkom verejnej výskumnej inštitúcie (okrem iného) podľa § 33 zákona o VVI[XVIII] sa nevzťahuje na majetok, ktorý netvorí prioritný majetok.

Prioritný majetok je majetok, na ktorý sa vzťahujú osobitné ustanovenia zákona o VVI (odlišné od všeobecnej úpravy nakladania s majetkom podľa tohto zákona), za ktorý sa však považujú iba nehnuteľnosti a finančné prostriedky bližšie špecifikované v zákone o VVI.[XIX]

ZLEPŠENIE PODMIENOK

V zásade je možné konštatovať, že zákon o VVI priniesol – po zásadnom prepracovaní novelou – právnu úpravu, ktorá predstavuje priaznivejšie, akokoľvek nie optimálne, podmienky pre komercializáciu práv duševného vlastníctva. Podobný zákon, ktorý slúžil – nie celkom vhodne – slovenskému za inšpiráciu, existuje aj v právnom poriadku Českej republiky.[XX] No aj pre nakladanie s majetkom podľa zákona o VVI v súčasnosti existujú isté obmedzenia, ktoré predstavuje predovšetkým udelenie predchádzajúceho súhlasu dozornej rady verejnej výskumnej inštitúcie.[XXI] Okrem uvedeného, zákon o VVI na viacerých miestach hrozí absolútnou neplatnosťou právneho úkonu týkajúceho sa nakladania s majetkom verejnej výskumnej inštitúcie. Ide napríklad o situáciu, kedy by právny úkon nebol urobený písomne alebo mu nebol udelený predchádzajúci súhlas dozornej rady. Také opatrenie vnáša do každého obchodu nielen významné transakčné riziko pre investora, ale aj pre druhú stranu (ak by napríklad zavinila neplatnosť právneho úkonu zanedbaním rešpektovania zákonom predvídaných vnútorných procesov, prichádza do úvahy zodpovednosť za škodu spôsobenú neplatnosťou právneho úkonu).

Záverom si dovoľujeme konštatovať, že hoci sa recentne podarilo odstrániť rad problémov v licencovaní a transfere duševného vlastníctva verejných organizácií s vlastnou autonómiou, vonkoncom to neplatí pre organizácie bez majetkovej autonómie (príspevkové organizácie, rozpočtové organizácie a české organizačné zložky štátu), kde už dlhé roky pretrváva situácia priam zúfalá, a to rovnako na Slovensku i v Česku. Pritom sa tento problém v oboch krajinách dotýka veľkého okruhu pracovísk, ba aj významných výskumných inštitúcií, predovšetkým štátnych vysokých škôl, z ktorých prakticky všetky sa zúčastňujú aj na významných výskumných projektoch, verejných i súkromných. Je alarmujúce, že odstránenie tohto problému nepovažuje zrejme žiadna z oboch vlád za prioritu [XXII].

Autori:
Rudolf Leška, Monika Slováková, Kristína Bernáthová

[XVIII] *§ 33 zákona o VVI upravuje proces vyhlásenia majetku za trvalo alebo dočasne nepotrebný.*

[XIX] *§ 31 zákona o VVI.*

[XX] *Zákon č. 341/2005 Sb. o verejných výskumných inštitúciách.*

[XXI] *§ 35 ods. 3 zákona o VVI. Pozri tiež Klinka 2021.*

[XXII] *Je nám známe, že na Slovensku pripravila Ódorova úradnícka vláda novelu zákona, ktorá mala napraviť rad pretrvávajúcich problémov prameniacich najmä z nedostatočnej právnej úpravy zákona o správe majetku štátu a zákona o nakladaní s majetkom verejnoprávnych inštitúcii, no už nebola predložená parlamentu – predpokladáme, že vláda bude mať záujem sa k tomuto technickému návrhu novely čo najskôr vrátiť.*

FACTORS AFFECTING THE EFFECTIVENESS OF THE KNOWLEDGE TRANSFER PROCESS AT INSTITUTIONS

ABSTRACT The effectiveness of knowledge transfer activities in a large organization, such as a university or research institute, can be significantly improved by paying attention to a few key factors. One such factor could be the so-called scouting activity. The knowledge transfer process does not necessarily start with the submission of the invention disclosure. Scouting is the activity of identifying those elements of knowledge within the institution that can be used to start a new knowledge transfer process. Another factor could be to broaden the scope of knowledge elements, i.e. to focus not only on technologies but also on non-technological innovations or know-how-type intellectual properties. All this can significantly broaden the range of knowledge that can be transferred, generating more and better potential outcomes for the institution. In this article, we explore the possible applications of these types of factors and activities.

INTRODUCTION

Nowadays, as part of their third mission, universities are increasingly becoming knowledge centers, no longer focusing exclusively on education and research, but also on the dissemination of the knowledge they generate and the transfer of the technologies they develop to the economic sphere.

However, it is important to be aware of the fact that the technology transfer offices (TTOs) of universities work with inputs generated by other parts of the university, i.e. they are not primarily responsible for the size of the base with which they can then launch technology transfer processes. Transferable knowledge is not created in TTOs but in university research groups, institutes and faculties. Thus, while TTOs have no direct influence on the creation of intellectual property (IP), they can have some influence on the quantity and quality of the IP portfolio. What can the TTO do if it wants to increase the number of technology transfer (TT) cases?

In this article, three main options are discussed. Firstly, we mention those options that indirectly seek to support the objective by creating a supportive environment. Second, we focus on the so-called „scouting“ process, i.e. the search for potentially exploitable intellectual creations. In the final part of the article, we look at the potential broadening of the focus, i.e. that it may be worthwhile to look at the exploitation and transfer of non-technological solutions in addition to technologies.

INTEGRATING AN INNOVATION APPROACH INTO UNIVERSITY OPERATIONS

Indeed, creating an environment, with the support of the university‘s senior management, at both strategic and operational levels, that

motivates researchers to create new intellectual creations and, when created, to disclose them, can significantly positively impact the institution's technology transfer performance. Some examples of the measures proposed to achieve this objective are given below:

TTOs play an essential role in the exploitation of university research results. These offices act as intermediaries between universities and industry, facilitating collaboration between researchers and companies. Resources are important, not only to finance intellectual property rights (IPR) costs, but also to have competent staff.

In addition, universities should actively seek opportunities for **cooperation with companies.** This includes launching joint research projects, involving company experts in university teaching and developing training programs tailored to industry needs. A good example of this in Hungary is the Cooperative Doctoral Program, under which doctoral students carry out part of their research as employees on an industrial site.

USE OF INTERNAL, INSTITUTIONAL INCENTIVES

Finally, there is also an option to **motivate researchers.** The TTO could, for example, propose to doctoral schools that not only publications but also, for example, patents should be accepted as achievements and counted towards the degree. The process is also supported if innovation aspects and factors are included in the evaluation of researcher performance. These can be proposed by the TTOs to the strategic management of the university. At the same time, there are also tools that the TTO can create and operate in the institution. For example, the creation of an award. The award of an „Innovative Researcher of the Year" prize could motivate researchers to improve their innovation performance if they are awarded this prize. Overall, it is therefore important to create an environment in which the creation of intellectual creations and participation in technology transfer processes is clearly encouraged by the university. This can be operationalized at the level of doctoral students and researchers and research groups by building in

Ceremonial signing of a technology transfer agreement with a large Japanese company. Source: Archive MD.

university measurement and evaluation systems. At Eötvös Loránd University (ELTE), for example, the Rector presents the Innovative Researcher Award every year in the plenary part of a major Innovation Day, which, in addition to its prestige value, also includes a financial reward.

IDENTIFYING THE LARGEST POSSIBLE NUMBER OF EXPLOITABLE IP WITHIN THE INSTITUTION

Scouting in universities is a strategic process aimed at discovering, identifying and exploiting research results and IP. This activity is key for technology transfer and the development of the innovation ecosystem, as it enables universities to turn their research results into market value.

Main steps of the scouting activity:

1. Scouting and identification: The first step of the scouting activity is the identification of research projects and intellectual creations. This involves identifying innovations, inventions and results with patent potential created by researchers and students. For example, it is recommended that all relevant contract research and development projects are examined and screened for exploitation.
2. Preliminary assessment: the identified IP are assessed and analyzed to determine their market potential, patentability and exploitability.
3. IP management: following the assessment, a patent and exploitation strategy can be developed.

The scouting activity poses a number of challenges that can make it difficult to effectively identify and exploit research results and IP. The most common challenges are described below:

1. Identifying potential innovations: there are many research projects in universities and it is not always easy to identify those with real market potential. Researchers often do not recognize the patentability or market value of their own work, which makes scouting difficult.
2. Identifying market needs: identifying and assessing the market needs for research results can also be a challenge. In scouting activities, it is important that the innovations identified genuinely meet market needs and are competitive. However, in the case of university research, this is rarely the case. They are usually early-stage innovations whose specific market viability direction may not yet be concretized at that stage.
3. Cooperation with researchers: Cooperation between researchers and TTOs is not always smooth. Researchers are often more focused on scientific publications and research projects and less interested in patenting and technology transfer.
4. Funding constraints: Funding scouting activities can also be a challenge. Universities often have limited resources to run TTOs and to fund patent applications. Scouting activity in itself requires significant human resources.

EXTENDING THE FOCUS

For the success of the third mission of universities, I am convinced that it is essential to broaden the focus from the traditional technological innovation paradigm to broader areas of innovation (methodological innovation, social innovation, etc.). When universities consult with their external, large corporate partners, they often come up with problems related to the labour market, consumer behaviour, regulation, which cannot be solved with a traditional technological focus.

I therefore propose to replace the term technology transfer activity with the broader term knowledge transfer activity and to use the term knowledge transfer office instead of technology transfer offices. The rationale for this is that complex problems require a complex response, which can often only be developed through interdisciplinary cooperation between disciplines. ELTE, as a classical science university, is increasingly setting up inter-faculty research-innovation collaborations to achieve a specific goal.

Presentation of the Innovative Researcher Prize at our university. Source: Archive MD.

The British Academy, for example, uses the acronym SHAPE (Social Sciences, Humanities and the Arts for People and the Economy) to collectively refer to non-technological innovation areas . The University of Cambridge established the Centre for Research in the Arts, Social Sciences and Humanities (CRASSH) in 2001 as a research and innovation center to support non-technological innovation.

It is also important to note that the three disciplines taken as examples have specificities in terms of knowledge transfer, not only in that the results of innovation are used in a somewhat less direct way in the economic sphere. Here are some of these specificities to be aware of when targeting innovation areas beyond technology in our knowledge transfer activities.

Social Sciences

1. Interdisciplinarity: social sciences often overlap with other disciplines such as economics, psychology, law or political science.

2. Practical applicability: research findings are often directly applicable to public policy, education and other social systems. Thus the direction of exploitation is often B2G (business to government), which requires a specific knowledge transfer methodology.

3. Data protection and ethics: social science research often involves the collection of personal data, so data protection and ethical issues require special attention, more so than in the case of technical development.

Humanities

1. Preservation of cultural heritage: The humanities aim to preserve and transmit cultural heritage. It is important to preserve the historical and cultural context in the transfer of knowledge in universities.

2. Language and communication challenges: language and communication are central to the humanities. Linguistic and cultural differences must be taken into account in the transfer of knowledge.

3. Digital transition: the integration of digital technologies in the humanities creates new opportunities for storing, analyzing and sharing data. See for example the digital humanities discipline.

Arts

1. Supporting creative processes: knowledge transfer in the arts aims to support creative processes and innovation. Universities often collaborate with artists and creative industries.

2. Interactive and experiential learning: interactive and experiential approaches to arts education are at the forefront, which facilitate the acquisition of practical skills.

3. Community engagement: arts projects are often community-engaged, so it is important to build community relationships and collaborations in the transfer of knowledge.

To conclude, here is an example of how often at the intersection of a technological and non-technological field, results are produced that can be used in a knowledge transfer process. In our case, the two fields are the arts and information technology. The digital transformation of the arts is an exciting and multifaceted process that brings with it many new opportunities and challenges.

New forms of expression: digital technologies allow artists to use new media and tools for their work. Digital painting, 3D modelling, virtual reality and augmented reality all offer new forms of expression for artists to experiment with.

Wider reach: Online galleries, social media and streaming services allow artists to reach a global audience and connect directly with viewers.

Interactivity and community participation: This creates new experiences and community engagement that enrich the artistic experience.

Archiving and preservation: Digital technologies help to archive and preserve works of art. Digital copies and databases allow works of art to be preserved for the long term and easily accessible for future generations.

Ethical issues: Digital transformation also brings with it a number of challenges, such as copyright protection and data protection.

SUMMARY

A well-prepared university knowledge transfer organization must also be able to confidently manage the transfer of IP created at the intersection of disciplines. In summary, I would therefore once again recommend, on the one hand, the creation of a supportive and open innovation environment and, on the other, the strengthening of scouting, i.e. the mapping of potentially exploitable university IP. My third suggestion is to broaden the focus of the technology transfer competences, complementing them with increasing attention to the exploitation of intellectual creations arising from meeting technological and non-technological fields, thus helping universities fulfil their third mission.

REFERENCES

https://www.elte.hu/en/innovation/nlp/elte

https://www.thebritishacademy.ac.uk/this-is-shape/

https://www.crassh.cam.ac.uk/about/

Author:
Dániel Magyar

Source: iStock.com/Benny Winslow.

U.S. GOVERNMENT TECHNOLOGY TRANSFER FOR FOREIGN-OWNED COMPANIES

The Office of Naval Research (ONR), Technology Transfer Office and the Air Force Research Laboratory (AFRL) Technology Transfer and Transition offices exist to execute the mission of technology transfer between federal labs and industry or academia. In their toolbox, they have various contract vehicles for research and development, and licensing. They also create training opportunities, identify best practices, and gather information for the ONR and AFRL annual report of technology transfer activities.

Within the federal ecosystem of technology transfer the Office of Research and Technology Applications (ORTA) is the organizational structure set up in United States federal laboratories through the Stevenson-Wydler Technology Innovation Act of 1980. The acronym „ORTA“ has evolved to refer to those who perform the functions of the ORTA organization. By law, the ORTA must be staffed by at least one full-time person in any laboratory with two hundred or more scientific, engineering, or related technical positions, to coordinate and promote technology transfer.

Lockheed Martin F-22 Raptor, Nellis Air Force Base. Source: iStock.com/tfoxfoto.

IMPORTANT INSTITUTIONS

Now that we have determined who the main players are for the purposes of this article, there are a few things that will clarify what these offices do, and how to interact with them. In addition, we will summarize what the Defense Technology Transfer Information System, (DTTIS) is and how this innovative platform ties everything together. Or at least that is the hope!

Within this lifecycle the Office of Naval Research Technology Transfer is dedicated to these steps, some more than others. Ultimately, the insertion of innovative technologies for public use and economic growth is the goal, and as such ONR is required to complete an annual report of technology transfer activities, as is the Air Force Research Laboratory and all federally funded research laboratories. Technologies must also meet a mission need of the federal branch, say Army or Navy mission needs.

Bar none, the one federal agency that has the best marketing and technology transfer success is NASA. They are world renowned and often imitated for their innovative technology concepts like Technical Readiness Level, TRL. (BTW one thing if you are going to learn about American government technology transfer, learn the acronyms! It is like another language).

About federal lab commercialization success stories, consider this. Have you ever seen chemiluminescent sticks, of course you have! Glow sticks were developed at the Naval Weapons Station at China Lake, California. (This is where I first learned about technology transfer. Now this basic technology is being advanced. www.battlesighttech.com All from the chemiluminescent mind of Dr. Edwin Chandross. He was intrigued by the chemical reaction that emitted light but no heat!

USEFUL COOPERATION TIPS USING A CRADA

How to collaborate with U.S. Federal Laboratories? Third-party collaboration is welcomed and has a review process. The industry/academic partner can be an individual, a university, or a business. The most popular contract vehicle for third party collaboration is a Cooperative Research And Development Agreement, or a CRADA. CRADA's are initiated by either a scientist or engineer working at a federal laboratory, an inquiry from the third-party collaborator or the ORTA. Oftentimes relationships between scientists in different organizations prompt collaboration. Once the potential collaborator is at the ORTA there is a process before the CRADA is executed.

If there is a company that would like to cooperate with a federal laboratory that falls under Foreign Ownership, Control, or Interest (FOCI) and export control category there is a thorough process which is demonstrated in the graphic. CRADA will include collaboration, lab use, however no money is exchanged.

Now how does the Defense Technology Transfer Information System come into play? The system was developed by NASA for AFRL and to a certain extent based on NASA's National Technology Transfer System (NTTS). The platform architecture is completed and is currently being enhanced by ONR and AFRL. It will eventually include the participation of all ORTA's and federal labs and be uploaded with multiple databases.

"The Defense Technology Transfer Information System (DTTIS) is AFRL's enterprise data system that identifies, and tracks technologies developed by the Air Force. Once new technologies are identified in DTTIS, the system is used to track the progress of the technologies as they move through the technology transfer pipeline. DTTIS supports various technology transfer activities including reporting new technologies, technology evaluation, tracking intellectual property rights, partnerships, licensing, marketing, and reporting." AFRL

DTTIS is the one-stop-shop for federal laboratories allowing for a fluid and comprehensive platform to expedite technology transfer activities. The ability for DTTIS to automate workflows to standardize and streamline T2 business rules will result in efficient, standardized process and reduction in errors. The search and reporting engine within DTTIS will also allow for improved visibility and insight into the technology transfer programs.

Author: **Arabella Carey Adolfsson**

ARABELLA CAREY ADOLFSSON

CEO for **Diagnostic and Defense Technology Analysts**

As the Chief Executive Officer with DTA in charge of business development and contracts, Adolfsson brings a global reach to her clients. DTA's numerous clients include academia, R&D institutions and private companies. Adolfsson has a B.S. in Business and Management from the University of Redlands, a Global Bio-Executive Certificate from the Haas School of Business at the University of California Berkeley. She attended schools in Mexico and France, is bilingual and loves deep sea fishing.

www.dtanalysts.com

Source: pixabay.com.

FOREIGN EXPANSION OF ACADEMIC SPINOFFS. A POLISH PERSPECTIVE

ABSTRACT The internationalization of academic spin-offs in Poland is crucial for their long-term success. Creating a support ecosystem that promotes and facilitates international expansion from the beginning is necessary to enhance global thinking. With appropriate educational, financial, and advisory programs, Polish spinoffs will be able to compete more effectively in the global market and contribute to the growth of innovation and competitiveness of the Polish economy.

Source: iStock.com/Fokusiert.

INTRODUCTION

Transforming knowledge into a business idea and ultimately into an innovative enterprise requires researchers to have managerial skills, capital, and university support in creating academic spin-offs. Academic spinoffs enjoy the increasing attention of policymakers in recent years. They are attracting considerable attention because of their potential to (a) enhance local economic development, (b) assist universities in their primary mission of teaching and research and (c) generate high-performance firms[1]. However, this attractiveness must be linked to their openness to international markets, which will allow them to develop faster, provide an impetus for the development of new products and services, and ultimately bring significant benefits to Poland's competitiveness on the international arena. This impact is limited, as the internationalization of spinoffs in Poland is not yet a common phenomenon. The key to accelerating this process will be continuous support from government institutions, universities, and the private sector and the building of a global market-oriented entrepreneurial culture among Polish researchers and students.

[1] *Academic entrepreneurship: University spinoffs and wealth creation. Cheltenhan, UK: Edward Elgar (Shane,2004)*

UNIVERSITY SPIN-OFFS (USOS)/ ACADEMIC SPIN-OFFS (ASOS)

Before discussing international expansion, let's define university spin-offs (USOs) or academic spin-offs (ASOs). These are companies established to commercialize research results and technologies developed in an academic institution. It is usually created by researchers, doctoral students, or students who want to bring innovative solutions developed in their research to the market[II]. Researchers, as partners, share the profits. From the legal viewpoint, a spinoff is no different from an ordinary business enterprise. It typically operates in advanced technology sectors. University or special purpose vehicle may be a partner or stakeholder[III]. University spinoffs (USOs) represent one mechanism for commercializing knowledge.

CHALLENGES OF INTERNATIONAL EXPANSION

The international expansion of academic spin-offs is a complex process that faces several challenges, which may vary depending on the national context. For example, Germany[IV] and the United Kingdom[V], which have well-developed spinoff support ecosystems, still face challenges in adapting to local markets and cultures. In contrast, in the Netherlands[VI], the large share of universities in spinoffs hinders their development. It deters investors, which requires a change in approach to shareholding structure and intellectual property. The histories of various foreign academic spinoff companies show that some internationalize quickly, while others experience a slower or more gradual process. Moreover, internationalization is a sporadic phenomenon for some companies, while for others, initial rapid growth is not sustained. The challenge is establishing and developing relationships with foreign partners and customers regardless cultural, linguistic, legal, and geographical barriers.

[II] *Defining university spin-offs. Article in New Technology Based Firms in the New Millennium (Hogan,2010)*

[III] *https://www.igi-global.com/dictionary/academic-spin-offs/51041, access 07.07.2024*

[IV] *https://www.businesslocationcenter.de/en/zukunftsorte-en/technology-park-berlin-humboldthain/, access 10.07.2024*

[V] *https://www.gov.uk/government/publications/review-of-the-council-for-science-and-technology-impact-of-advice/a--review-of-the-council-for-science-and-technology, access 10.07.2024*

[VI] *The Internationalization of University Spin-offs: A Review and Research Agenda https://www.oecd.org/innovation/university-industry-collaboration-e9c1e648-en.htm, access 10.07.2024*

Source: pixabay.com.

A POLISH PERSPECTIVE

Despite the difficulties observed in Poland, the international expansion of Polish academic spinoffs is gradually developing and gaining momentum. The decision to internationalize from the very beginning of the life cycle should encourage spinoffs to create their company's image through a website in a foreign language and an international domain, and to develop international cooperation in research and development. Moreover, internationalization is necessary for spin-off companies associated with significant research and development costs. A spinoff internationally oriented from the outset and constantly seeking new international opportunities has a greater chance of success. The technologies and solutions created by spinoffs often have global potential, going beyond the local market. However, it is crucial to consider cultural and regulatory differences from the beginning of creation, which will allow for better product preparation for entry into different markets. Additionally, operating in multiple markets will reduce the risk associated with fluctuations in a single market. Spinoff founders often have international network connections due to academic ties abroad, and such contacts prove to be extremely useful for the first and subsequent entries into foreign markets. The increase in prestige is also crucial for this type of entities. Successful international expansion can increase the recognition of both the spinoff company and the university from which it originated. The global expansion strategies adopted by spinoffs can vary greatly. The company can export its products or services to foreign markets, it can license its technology to foreign companies, establish foreign subsidiaries that will operate in a given market, or finally, it can cooperate with foreign partners to conduct research and development or carry out joint projects.

OVERCOMING THE CHALLENGES

The main challenges are a particular aversion to risk and an excessive focus on technological development. In addition, many spinoff founders lack experience doing business in foreign markets

and dealing with competition in global markets, where they have to compete with already established international ones. Overcoming the challenges of adapting products and services for international markets requires a strategic approach and a commitment to understanding the specific needs of each target market. Moreover also requires flexibility and determination on the part of the spin-off management teams. The challenges of securing the rights to innovative technologies on international markets are also significant. The percentage of international patents of Polish universities and research institutes is deficient - about 5% - which indicates a shallow level of global exposure, which limits the transfer and diffusion of innovations[VII].

The problems do not concern the spinoffs and their founders; it is also worth paying attention to technology transfer centers and special purpose vehicles, which may not always be able to «discover» those scientific teams with the potential for internationalization. This means entities may be supported and financed without the appropriate international perspective to become a global company. The university and its structures responsible for the commercialization of the results of intellectual property work must play an essential role in supporting the expansion of a foreign spinoff company, by providing assistance in the field of market research, raising capital and establishing contacts with foreign partners. Here, we can observe an increased awareness of the need for expansion. Polish universities and institutions supporting innovation are increasingly promoting global thinking among scientist-entrepreneurs. More and more universities and research institutions offer support programs for spinoffs that want to develop internationally. An attractive solution is the creation of specialized acceleration programs addressed to spinoffs planning international expansion, which enable them to verify their business, confront their beliefs with experienced practitioners, test solutions in a professional environment and gain contacts that may bear fruit in the future. However, we should focus on solutions with application potential, determine teams and look at the international perspective. There are also many initiatives available with the participation of experienced entrepreneurs operating in foreign markets, dedicated venture capital funds supporting the international expansion of spin-offs, and grants and subsidies, e.g. for participation in fairs or opening offices abroad.

Source: iStock.com/Andreus.

[VII] *Research Institutes in Poland as an Element of the National Innovation System—Complexity, Financing and Effectiveness (Jonek-Kowalska, 2021)*

CONCLUSION

Foreign expansion is a crucial success factor for university spinoffs. While it comes with many challenges, many tools and resources are available to help companies overcome these barriers. It is important for spinoffs to carefully analyze their options and develop an overseas expansion strategy tailored to their specific needs. Consequently, this not only brings economic benefits but also contributes to promoting Polish science and innovation in the international arena. This trend will strengthen in the coming years, supporting the transformation of the Polish economy. There is no detailed data on the scale of internationalization of Polish spin-offs and its impact on the economy, which may constitute material for further research and analysis.

REFERENCES

Academic entrepreneurship: University spinoffs and wealth creation. Cheltenhan, UK: Edward Elgar (Shane, 2004).

Defining university spin-offs, Article in New Technology Based Firms in the New Millennium (Hogan, 2010).

Research Institutes in Poland as an Element of the National Innovation System—Complexity, Financing and Effectiveness (Jonek-Kowalska, 2021).

https://www.igi-global.com/dictionary/academic-spin-offs/51041, access 07.07.2024

https://www.businesslocationcenter.de/en/zukunftsorte-en/technology-park-berlin-humboldthain/, access 10.07.2024

https://www.gov.uk/government/publications/review-of-the-council-for-science-and-technology-impact-of-advice/a-review-of-the-council-for-science-and-technology, access 10.07.2024

The Internationalization of University Spin-offs: A Review and Research Agenda https://www.oecd.org/innovation/university-industry-collaboration-e9c1e648-en.htm, access 10.07.2024

Author:
Katarzyna Papież-Pawełczak

Zdroj: pixabay.com.

Makerspace, zdroj: Nová Cvernovka.

ŠPECIFIKÁ SPOLUPRÁCE V „MAKERSPACES“ A „FABLABS“ – PRÍLEŽITOSTI A PREKÁŽKY PRE MIESTNY ROZVOJ

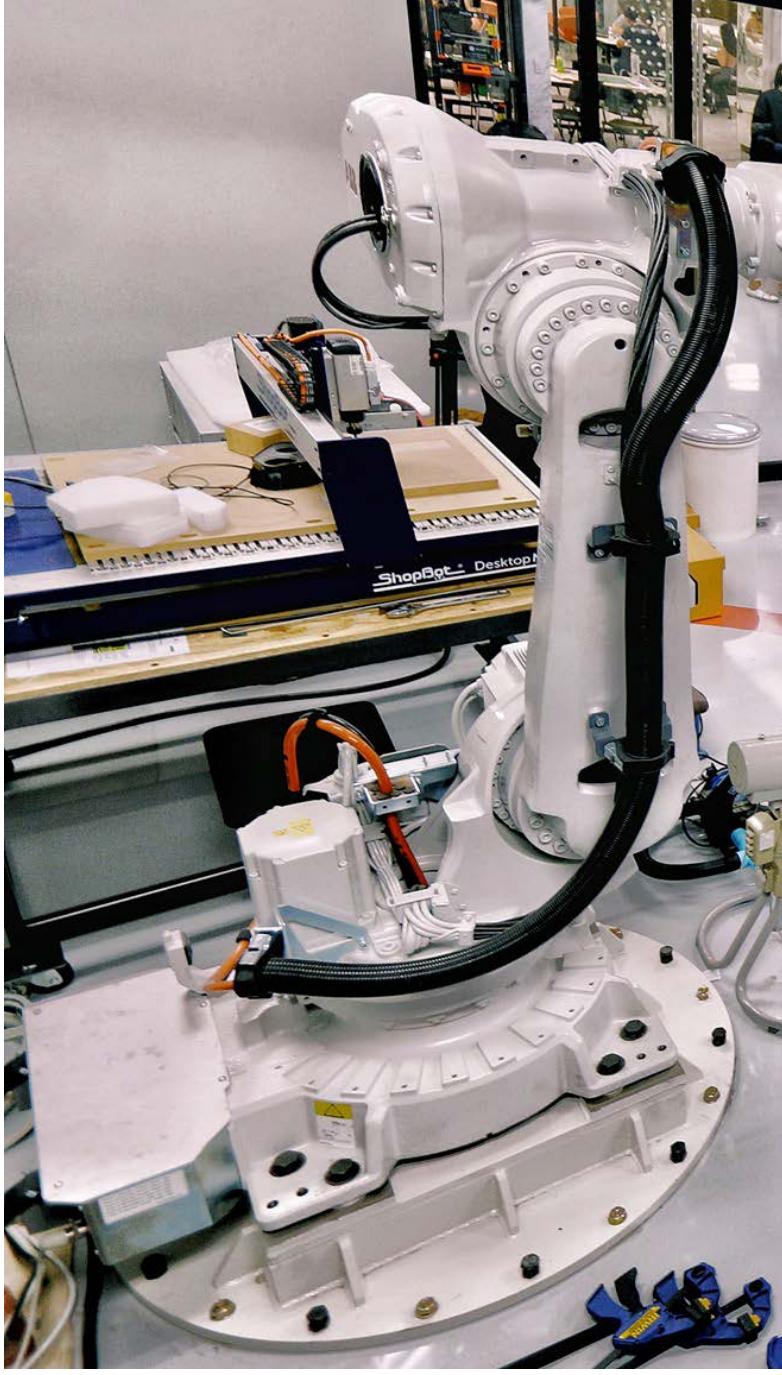
Makerspaces a fablaby predstavujú trvalé alebo dočasné (formálne aj neformálne) pracovné priestory, ktoré umožňujú spoluprácu, vzájomné učenie, zdieľanie vedomostí, ako aj sociálne a priestorové vzťahy medzi používateľmi. Tieto interakcie súvisiace so znalosťami sú organizované v prostredí vhodnom na prácu. Ich opodstatnenie je spojené s rozvojom zdieľanej ekonomiky, keď používatelia zdieľajú vybavenie, znalosti a zdroje, ktoré sú prínosné pre ich prácu. Prínosom týchto pracovných priestorov je ich akcent na technické vzdelávanie a experimentovanie, ktoré sú zamerané na transfer výsledkov priamo do praxe. Aj keď ide o spoločné priestory, silným prvkom je zameranie „urob si sám“. Tento prvok je podporený mentoringom alebo aj vedením k samostatnosti v technologických riešeniach. Používatelia sú spravidla jednotlivci a mikrofirmy (do 10 zamestnancov), ktoré sa zameriavajú na transfer prototypov do praxe.

V praxi sú makerspaces aj fablaby prirovnávané ku kreatívnym dielňam, ktoré kombinujú kreativitu s technickým vzdelaním. Práve ich rola v neformálnom vzdelávaní predstavuje potenciál prepojenia so vzdelávacími inštitúciami. Spoločne tak dokážu kombinovať neformálne a formálne vzdelávanie, ktoré prispieva k rozvoju miestnych aktérov.

MAKERSPACES ALEBO AJ KREATÍVNE DIELNE

Cieľom makerspaces alebo kreatívnych dielní je propagovať a podporovať tvorbu svojpomocne alebo aj „urob si sám“ tým, že kombinujú tvorbu jednotlivcov a mentoring od komunít. Makerspaces predstavujú priestory, ktoré disponujú vybavením (nástroje a stroje) na spoločnú výrobu, a to tak pre „hobbystov“, ako aj profesionálnych tvorcov/remeselníkov. Spravidla fungujú na báze členstva (poplatky), ktoré umožňujú využívať ich vybavenie, pričom ide o nový model spoločenskej produkcie. Cieľom tohto modelu je nielen rozvoj špecializovanej výroby, ale aj posilnenie postavenia jej používateľov. Je založený viac na výmene informácií a znalostí ako na ekonomických aspektoch a opiera sa o celosvetový trend tvorby v komunitách remeselníkov.

Tvorcovia sa považujú za remeselníkov digitálnej éry a môžu to byť amatéri aj nadšenci (často mladí ľudia s vášňou pre vlastnú výrobu), ako aj kreatívni a profesionálni tvorcovia, ktorí využívajú svoje zručnosti pri experimentovaní s novými výrobkami. Činnosti tvorcov sa preto môžu považovať za výrobné činnosti umiestnené mimo sféry veľkých firiem. Ich cieľom môže byť spolupráca, šírenie a zdieľanie poznatkov prostredníctvom uplatňovania princípov otvoreného prístupu k výrobe materiálnych výstupov. Činnosti „makerov“ sa do istej miery líšia od tradičných remeselných činností tým, že využívajú možnosti, ktoré poskytujú informačné technológie v rôznych fázach tvorivého procesu smerom k prototypom. Tento typ infraštruktúry v súčasnosti plní úlohu neformálneho vzdelávania prostredníctvom kreatívnych programov (pre dospelých aj deti) a ich kombinovanie so zariadením (digitálnym alebo iným), na podporu tvorby a transferu výsledkov do praxe. Dôležitým prvkom je prístupnosť priestorov pre verejnosť s cieľom zdieľať príležitosti a nástroje na tvorbu a navrhovanie. Makerspaces v tomto kontexte predstavujú prepojenie medzi jednotlivcami, firmami, združeniami, školami a univerzitami.



V súčasnosti predstavujú prepojenie aktérov oblasti STEM (veda, technológia, inžinierstvo a matematika), aby si mohli precvičiť svoje zručnosti s technickým vybavením na digitálnu výrobu a experimentovanie s materiálmi. Potenciál pre oblasť STEM spočíva v kombinácii infraštruktúry a znalostí pre inovatívne riešenia. Práve z toho dôvodu

Fablab Bangkok, zdroj: FabLabs.io.

sú priestory makerspaces často súčasťou univerzít, knižníc alebo škôl, čím cielene aktivizujú miestnych a regionálnych aktérov pri transfere výsledkov. V týchto prípadoch sa makerspaces dajú považovať za netypické pracoviská, ktoré prispievajú k rozvoju znalostí, zručností a odbornosti typu „urob si sám“. Na základe prístupu k výrobe založeného na otvorenom prístupe (inklúzii) sú makerspaces súčasťou zdieľanej ekonomiky a spoločnosti a mohli by predstavovať alternatívu k veľkovýrobe, distribúcii. V tomto smere ide aj o rolu makerspaces pri tvorbe nových podnikateľských subjektov. Protipól pozitívnych dosahov makerspaces možno sledovať vo viacerých kritických otázkach, ako je napríklad neistota zamestnania znalostných, kreatívnych a digitálnych pracovníkov, ako aj častá nízka ziskovosť makerspace alebo špekulácie na trhu s nehnuteľnosťami.

Jasným cieľom makerspaces je pomôcť vytvoriť ideálny priestor na tvorbu, prezentáciu súčasných tvorcov a ich transfer do praxe. Ďalším veľmi dôležitým bodom je vzdelávanie, pravidelná organizácia prednášok pre širokú verejnosť, vyvolanie záujmu verejnosti o súčasné dianie v kreatívnych odboroch a STEM. V súčasnosti sa čoraz viac skloňuje vplyv infraštruktúry na profesijnú činnosť, ale aj voľný čas. Vzniká tak priestor na podporu spontánnej kooperácie medzi lokálnou produkciou a vývojom na úrovni miestneho trhu.

FABLABY A DIGITÁLNE ZNALOSTI

Fablaby sú v podstate makerspaces, ktoré vytvorili a financujú univerzity (FabLab, MIT Media Lab) a súkromné spoločnosti (v prípade bývalého Techshopu). Obe sú vybavené infraštruktúrou na tvorbu a strojmi určenými najmä na experimenty a prototypy. Hlavným rozdielom je poskytovanie hardvéru a softvéru na inovatívnu fyzickú aj digitálnu výrobu. V skutočnosti poskytujú výrobnú infraštruktúru všetkým členom. Termín makerspace vznikol skôr ako fablab a používa sa širšie, takže fablaby sa niekedy považujú za súčasť franšízy makerspace.

Súčasne umožňujú inovačné aktivity súvisiace s rôznorodými odvetviami výrobného sektora (manufacturing). V zmysle princípov zdieľanej ekonomiky a spoločnosti ponúkajú fablaby nástroje a služby pre digitálnu výrobu jednotlivým používateľom, malým podnikom a školám. Cieľom fablabov je podporovať inovatívnu výrobu a zároveň školiť členov a širokú verejnosť. Podobne ako makerspaces môžu predstavovať alternatívu k veľkovýrobe a spotrebe, pričom sa zameriavajú na jednotlivcov a mikrofirmy. Fablaby sa však výraznejšie špecializujú na digitálne technológie, na efektívny prístup k prototypom a ich transfer do praxe, na základe siete aktérov (od výroby po spotrebu).

Prínosom konceptu fablab je súčasne prepojenie miestnych zdrojov s globálnou sieťou. Tým, že ide o populárny koncept medzi univerzitami, spomínané priestory poskytujú prístup k medzinárodnej komunite laboratórií a skupín jednotlivcov zdieľajúcich postupy a postoje. Podobne ako pri makerspace vzniká priestor pre skupiny jednotlivcov, ich vzájomné interakcie v podobe zdieľania znalostí a následná podpora podnikateľských aktivít. Cieľom nie je výhradne poskytovať zariadenia na výrobu, ale súčasne aj podporiť výrobu jednotlivých produktov, a tým znížiť náklady na ich tvorbu. V kontexte sieťovania, sa tieto priestory zameriavajú na sprístupnenie miestnej produkcie na globálnom trhu. Fablaby môžu mať podobu stacionárnych laboratórií alebo mobilných laboratórií, napríklad nákladných vozidiel s príslušným vybavením, ktoré umožňuje prepravu k externým používateľom. Aj keď ide o globálny koncept, mnohé fablaby sú úzko spojené s miestnou komunitou a rozvíjajú silné väzby pre transfer výsledkov do svojho okolia, ktoré je postavené na základe partnerstiev s miestnymi firmami a inštitúciami verejnej správy.

VÝCHODISKÁ MAKERSPACE A FABLAB A ICH DOSAH NA SPOLUPRÁCU

Z hľadiska lokalizovaného otvoreného priestoru ide v rámci spolupráce o priestory, ktoré ponúkajú prístup k zdrojom (napr. strojom a nástrojom na tvorbu prototypov). Spoločným prvkom je otvorenosť a spolupráca aktérov v miestnom prostredí so zameraním na:

- podporu zdieľania technologických a netechnologických znalostí a zručností pri používaní spoločných nástrojov a platforiem;
- perspektívu samoorganizovaného prostredia, ktoré často nepotrebuje významné zásahy do fungovania;
- spoluprácu na prototypoch a experimentoch v kontexte mentoringu a transferu výsledkov/technológií do praxe;
- prevládajúci inovatívny prístup v bádaní a produkcii;
- organizáciu „z dola nahor“ na základe potrieb používateľov a ich komunitné aktivity alebo občianske iniciatívy.

V prípade potenciálu miestneho rozvoja prostredníctvom makerspace/fablab infraštruktúry, môžeme sledovať nasledujúce účinky na miestny rozvoj:

- podporu podnikateľského ducha a tvorbu podmienok pre rozvoj mikropodnikov a živnostníkov v technologických odboroch;
- zabezpečovanie neformálneho vzdelávania v oboroch STEM ako doplnku vzdelávacieho systému;
- udržanie kvalifikovanej pracovnej sily prostredníctvom tvorby podmienok pre podnikanie;
- systematický rozvoj digitálnych znalostí a zručností;
- uplatňovanie princípu udržateľnosti v praxi s cieľom optimalizovania výroby a využívania zdrojov.

Dopad na miestny rozvoj			
Priamy vplyv na transfer	Úspora nákladov pri technologických výstupoch (prenájom kancelárií, spotreba energie v kanceláriách, čas dochádzania zamestnancov); zníženie rizika izolácie; zvýšenie počtu stretnutí prostredníctvom sieťovania; podpora obchodnej spolupráce, inovácií a transferu technológií; zvýšenie produktivity a efektívnosti jednotlivcov/zamestnancov; zníženie času dochádzania do práce; zvýšenie príjmov; zvýšenie spokojnosti jednotlivcov/zamestnancov.		
Nepriamy vplyv na transfer	**Mestský priestor**	**Praktiky**	**Životné prostredie/plánovanie**
	Podpora atraktívnosti mestského priestoru.	Príspevok k rozvoju inovatívnych technologických služieb.	Recyklácia a využitie materiálov.
	Rozvoj spontánnej agregácie vo štvrtiach (odborníci a verejnosť).	Rozšírenie využívania verejných priestorov a prepojenie STEM aktérov.	Znižovanie znečistenia.
	Občianska angažovanosť na technologickom transfere (workshopy/konferencie a akcie).	Posilnenie väzieb v komunite kreatívcov a verejnosti.	Znižovanie energetickej náročnosti.

Sumarizácia priamych a nepriamych vplyvov „makerspaces“ a „fablabs“ na miestny rozvoj.

Makerspaces aj fablaby predstavujú tzv. nové pracovné priestory, ktoré poskytujú prístup k moderným technológiám a nástrojom, ktoré by boli inak finančne náročné. Podporujú tak inklúziu vo využívaní technológií a experimentovania, s cieľom jednoduchšieho transferu výsledkov do praxe a ku koncovým používateľom. Z hľadiska miestneho rozvoja umožňujú jednotlivcom a malým podnikom experimentovať a vyvíjať nové produkty, ktoré môžu viesť k vzniku nových pracovných miest v odboroch STEM. Ich úloha v miestnom rozvoji spočíva rovnako v možnosti organizovania workshopov, školení a spoločenských akcií, ktoré pomáhajú verejnosti osvojiť si nové technické zručnosti, čím prispievajú k zvyšovaniu kvalifikácie a podporujú zamestnateľnosť jednotlivcov na miestnej úrovni.

V kontexte priameho vplyvu na miestne komunity možno sledovať ich úlohu pri rozvoji komunitných centier, kde sa ľudia môžu stretávať, vymieňať si nápady a pracovať na spoločných technologických projektoch. Z hľadiska rozvoja spoločnosti plnia funkciu posilňovania sociálnych väzieb a podpory súdržnosti medzigeneračných komunít. Miestne iniciatívy sú často spojené s konceptom udržateľnosti a recyklácie, pričom makerspaces a fablaby cielene podporujú udržateľné postupy tým, že umožňujú recykláciu a opätovné použitie materiálov. Miestne komunity tvorcov tak môžu realizovať environmentálne udržateľnú miestnu výrobu a experimenty, ktoré vo svojej podstate môžu postupne znižovať ekologickú stopu.

Autor: **Lukáš Danko**

Source: by PublicDomainPictures via Pixabay.

HOW PATENTS AND INVENTIONS CHANGED THE WORLD OF CINEMA

The history of film as an independent art form begins at the end of the 19th century. But what inventions preceded it and what shaped the youngest audiovisual art form? So let's take a closer look at the beginnings of the functioning of the film industry, or the exciting lawsuits over patents. Let yourself be guided through the world of miracle factories!

The Lumière brothers are considered the fathers of cinematography as an independent art form, who introduced their cinematograph in Paris in 1895. But the film as a technical miracle was created much earlier.

In the second half of the 19th century, especially in the last decade, inventors and designers in many countries tried to build a device that could detect people, land, and animals. They often had an accessory, a projection device, making it possible to project moving photos onto the screen. There was a boom in patents for such devices, especially in Paris, Berlin, St. Petersburg, and London. However, it was a very unstable device for which the inventors often did not get any subsidies and financial support to improve and upgrade their devices.

If we want to map film's origin with the first patents that developed film history, we must logically search among the pioneers of photography. French inventors Luis Jacques Daguerre and Joseph Nicéphore Niépce found a way to create a light recording of any object for the camera using a camera obscura and a specially modified silver-plated copper plate.

The magic lantern (Lanterna magica), an image projector which projected an inverted image through a small hole using a light source, was later developed by Dutch scientist Christiaan Huygens, who is considered to be one of the possible inventors.

Despite this, it is more likely the credit for coining the term Laterna Magica was gained by Thomas Rasmussen Walgensten, who demonstrated the invention in Paris, Lyon, Rome, and Copenhagen. The magic lantern's history has many gaps and more names seem to appear also in Germany, such as Johann Franz Griendel, who was indicated as the inventor of the magic lantern or instrument maker Johann Wiesel.

An invention, that changed the world of moving media and paved the way for film industry development, was the Phenakistiscope (1832), a simple spinning cardboard disc attached vertically to a handle that simulated the movement of the pictures painted on it.

The phenakistiscope, initially misspelled and later adopted as an official term, started developing in the 1820's by a Belgian physicist Joseph Plateau, whose work inspired the Austrian professor of practical geometry Simon Stampfer. They both invented their first versions of phenakistiscope, but

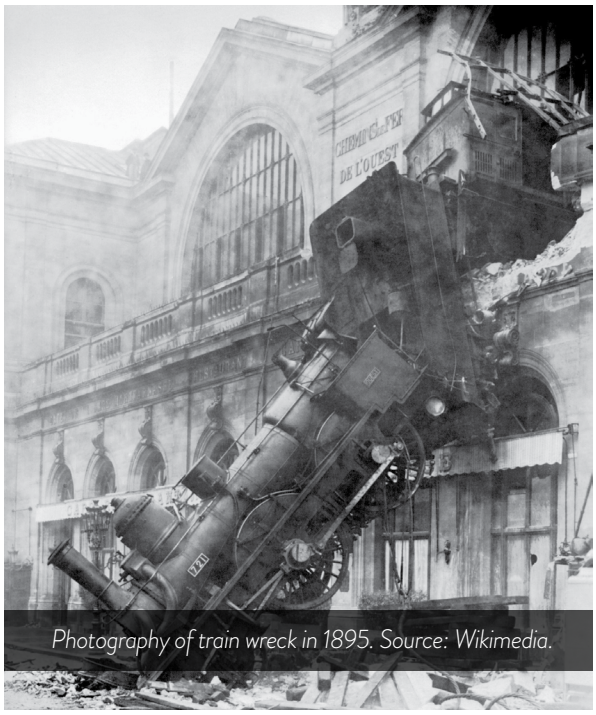
Stampfer made multiple modifications - double-sided discs, which might have landed him and Mathias Trentsensky from art dealer and publishing company Trentsensky & Vieweg a patent on May 7th, 1833.

Joseph Plateau also made some modifications and came up with new ideas, for example, he created a combination of his Phenakistiscope and his Anorthoscope sometime between 1844 and 1849 and thought of combining the Phenakistiscope with the stereoscope by Charles Wheatstone.

Another version of the phenakistiscope, a bestseller in England, was patented here by Thomas Ross in 1869 and 1871. This one used a pulley and handle system to turn two discs and make a motion picture.

Only a year or two later after the first Phenakistiscope, British mathematician William George Horner took the idea of this invention, curved it, and made a drum-like version. The cylindrical variant was called the zoetrope and published details about its mathematical principles in January 1834. After this, a lot of similar devices were developed and registered in numerous countries, but the „definitive" zoetrope was invented in 1865 by William Ensign Lincoln, who was also granted a patent in the United States (1866 and 1887), United Kingdom (no. 629) and France (filed in 1867). Lincoln's patented version had „the viewing slits on a level above the pictures, which allowed the use of easily replaceable strips of images." The paper discs were not always commercially produced. In 1868 an improved Zoetrope was constructed by James Clerk Maxwell, who made the virtual image sharper. However, he never marketed his invention.

While Joseph Plateau, William Lincoln and other inventors and photographers worked on their modifications, gaining rights to them and improving the technological procedures in this industry, a Slovak Jozef Maximilián Petzval, constructed a portrait lens with a brightness that made it possible to shorten exposure times to a few seconds (1840). However, this invention was not patented by the Slovak scientist. Although he won a silver medal for his discoveries in optics at the Paris exhibition, he had no other profit from these inventions. In the 40s of the 18th century, Petzval's photo lenses reached the world market, thanks to the enterprising Viennese optician Peter Wilhelm Friedrich Ritter von Voigtländer, who mass-produced them.



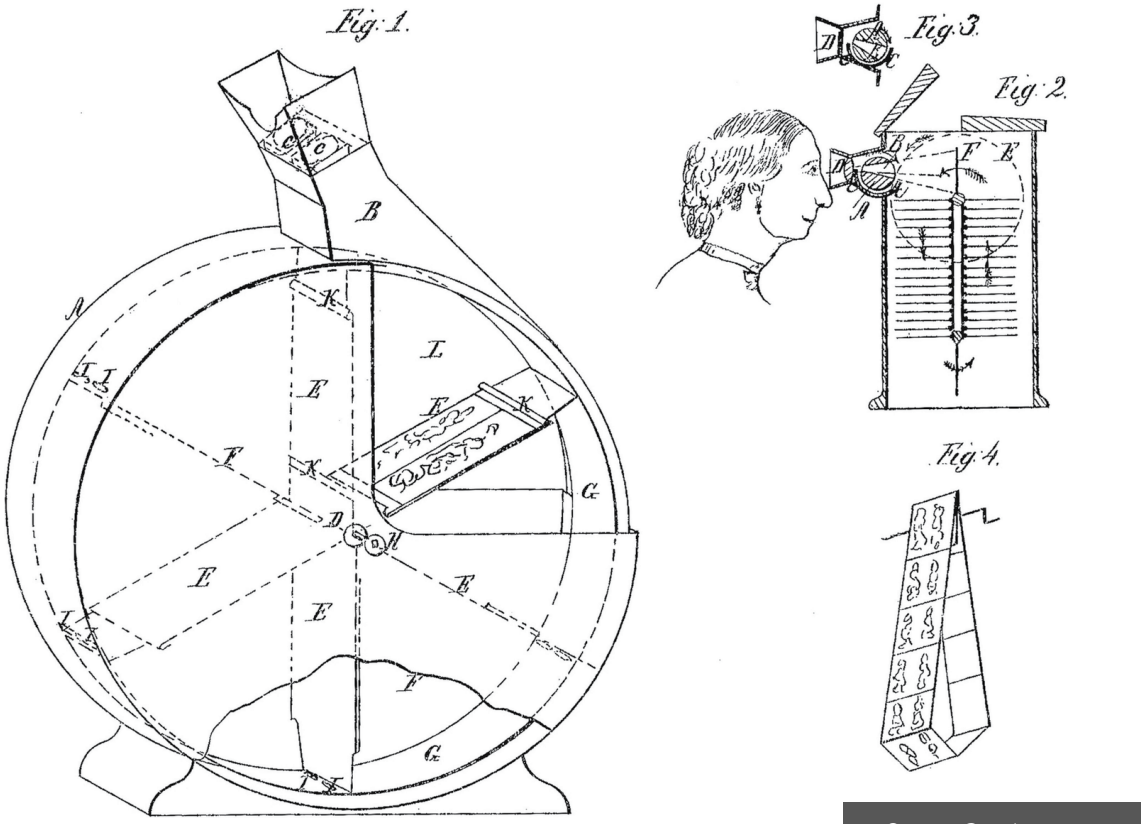
Photography of train wreck in 1895. Source: Wikimedia.

A zoetrope. Source: iStock.com/ ZernLiew.

The journey from photography to film is a series of successive discoveries that cannot be overlooked when studying the birth of film art. Inventions and patents preceding the birth of film can also be found in the interesting discovery of moving photography by the Englishman Edward J. Muybridge. Based on a bet with a friend, he tried to find out through an experiment whether there is a moment when a galloping horse in a race has all four legs in the air. He set up 24 photographic devices in a wooden building, hung a white horizon on one edge of the racetrack, and placed several cameras at regular intervals on the other. He laid ropes across the track, which were gradually released by the spring shutters of the cameras when the running horse broke them. The newspaper wrote about this big event, stating that the horse actually "freezes" in mid stride. The experiment quickly spread from the U.S. to the whole world and has gone down in history as one of the most important moments in moving picture development proving two great claims: horses leave the ground and recording motion is possible. It took him six years to work on the proof, he created several photographic devices and took over 20,000 pictures.

The series of photos under the title ‚Attitudes of Animals in Motion' helped with gaining a patent for the above mentioned method of stop-action series photography in 1897.

The year 1861 brought an important patent in this field of cinematography. The patent (US patent no. 31,357) for a Kinematoscope made by Coleman Sellers described the device as an improvement in exhibiting stereoscopic pictures or photographs that were mounted on the blades of a spinning paddle. They were hidden in a cabinet that you could peek into through slits. The first images Sellers made for a Kinematoscope were the photographs of his children working at his factory in Philadelphia.



Source: Google patents.

Harold Lloyd. Source: by Perlinator via Pixabay.

Fast forward a few years and you can read about Mr. Muybridge again, who in 1883 invented a camera that made it possible to capture an entire series of exposures on a single plate, thus obtaining a motion diagram. Later, he constructed a camera, the so-called zoopraxiscope, a projector that made it possible to view photographs stuck to a disc, when turning a crank, the disc rotated and a moving image was projected onto the screen through the lens. This camera took a separate image of one motion phase with each exposure. During the construction and continuous improvement of his cameras, he also invented several special mechanisms-devices that were crucial for the later development of the film industry. Chronophotographer, as this inventor was called in the 80s, applied for a patent in December 1881 (United States Patent No. 251, 127) entitled "Picture-Feeding Device for Magic Lanterns". The invention was also called a slide-changer. He assigned the rights of this patent to the Scovil Manufacturing Company of Waterbury, Connecticut, whose cameras he had used in his earlier chronographic work at Palo Alto, California.

However, all of the then-often patented inventions such as stroboscopes and praxinoscopes had one thing in common. They were short-lived and unreliable, mainly because they abounded in technological imperfections. It was difficult to shoot and develop the film strip, which broke very often. Especially excellent inventors such as the Pole K. Proszynsky and the Ukrainian J. A. Timčenko did not have enough funds to improve their equipment or patent and market their inventions. They were able to do it only at the beginning of the 20th century.

In contrast, the inventor Thomas Alva Edison had enough funds. And he knew how to use it. And he did not hesitate to patent his inventions. At first, it was a 35 mm sliding celluloid strip for the camera and projector. An important patent is of course the cinematograph from 1891, which was followed by the kinetoscope. He patented it with William K. Dickson and it allowed one person to watch a film through an eyepiece with a magnifying glass. A significant milestone in film history was also the founding of the Blak Mary film studio, where Edison produced special films for kinetoscopes. It was located on the original Edison Laboratory site in West Orange, New Jersey. Edison also met with Mr. Muybridge, so the two of them could discuss the potential combining of Muybridge's Zoopraxiscope for vision, and Edison's Phonograph for audio. This was a big step forward for the cinematographic industry that opened up the door for a new type of media: the audiovisual.

Mary Pickford. Source: by Perlinator via Pixabay.

Edison also came to the picture, when the invention of Phantoscope was born. But let's go back to the beginning. Phantoscope was a film projection machine that was made by Charles Jenkins in the 1890's. Jenkins started alone, but later met his classmate Thomas Armat, who agreed to assist him with the modifications. Their first ever movie had a premiere in a jewelry store in Indiana, where pictures of a dancer performing a "butterfly dance" were projected. Armat and Jenkins both attended exhibitions together, but soon after one they split due to their turbulent relationship, which resulted in at least two disputes over the rights to Phantoscope. They both wanted a solo patent for the invention. The result was: Jenkins received a patent for his initial projector and Armat for the modified version, which he finally sold to Thomas Alva Edison. The Edison Manufacturing Company agreed to manufacture the machine and to produce films for it, as long as it will be advertised as Vitascope, Edison's new invention.

MOTION PICTURE PATENT COMPANY

The first years of American film production were accompanied by several lawsuits. By 1905, development was hampered by patent fights, a second ten-year round of legal disputes between the Edison-led Motion Picture Patent Company (MPPC) and independent producers. However, attempts at monopolization failed. The independents, almost all of whom came from cinema operators' backgrounds, knew the audience's tastes better and represented a more effective concept with their move to feature-length films and the introduction of the movie star system.

MPPC also known as the Edison Trust was founded in December 1908 and effectively terminated in 1918 after it lost a federal antitrust suit. MPPC was a trust of all the major US film companies and local foreign branches (Essanay, Selig Polyscope Edison, Biograph, Vitagraph Lubin Manufacturing, Kalem Company, American Pathé, Star Film Paris), the leading film distributor (George Kleine) and the biggest supplier of raw film stock, Eastman Kodak. The MPPC ended the domination of foreign films on US screens, standardized how films were distributed and exhibited within the US, and improved the quality of US motion pictures through internal competition. It also discouraged its members' entry into feature film production, and the use of outside financing, both to its members' eventual detriment.

Problems with licensing in the USA started in the 90s of the 19th century when Thomas Edison owned the American patents for a series of film cameras. The MPPC was preceded by the Edison licensing system, in effect in 1907–1908, on which the MPPC was modeled. The Edison Manufacturing Company's patent lawsuits against each of its domestic competitors crippled the US film industry, reducing production mainly to two companies: Edison and Biograph, which used a different camera design. This left Edison's other rivals with little recourse but to import French and British films.

The MPPC established a monopoly on all aspects of filmmaking. Eastman Kodak owned the patent on raw film stock, and the company was a member of the trust and thus agreed to sell stock only to other members of MPPC. Importantly, patent control over film trusts ensured that only member studios could film, and projector patents allowed trusts to enter into licensing agreements with distributors and theaters – thus determining who and where their films would be shown.

The end of the MPPC came with the federal court's decision in United States v. Motion Picture Patents Co. on October 1, 1915. The court held that the MPPC's actions went "far beyond what was necessary to protect the use of the patents or the monopoly that went with them" and were therefore an unlawful restraint of trade under the Sherman Antitrust Act. The Court of Appeal rejected MPPC's appeal and officially closed the company in 1918.

Source: by Alexas_Fotos via Pixabay.

THE LUMIÈRE BROTHERS

The Lumière brothers are often fondly said to be the inventors of film. Rather, they brought this invention to perfection by being able to build on the successful products and discoveries of their predecessors. Thanks to his invention of the cinematograph from the workshop of the gifted designer J. Carpentier, according to the Lumiere brothers, the cinematograph was just something of a technological curiosity following the successful years of new inventions in the world of photography. They had no idea that it would have such a huge commercial use and would be the seed of a new gigantic industry.

They knew about various attempts to capture movement on film, in Paris they saw a new attraction - Edison's kinetoscope. When they took over the factory from their father in 1892, they decided to focus their efforts on improving film technology that would allow moving photographic images to be projected onto a large screen. The contract between the two brothers stipulated that they would share equally in all their inventions and business activities. Until 1918, all their work was signed with two first names.

A novelty of the cinematography of the Lumière brothers was the so-called step feed of the film strip, using a grabbing mechanism, which enabled an even pace of projection.

In 1984, they filmed the first film using a new device. Leaving the Lumière factory in Lyon-Mont Plaisir. It was shown for the first time in Paris on March 22, 1895. The projection was organized by the Association for the Support of National Industry. The first screening for which tickets were also sold was held on December 28th at the Grand Café on the Boulevard des Capucines in Paris. In addition to the already mentioned Departure from the Factory, the Arrival of the Train, Swimming in the Sea Blacksmith and others were shown.

The Lumiére brothers were known for their thorough knowledge of the history of photography and the ability to perfect the process of their creation.

The Lumière brothers patented autochrome in 1903 (autochrome Lumière means automatically colored). This is an early color photography process that was commercially produced between 1907 and 1935. It was the most widely used color photography process at this time.

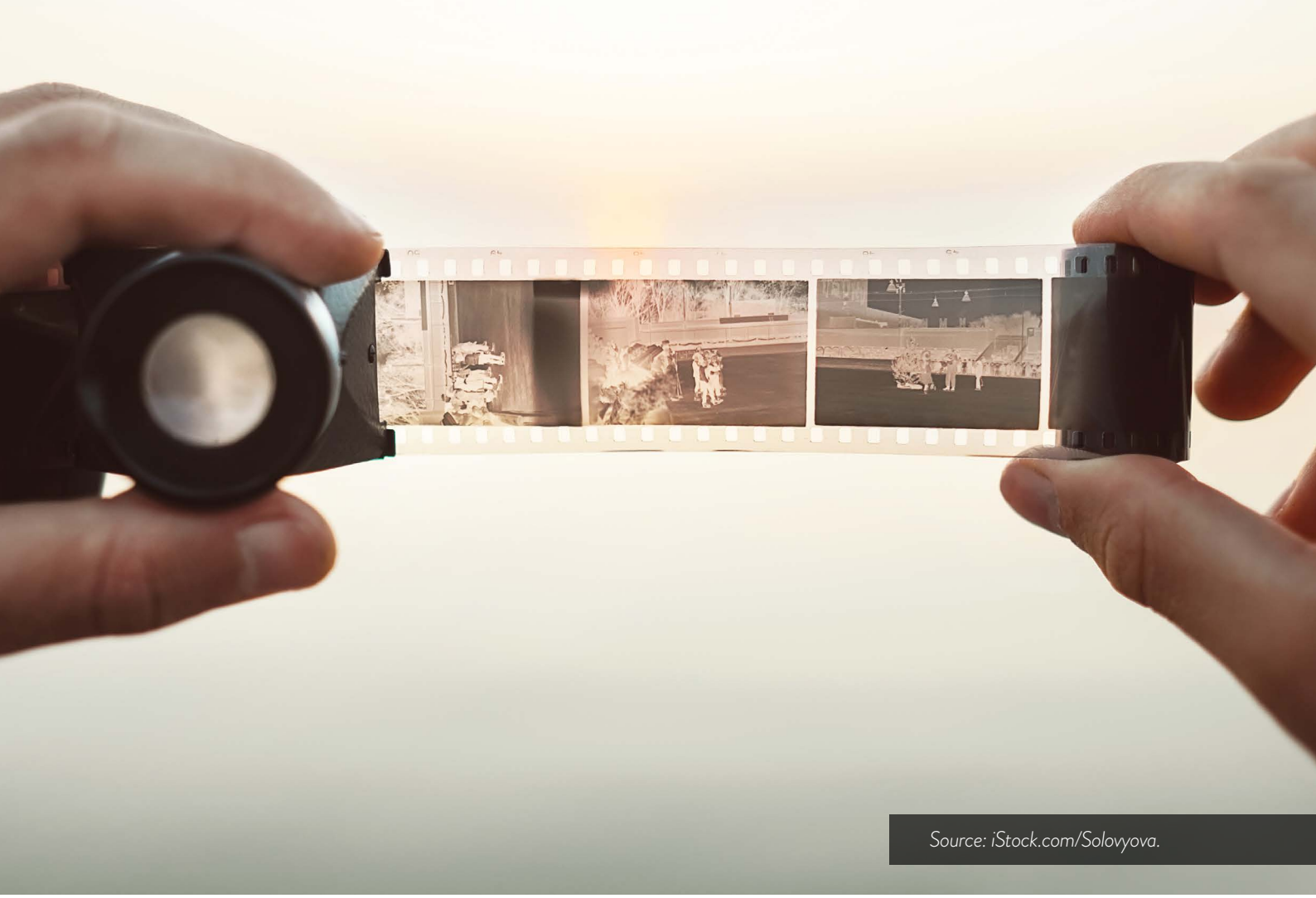
Autochrome is, like today's slide, a colored slide. The glass plate is covered with a colorful mosaic of microscopic potato starch grains dyed orange, green, and blue, covered with a black and white panchromatic emulsion. During the exposure, the light then penetrates through the different colored grains, and after being developed into a positive, a colored image is created. We observe the black-and-white image on the emulsion through the same color filters as when it was exposed. With this invention, he changed not only the photography industry but also the development of newer camera technology for filmmaking.

MAGICIAN GEORGES MÉLIÈS

The first public screening was also attended by Georges Méliès, who revealed new possibilities in cinematography. While the Lumières made more documentaries that show reality, Méliès used his theater and magic experience to bring effects, film tricks, and action to cinematography. The brothers quickly realized the value of capturing scenic footage around the world and showing it for projection or selling it with the camera. For commercial reasons, they refused to transfer the patents for their invention to Georges Méliès. He turned to his London friend, inventor, and first British director Robert W. Paul, who provided him with an intermittent mechanism (kinescope) with which he made his first film Une partie de cartes (Party of Cards) in 1896, a replica of the same subject directed by Louis Lumière. He made many of his improvements and began showing his first short films. He founded his own production company, Star Film, and in 1897 created the world's first film studio in his house in Montreuil. An important part of his films is the story. This is another fact by which they differ from the Lumières. The Lumière brothers mainly filmed documentary shots, while he inserted the plot and plot into his films, told the story. He also produced adaptations of books and fairy tales (e.g. 20000 Miles Under the Sea, Bluebeard, Cinderella, Journey to the Moon, Cleopatra). In the early 20th century, filmmaking was still a craft. There was no division of labor here, the filmmaker had to realize his film all by himself. Méliès also wrote the script himself, was an actor, creator and designer of scenes and backdrops, and developed the film in his laboratory. He was also a director and even sometimes a projectionist of his own works.

Theda Bara as Cleopatra. Source: by Perlinator via Pixabay.

He often said about himself: "I was born with the soul of an artist, nature endowed me with great manual dexterity, versatile abilities, ideas, and innate acting talent. I always worked mentally but also physically."



Source: iStock.com/Solovyova.

REFERENCES:

MACEK, V. – PAŠTÉTOVÁ, J. Dejiny slovenskej kinematografie. Vydavateľstvo Osveta, 1997, s. 5-8. ISBN 80-217-0400-4.

TOEPLITZ, Jerzy. Dejiny filmu. Praha: Vydavateľstvo Panorama, 1989, s. 34-35. ISBN 80-7038-016-0.

TÖTEBERG, Michael. Lexikon světového filmu. Praha: Orpheus, 2005. ISBN 80-903310-7-6.

Poslední trik Georgese Méliès - Divadlo Drak | i-divadlo.cz. [online]. [cit. 2019-06-03]. Avaliable on: www.i-divadlo.cz.

The Encyclopedia Americana (1920)/ Cinematograph. [online]. Avaliable on: https://en.wikisource.org/wiki/The_Encyclopedia_Americana_(1920)/Cinematograph.

Eadweard James Muybridge - The Zoopraxiscope 1879. [online]. Avaliable on: https://archive.org/details/zoopraxiscope_animation.

Era of exploration: the rise of landscape photography in the American West, 1860–1885. [online]. Fully digitized text from The Metropolitan Museum of Art libraries.

MÜLLER, M. Dějiny světové kinematografie – počátky. [online]. Avaliable on: https://www.moderni-dejiny.cz/clanek/dejiny-svetove-kinematografie-pocatky/.

In the beginning: cinema's murky origin story. BFI. [online]. 27. február 2021. [cit. 2021-03-02]. Dostupné na: https://www.bfi.org.uk/news/in-the-beginning-cinemas-murky-origin-story.

Lumière, Louis. The Lumière Cinematograph. In: FIELDING, Raymond. A technological history of motion pictures and television: an anthology

from the pages of the Journal of the Society of Motion Picture and Television Engineers. Berkeley: University of California Press, 1979, s. 49-51. ISBN 0-520-03981-5.

BOHN, Thomas W. Light and shadows: a history of motion pictures. Palo Alto: Mayfield Pub. Co., 1987, s. 4. ISBN 978-0-87484-702-4.

PARKINSON, David. History of film. 2. vyd. New York: Thames & Hudson Ltd., 2012, s. 16. ISBN 978-0-500-20410-8.

ABEL, Richard, ed. Encyclopedia of Early Cinema. Routledge, 2004. ISBN 978-1-134-56676-1. doi:10.4324/9780203482049.

HUYGENS, Christiaan. Oeuvres complètes de Christiaan Huygens. Supplément à la correspondance varia. Biographie de Chr. Huygens. Catalogue de la vente des livres de Chr. Huygens. Publ. par la Société hollandaise des sciences.

ROSSELL, Deac. Early Magic Lantern Illustrations: What Can They Tell Us About Magic Lantern History?. 2009.

PRINCE, Stephen. Through the Looking Glass: Philosophical Toys and Digital Visual Effects. Projections. 2010, 4 (2). ISSN 1934-9688. doi:10.3167/proj.2010.040203.

STAMPFER, Simon. Die stroboscopischen Scheiben; oder, Optischen Zauberscheiben: Deren Theorie und wissenschaftliche anwendung, erklärt von dem Erfinder. Viedeň: Trentsensky a Vieweg, 1833, s. 2.

Herbert, Stephen. From Daedaleum to Zoetrope, Part 1. [online]. [cit. 2014-05-31]. Avaliable on: http://www.mhs.ox.ac.uk/exhibits/fancy-names-and-fun-toys/phenakistiscopes/.

VERAS, Christine. Reanimating the History and the Forgotten Characteristics of the Zoetrope. Animation. 2022, 17, s. 26-48. doi:10.1177/17468477221085412. S2CID 248367347 – via SAGE.

MAXWELL, James Clerk. The Scientific Letters and Papers of James Clerk Maxwell. CUP Archive, 1995. ISBN 9780521256261.

Le Cosmos; revue des sciences et de leurs applications. April 10, 1869. Avaliable on: https://books.google.com.

The History of The Discovery of Cinematography - 1860 - 1869. [online]. June 7, 2012. Avaliable on: https://www.patents.google.com/patent/US31357A/en.

https://es.wikipedia.org/wiki/Kinematoscopio

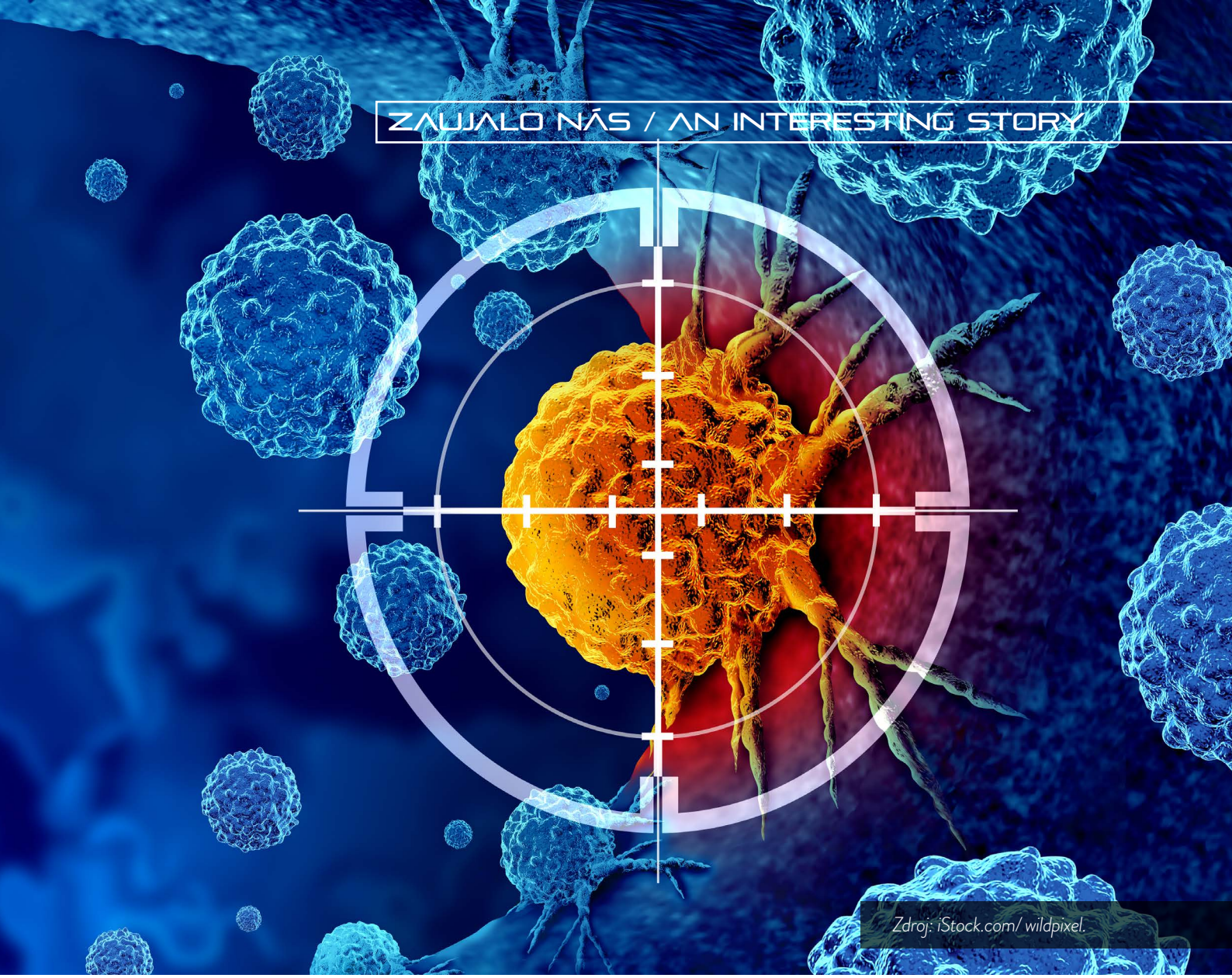
https://archive.org/details/zoopraxiscope_animation

The Kinetoscope Stereopticon, Film Machine 1896. [online]. Archived from the original on 2009-11-11. Retrieved 2009-08-17. Avaliable on: https://machine-history.com/kinetoscope.

Shift to Projectors and the Vitascope - Edison Company Motion Pictures. [online]. Library of Congress. Avaliable on: https://www.loc.gov/collections/edison-company-motion-pictures-and-sound-recordings/articles-and-essays/history-of-edison-motion-pictures/shift-to-projectors-and-the-vitascope/.

The Case Files of Francis Jenkins Phantoscope. [online]. Avaliable on: https://fi.edu/en/news/case-files-francis-jenkins-phantoscope.

Authors:
Juliana Bezáková, Martin Karlík



Zdroj: iStock.com/ wildpixel.

ODHALENIE RAKOVINY POMOCOU UMELEJ INTELIGENCIE URÝCHLIL TRANSFER TECHNOLÓGIÍ NA STANFORDSKEJ UNIVERZITE

Vedci z inštitútu Stanford Bio-X vyvinuli prelomové zariadenie na diagnostiku rakoviny a vďaka novému univerzitnému spinoutu Enspectra Health Inc. ho privádzajú na trh.

Budova rektorátu Stanfordskej univerzity. Zdroj: Pixabay

Novovzniknutá firma Enspectra Health Inc. zložená z vedcov Stanfordskej univerzity pomáha preniesť k pacientom výnimočnú diagnostickú platformu klinického zobrazovania. Zobrazovacia platforma novej generácie na báze umelej inteligencie, ktorú americká FDA (U.S. Food and Drug Administration) nedávno označila za „prelomové zariadenie“, využíva optické a AI technológie na diagnostiku rakoviny kože v reálnom čase.

DLHÝ VÝSKUM

V roku 2006 sa profesori zo Stanfordu Scott Delp a Mark Schnitzer uchádzali v programe Stanford Bio-X Interdisciplinary Initiatives Program o skromný počiatočný grant, aby preskúmali sľubnú, ale neoverenú metódu. Zámerom bolo stavať na novej optickej zobrazovacej technike nazývanej mikroendoskopia, ktorú Schnitzer vyvinul na prezeranie jednotlivých buniek hlboko vo vnútri tkanív živých zvierat.

V tom čase Delp, Schnitzer a ich študenti zhromaždili predbežné údaje, ktoré ukazujú, že mikroendoskopické zobrazovanie na živých myšiach môže odhaliť sarkoméry, jednotky svalov vytvárajúce silu. Vďaka počiatočnej podpore z grantu Bio-X a úsiliu doktorandov zo Stanfordu Michaela Llewellyna, Roberta Barretta, Melindy Cromie (členka Bio-X SIGF Fellow) a Gabriela Sancheza tieto dve laboratóriá vyvinuli mikroendoskopiu do technológie, ktorá by sa mohla použiť na vizualizáciu sarkomérov v ľudských subjektoch.

VEĽKÝ PRELOM

Platforma spoločnosti VIO Skin Platform bola nedávno ocenená FDA ako „prelomové zariadenie“ vo vybraných skupinách pacientov – čo je významný úspech, ktorý urýchľuje prísny regulačný proces pod gesciou FDA. „Platforma neinvazívne generuje digitálne snímky živých buniek vo vysokom rozlíšení u živých pacientov, čo umožňuje vyškoleným odborníkom hodnotiť kožné lézie v reálnom čase. Zariadenie je ručné, ako ultrazvukový prístroj. Celý zobrazovací systém možno nosiť v malom kufríku,“ povedal pre portál stanford.edu profesor Delp. Ako dodal, výzvou pre neho i jeho spolupracovníkov bolo to, aby prístroj mohol lekár priložiť na kožu a získal tak živé prenosy obrázkov, ktoré môžu identifikovať, či je prítomná rakovina kože. „Žiadne rezy, žiadne dlhé čakanie na výsledky biopsie,“ vysvetlil Delp.

Zdá sa, že technológia použitá v novom zariadení predstavuje prvú novú fyzikálnu zobrazovaciu modalitu, ktorá bola schválená FDA na klinické použitie približne za štvrťstoročie.

POUŽITIE V PRAXI

„Zariadenie je určené na pomoc pri diagnostike bazocelulárneho karcinómu a spinocelulárneho karcinómu, ktoré zahŕňajú väčšinu prípadov rakoviny kože v Spojených štátoch. Rakovina kože je však len prvou aplikáciou tejto technológie,“ povedal Delp. Spolu s profesorom Schnitzerom veria, že sa môže ďalej rozvíjať, aby slúžila na mnohé ďalšie klinické potreby.

„Inovácie v medicínskom zobrazovaní spôsobili mnohé z kľúčových pokrokov v modernej medicíne. Sme hrdí na to, že môžeme pokračovať v tomto dedičstve v oblasti bunkovej ríše živých tkanív,“ povedal pre portál MyScience výskumník Gabriel Sanchez.

Platforma umožňuje zobrazovanie živých buniek bez poškodenia v živom tele.

„Dokáže vizualizovať submikrónové štruktúry. Môžete zobraziť celé bunky a subcelulárne štruktúry u živého pacienta vo vyšetrovacej miestnosti,” povedal Delp.

Zdroj: iStock.com/Jacob Wackerhausen.

Vyspelejšia technológia, reflexná konfokálna mikroskopia, približne od 50. rokov minulého storočia, umožňuje lekárovi vidieť cez kožu niekoľko vrstiev hlboko, aby si vizualizoval kožné znaky od krvných ciev, kolagénu a pigmentu po stratum corneum, vlasové folikuly, hyperkeratózu a ďalšie.

DOPLNENIE TECHNOLÓGIE

Kombinované zobrazovacie technológie budú doplnené o prediktívne algoritmy založené na AI, ktoré umožňujú vyškoleným dermatológom a patológom vykonávať neinvazívne „virtuálne biopsie" v reálnom čase.

„Len niekoľko vybraných nových zariadení sa každý rok posudzuje na označenie prelomového zariadenia FDA. Všetky prelomové zariadenia musia spĺňať prísne normy bezpečnosti a účinnosti FDA. V úzkej spolupráci s Bio-X a fakultou genetiky, Office of Technology Licensing podporuje transfer stanfordskej technológie pre potreby spoločnosti a zároveň vytvára neobmedzený príjem na podporu ďalšieho výskumu a vzdelávania," dodal Delp.

Autor:
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.

Všetky uvedené služby poskytujeme bezplatne.

- **Odborné individuálne konzultácie k problematike duševného vlastníctva**
- **Rešeršné služby**
- **Odborné podujatia**
- **Vyhľadanie partnera pre výskum a vývoj**

https://patlib.cvtisr.sk

patlib@cvtisr.sk

+421 918 807 145

Centrum transferu technológií pri CVTI SR

CTT CVTI SR

Centrum transferu technológií pri CVTI SR

Publikujte v časopise TTb získate zverejnenie svojich článkov v prestížnych databázach

TRANSFER TECHNOLÓGIÍ bulletin (TTb)

- interdisciplinárny **recenzovaný odborný časopis**
- **aktuálne informácie z oblasti transferu technológií**
- prepojenie vedy s praxou
- pravidelné rubriky, **recenzované odborné články** a **články v anglickom jazyku**
- určený pre vedcov, pracovníkov centier transferu technológií, odborníkov na duševné vlastníctvo, podnikateľov, startupistov a študentov
- tlačený aj online formát
- **jediný časopis svojho druhu indexovaný v medzinárodných databázach** DOAJ, EBSCO, ProQuest a OpenAIRE
- spĺňa kritériá **open access**
- vydáva Centrum vedecko-technických informácií SR

Výhody publikácie

- **zvýšený počet citácií** zabezpečený indexáciou časopisu v štyroch medzinárodných databázach
- možnosť diskusie o témach ako je **ochrana duševného vlastníctva** a jeho **komercializácia, štátna podpora a podpora akademikov zo strany akademických inštitúcií**
- **prezentácia úspechov výskumného pracoviska pri spolupráci s praxou**
- možnosť **zviditeľniť svoju prácu v jedinečnom domácom časopise** zameranom na univerzitný transfer technológií

Chcete publikovať? Napíšte nám na ttb@cvtisr.sk

www.ttb.sk

MINISTERSTVO ŠKOLSTVA, VÝSKUMU, VÝVOJA A MLÁDEŽE SLOVENSKEJ REPUBLIKY

CENTRUM VEDECKO-TECHNICKÝCH INFORMÁCIÍ SR

CENTRUM TRANSFERU TECHNOLÓGIÍ CVTI SR