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**TRENDY A VÝZVY RODINNÉHO PODNIKANIA
A NÁSTUPNÍCTVA XII.**

**Vybrané problémy identifikácie vhodných komponentov
finančnej stratégie**

**TRENDS AND CHALLENGES OF FAMILY BUSINESS
AND SUCCESSION XII.**

**Selected problems of identifying appropriate components of a
financial strategy**



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Trendy a výzvy rodinného podnikania a nástupníctva XII. (Vybrané problémy identifikácie vhodných komponentov finančnej stratégie) – Trends and challenges of family business and succession XII. (Selected problems of identifying appropriate components of a financial strategy)

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Zborník vedeckých statí prezentuje názory autorov na vybrané problémy ekonomiky a manažmentu, ktoré sa prejavujú v rodinných podnikoch, dotýkajú sa ich fungovania a v procese podnikového nástupníctva môžu pozitívne/negatívne ovplyvniť ich ďalšiu existenciu.

The collection of scientific papers presents the authors' opinions on selected problems of economics and management, which are reflected in family businesses, affect their functioning and can positively/negatively affect their further existence in the process of business succession.

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OBSAH**(CONTENT)**

Peter BAHNA – Lucia GÁLOVÁ – Dávid RYBJANSKÝ	5
<i>Generatívna umelá inteligencia vo financiách: systematický prehľad rozvíjajúceho sa výskumného poľa</i>	
Adam ČARDÁŠ	20
<i>Financial strategy under inflation and rising insolvencies: evidence-based working capital and trade credit policy for the dry construction materials value chain in CEE</i>	
Filip GÁL	32
<i>Modern Concepts in Pricing and Revenue Management Decision-Making: A Financial Strategy Perspective</i>	
Lucia GÁLOVÁ – Anita ROMANOVÁ	49
<i>Artificial Intelligence as a Driver of Financial Strategy and Decision-Making: A Literature Review</i>	
Miroslava JOZEKOVÁ	64
<i>Modelovanie finančnej efektivity a hodnoty zákazníka v prostredí e-commerce</i>	
Yuliya PETRENKO	75
<i>Undoing Problem in Household Financial Experiments: Evidence from Social Distance Experiments including Household Context</i>	
Dávid RYBJANSKÝ – Róbert HANÁK	87
<i>Business Intelligence and AI Adoption in Financial Management of SMEs in the EU</i>	
Miriam TAKÁČOVÁ – Katarína REMEŇOVÁ	106
<i>Finančné rozhodovanie vlastnícky riadenej malej spoločnosti v podmienkach obmedzenej racionality: behaviorálny pohľad na investície, likviditu a zadlženie</i>	
Roman TRANŽÍK	125
<i>Likvidita a zadlženosť ako faktory finančnej stability zdravotníckych zariadení</i>	

Veronika VOLFOVÁ	142
<i>The Influence of Financial Decision-making on the Introduction of Innovations in Rural Enterprises</i>	
Sofia ZAVACKÁ – Nadežda JANKELOVÁ	151
<i>Financial and Cost Barriers to Digital Transformation in Healthcare Facilities: A Systematic Literature Review Based on the PRISMA Methodology</i>	

GENERATÍVNA UMELÁ INTELIGENCIA VO FINANCIÁCH: SYSTEMATICKÝ PREHĽAD ROZVÍJAJÚCEHO SA VÝSKUMNÉHO POĽA

Peter Bahna – Lucia Gálová – Dávid Rybjanský

Abstract

Cieľom príspevku je systematicky konsolidovať recenzovanú dôkazovú bázu o aplikáciách generatívnej umelej inteligencie a veľkých jazykových modelov vo finančnom rozhodovaní a usporiadať ju okolo prierezovej optiky augmentácie verzus substitúcie ľudského úsudku. Z metodického hľadiska ide o systematický naratívny prehľad s tematickou syntézou realizovaný podľa vykazovacích zásad PRISMA 2020. Vyhľadávanie prebehlo v troch otvorených bibliografických databázach (OpenAlex, Lens.org a Semantic Scholar) za obdobie 2022 – 2026; po odstránení duplícít, skríningu titulkov a abstraktov a posúdení úplných textov tvorí korpus 100 recenzovaných štúdií, z ktorých 8 prešlo hĺbkovou tematickou analýzou. Výsledky identifikujú päť doménových klastrov aplikácií (kapitálová alokácia a rozpočtovanie, hodnotenie fúzií a akvizícií, finančné plánovanie a analýza, riadenie rizík a pokladnica, a prierezová správa) a tri zreteľné pozície k úlohe GenAI: augmentáciu, skepsa voči substitúcii a podmienené nasadenie s dôrazom na správu a zodpovednosť. Prehľadom ukazujeme, že žiadna z pozícií nedominuje vo všetkých doménach, a formuluje výskumnú agendu zameranú na malé a stredné podniky, kontext strednej a východnej Európy, longitudinálne dôsledky a rozvoj rámcov správy.

JEL classification: G30, G32, O33

Keywords: generatívna umelá inteligencia, veľké jazykové modely, finančné rozhodovanie, systematický prehľad literatúry

Úvod

Uvedenie nástroja ChatGPT koncom roka 2022 predstavovalo zlomový bod pre prakticky všetky oblasti života. Pre finančný sektor je AI ako katalyzátor zmien (McKinsey & Company, 2024). V pozoruhodne krátkom čase sa generatívna umelá inteligencia posunula od výskumnej kuriozity k technológii, ktorú finančné inštitúcie, podnikové finančné útvary, či dokonca jednotliví odborníci začali nasadzovať vo veľkom rozsahu. Prieskumy a prognózy z prostredia praxe tento posun rámcujú silnými výrazmi a poradenské firmy aj profesijné organizácie charakterizujú GenAI skôr ako strategickú prioritu než ako nástroj (McKinsey & Company, 2024; Brynjolfsson & Mitchell, 2017). Hoci takéto naratívy z praxe treba čítať s primeranou opatrnosťou, signalizujú rýchlosť, akou technológia vstúpila do finančnej praxe, a podčiarkujú potrebu rigorózneho akademického spracovania toho, čo je o nej skutočne známe.

Akademický výskum tento prudký rast nasleduje, no nerovnomerne. Pretože je táto oblasť veľmi mladá, recenzovaná dôkazová báza pred rokom 2023 prakticky neexistovala a rýchlo sa rozšírila až od roku 2024. Prvé syntézy sa objavili koncom roka 2025: Ali, Zafar

a Aysan (2025) realizovali systematický prehľad s tematickou syntézou 84 recenzovaných článkov vo Finance Research Letters, zatiaľ čo Eisfeldt a Schubert (2025) ponúkli naratívny prehľad v Annual Review of Financial Economics. Obidva prehľady mapujú problematiku pomerne široko. Začali od oceňovania aktív až po finančné rozhodovanie domácností a trhové aplikácie. Aplikovanie GenAI na strategické, firemné finančné rozhodovanie však zostáva v týchto syntézach perifériou, nie ústredným predmetom analýzy.

Prehľadom literatúry sme chceli reagovať na uvedenú medzeru. Sme toho názoru, že empirická literatúra a literatúra orientovaná na prax sa nezhodujú v jednej zásadnej otázke... a to či GenAI predstavuje nástroj rozšírenia (augmentation) ľudského finančného úsudku, alebo jeho postupnú náhradu (substitution). Tento spor nie je len rétorický. Má priame dôsledky pre to, ako sa finančné rozhodnutia spravujú, ako sa prideľuje zodpovednosť a ako je štruktúrovaný vzťah zastúpenia medzi manažérmi, vlastníkmi a čoraz schopnejšími systémami (Jensen & Meckling, 1976).

Predkladaný prehľad preto sleduje dvojaký cieľ. Snažíme sa konsolidovať rýchlo rastúcu recenzovanú dôkazovú bázu o GenAI vo financiách a túto evidenciu postavíme okolo sporu medzi augmentáciou a substitúciou, ktorý ako argumentujeme, predstavuje ústrednú konceptuálnu líniu zlomu v tomto poli. Týmto sa prehľad usiluje posunúť za hranicu inventára aplikácií smerom k zachyteniu toho, kde sa odborné názory zbiehajú, kde sa rozchádzajú a prečo.

Prehľad sa riadi štyrmi výskumnými otázkami:

- VO1. V ktorých doménach financií sa GenAI aplikuje a s akými doloženými výsledkami?
- VO2. Ako sa literatúra rozdeľuje v otázke úlohy GenAI (augmentácia verzus substitúcia ľudského úsudku) a aké dôkazy predkladá každá pozícia?
- VO3. Aké riziká, obmedzenia a mechanizmy správy (governance) sa identifikujú v súvislosti s nasadením GenAI vo finančných kontextoch?
- VO4. Aké medzery pretrvávajú a ktoré smery by mal budúci výskum uprednostniť?

Zvyšok príspevku je štruktúrovaný nasledovne. Kapitola 2 mapuje aktuálny stav riešenej problematiky doma a v zahraničí. V kapitole 3 sme opísali dizajn výskumu a metodológiu podľa zásad PRISMA 2020. Kapitola 4 prezentuje výskumné výsledky vo forme tematických zistení a sporu o úlohu GenAI. Kapitola 5 obsahuje diskusiu a kapitolu 6 uzatvárame závermi a odporúčaniami.

1 Aktuálny stav riešenej problematiky doma a v zahraničí

1.1 Generatívna umelá inteligencia a veľké jazykové modely

Generatívna umelá inteligencia označuje výpočtové systémy, ktoré tvoria nový obsah (text, kód, číselné odhady či štruktúrované výstupy) učením sa štatistických pravidielností z rozsiahlych tréningových korpusov. V rámci tejto širokej kategórie predstavujú veľké jazykové modely dominantnú podtriedu: architektúry založené na transformeroch

(Vaswani et al., 2017), trénované na rozsiahlom texte tak, aby predikovali nasledujúce tokeny, čo im umožňuje sumarizovať dokumenty, odpovedať na otázky, koncipovať texty a vykonávať celý rad jazykovo sprostredkovaných úloh uvažovania (Brown et al., 2020). Toto rozlíšenie je pre financie dôležité, pretože značná časť finančného rozhodovacieho prostredia je sprostredkovaná textom napríklad: výsledkové konferenčné hovory, zverejnenia, analytické správy, regulačné zmeny atď. (Loughran & McDonald, 2016) Práve tým sa LLM stávajú bezprostredne použiteľnými na úlohy, ktoré boli predtým náročné na ľudskú prácu.

Je dôležité odlíšiť GenAI od skorších foriem analytickej umelej inteligencie vo financiách. Prediktívne strojové učenie sa už roky používa na úverové skórovanie (Khandani et al., 2010), odhaľovanie podvodov a predikciu výnosov (Gu et al., 2020). Charakteristickou črtou GenAI je jej generatívna a konverzačná schopnosť. To znamená, že namiesto toho, aby len klasifikovala alebo skórovala, dokáže tvoriť prvé verzie dokumentov, formulovať strategické zhrnutia a komunikovať s používateľom v prirodzenom jazyku (Bommasani et al., 2021). Tým sa ťažisko aplikácie presúva od predikcie v back-office smerom k úlohám bližším analýze, komunikácii a úsudku, teda práve k tým úlohám, pri ktorých sa tvrdenia o augmentácii alebo substitúcii stávajú spornými.

1.2 Finančné rozhodovanie ako miesto aplikácie

Finančné rozhodovanie zahŕňa široké spektrum, od vysokofrekvenčných úloh bohatých na dáta až po nízkofrekvenčné, na úsudok náročné strategické rozhodnutia. Na jednom konci stoja aplikácie ako extrakcia sentimentu a krátkodobá predikcia, kde sú signály hojné a výsledky rýchlo pozorovateľné. Na druhom konci stoja rozhodnutia charakterizované riedkymi dátami, hlbokou neistotou a dlhými horizontmi. Práve pri alokácii kapitálu, štruktúre financovania a pri zásadných investičných rozhodnutiach má tendenciu dominovať kvalita úsudku, a nie objem výpočtov (Brynjolfsson & Mitchell, 2017). GenAI sa navrhuje ako nástroj naprieč celým týmto spektrom, no sila podporných dôkazov nie je rovnomerná a vhodnosť delegovania úsudku sa výrazne líši podľa typu rozhodnutia. Ústrednou analytickou úlohou tohto prehľadu je preto udržať tieto rozhodovacie kontexty oddelené, namiesto ich zlúčenia do jediného naratívu o „umelej inteligencii vo financiách“.

1.3 Podpora rozhodovania, augmentácia a substitúcia

Konceptuálny slovník na situovanie GenAI nie je nový. Systémy na podporu rozhodovania sa už dlho teoretizujú ako nástroje, ktoré ľudské poznanie rozširujú, a nie nahrádzajú (Arnott & Pervan, 2014). Novšie práce argumentujú, že LLM sa od skorších nástrojov podpory rozhodovania odlišujú svojou univerzálnosťou (Bommasani et al., 2021), čo otvára nové otázky o hraniciach automatizovanej podpory. Diskusiu štruktúrujú dva rámce. V rámci augmentácie GenAI absorbuje rutinnú kognitívnu prácu a uvoľňuje ľudských rozhodovateľov pre úsudok vyššieho rádu, pričom človek zostáva „v slučke“. V rámci substitúcie čoraz schopnejšie systémy preberajú postupne väčšie časti samotného rozhodnutia. Empirická literatúra, ako uvádzame v kapitole 4, poskytuje dôkazy

zlučiteľné s oboma rámcami, niekedy aj v rámci tej istej štúdie, čo je práve dôvod, prečo otázka zostáva otvorená a hodná syntézy.

Oba rámce pretína tretia úvaha a to governance. Ak GenAI rozširuje úsudok, tak kontrola, transparentnosť a auditovateľnosť rozhodnutia stelesnené v ľudskom rozhodovateľovi zostávajú zachované. Ak však GenAI postupne preberá samotné rozhodnutie, vzniká nový problém medzi generálnymi riaditeľmi, manažérmi a algoritmickými systémami (Jensen & Meckling, 1976), ktorý súčasné rámce správy nepokrývajú v plnej miere. Tieto tri línie – augmentácia, substitúcia a správa – tvoria analytickú optiku, prostredníctvom ktorej v ďalších kapitolách čítame zaradenú literatúru.

1.4 Existujúce prehľady a medzera v poznaní

Skoršie prehľady mapujú pole „GenAI vo financiách“ široko. Ali, Zafar a Aysan (2025) realizujú bibliometricko-tematickú syntézu 84 prác s dôrazom na replikovateľnosť, identifikujú šesť hlavných tém vrátane finančného rozhodovania, ktoré však riešia podľa nášho názoru pomerne všeobecne. Eisfeldt a Schubert (2025) ponúkajú naratívny prehľad, ktorý spája GenAI s oceňovaním aktív, finančnými trhmi, rozhodovaním domácností a trhom práce. Ani jeden z týchto prehľadov sa systematicky nezameriava na strategickú firemnú finančnú funkciu ako napríklad kapitálovú alokáciu, kapitálovú štruktúru, hodnotenie fúzií a akvizícií, finančné plánovanie a analýzu a riadenie pokladnice. A ani jeden z nich systematicky nemapuje spor o úlohu GenAI (augmentácia vs. substitúcia) ako analytickú os.

Z týchto pozorovaní vyplývajú tri navzájom súvisiace medzery, ktoré predkladaný prehľad adresuje. Po prvé, chýba syntéza zameraná na strategickú, firemnú rovinu finančného rozhodovania s vysokou neistotou a dlhým horizontom, kde sa otázka delegovania úsudku stáva najostrejšou. Po druhé, žiadny existujúci prehľad systematicky nemapuje spor medzi augmentáciou a substitúciou ako prierezovú analytickú optiku; tento spor sa v primárnej literatúre zreteľne vynára, ale prehľadové práce ho zatiaľ neusporiadali. Po tretie, takmer absentuje evidencia o malých a stredných podnikoch a o trhoch strednej a východnej Európy, čo je výskumný kontext, ktorý si zaslúži samostatnú pozornosť.

2 Dizajn výskumu, výskumná metodológia a metódy

2.1 Cieľ výskumu a typ prehľadu

Základným cieľom nášho výskumu je systematicky konsolidovať recenzovanú dôkazovú bázu o aplikáciách GenAI vo finančnom rozhodovaní a usporiadať ju okolo prierezovej optiky augmentácie verzus substitúcie. Vzhľadom na rýchlosť rastu poľa, heterogenitu metód v primárnych štúdiách a kvalitatívne zameranie analytickej optiky bol zvolený systematický naratívny prehľad s tematickou syntézou (Snyder, 2019) namiesto kvantitatívnej metaanalýzy. Prehľad sa riadi vykazovacími zásadami PRISMA 2020 (Page et al., 2021), práve kvôli tomu, aby sme zachovali transparentnosť a replikovateľnosť dokumentácie procesu výberu štúdií.

2.2 Vyhľadávacia stratégia a databázy

Vyhľadávanie literatúry prebehlo v troch otvorených bibliografických databázach: OpenAlex, Lens.org a Semantic Scholar. Tieto databázy boli zvolené pre ich rozsiahle pokrytie, voľne dostupné metadáta a možnosť exportu záznamov. Doplňkové vyhľadávanie prebehlo v Google Scholar na overenie pokrytia; vzhľadom na obmedzenú replikovateľnosť však Google Scholar neslúžil ako primárny zdroj počtu záznamov a je uvedený medzi obmedzeniami metodológie. Vyhľadávanie bolo obmedzené na publikácie v období 2022 – 2026. Zamerali sme sa teda na obdobie po uvedení ChatGPT a vzniku poľa GenAI vo finančnej praxi.

Použitý vyhľadávací reťazec spájal dve tematické skupiny pomocou booleovskej spojky AND:

- Skupina 1 (technológia): „generative AI“ OR „generative artificial intelligence“ OR „large language model“ OR „LLM“ OR „ChatGPT“ OR „GPT-4“.
- Skupina 2 (finančná doména): „financial strategy“ OR „financial decision“ OR „capital allocation“ OR „capital budgeting“ OR „capital structure“ OR „corporate finance“ OR „CFO“ OR „chief financial officer“ OR „financial planning“ OR „mergers and acquisitions“

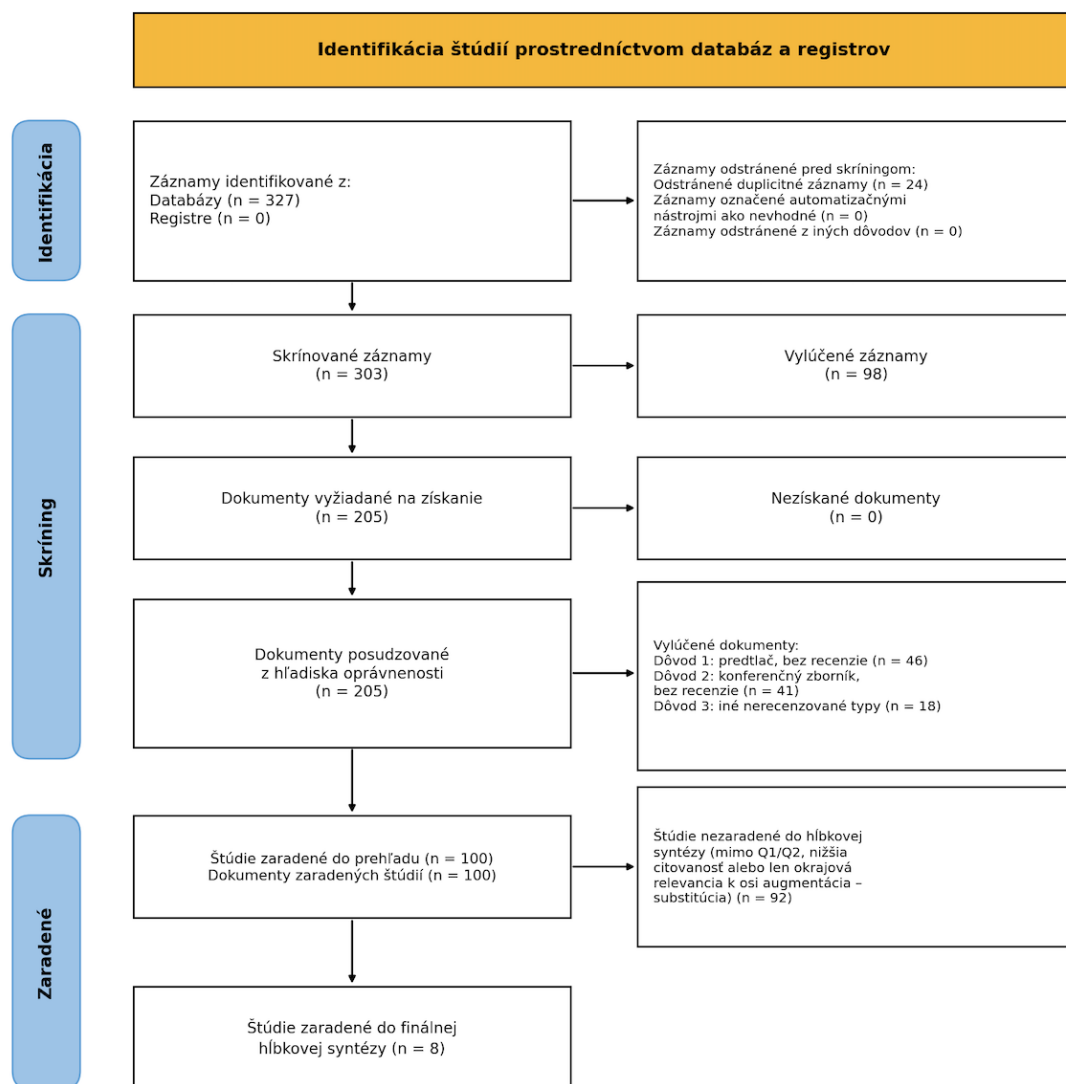
Vyhľadávanie bolo obmedzené na pole názov/abstrakt/kľúčové slová (title/abstract/keywords), na typ dokumentu článok alebo prehľadová štúdiá a na jazyk angličtina. Syntax reťazca bola prispôsobená osobitostiam každej databázy.

2.3 Kritériá zaradenia a vylúčenia

Štúdiá bola zaradená do syntézy, ak spĺňala všetky nasledujúce kritériá: bola recenzovaným pôvodným článkom alebo recenzovanou prehľadovou štúdiou; bola publikovaná v období 2022 – 2026; bola napísaná v angličtine; a empiricky alebo konceptuálne sa zaoberala aplikáciou GenAI alebo LLM vo finančnom rozhodovaní. Zo syntézy boli vylúčené editoriály, komentáre, knižné kapitoly a konferenčné príspevky bez recenzného konania; čisto technické práce zo strojového učenia bez väzby na finančnú doménu; práce zamerané výhradne na detekciu finančných podvodov, automatizované investičné poradenstvo pre individuálnych investorov alebo predikciu trhových cien bez väzby na firemné rozhodovanie a predtlače bez recenzného konania. Kde sú v texte uvedené predtlače na účely ilustrácie kontextu, sú explicitne označené ako predtlače a nepoužívajú sa ako konfirmačná evidencia. Proces výberu štúdií a výsledné počty záznamov sú zhrnuté v PRISMA diagrame nižšie.

Obrázok 1

Diagram toku PRISMA 2020



Zdroj: vlastné spracovanie podľa Page et al. (2021)

2.4 Extrakcia údajov a syntéza

Z každej zaradenej štúdie boli extrahované tieto údaje: bibliografické metadáta, typ štúdie a metóda, finančná doména, skúmaný systém GenAI/LLM, vykazované výsledky a uvedené obmedzenia. V súlade so zaužívanou praxou pre rozvíjajúce sa polia (Snyder, 2019) prebiehala syntéza tematicky: štúdie sa induktívne kódovali do doménovo orientovaných klastrov a na usporiadanie rozporných zistení sa aplikovala prierezová analytická optika – rozlíšenie medzi augmentáciou a substitúciou zavedené v podkapitole 2.3. Táto dvojaká štruktúra umožňuje pomocou prehľadu vykázať tak to, na čo sa GenAI používa, ako aj to, ako sa odborníci nezhodujú v otázke jej primeranej úlohy. Po posúdení úplných textov sme záznamy zaradených štúdií exportovali do tabuľkového hárka (MS Excel), kde sme ku každej položke priradili bibliografické metadáta, identifikátor časopisu

a indikátor kvartilu časopisu. Na podporu posúdenia relevantnosti a kvality sme využili dva nezávislé jazykové nástroje, Perplexity a Claude, ktoré sme požiadali o ohodnotenie každej štúdie z hľadiska tematickej relevantnosti k výskumným otázkam a z hľadiska metodologickej závažnosti. Skóre z oboch nástrojov slúžilo ako pomocná, no nie rozhodujúca informácia. Finálny výber realizoval výskumník manuálne, pričom uprednostnil štúdie, ktoré boli preukázateľne citované v ďalšej literatúre a publikované v časopisoch zaradených do prvého alebo druhého kvartilu (Q1/Q2) podľa databázy Scimago Journal Rank. Použitie jazykových modelov ako podporného nástroja pri triedení a hodnotení záznamov uvádzame transparentne medzi obmedzeniami metodológie. Tak isto považujeme za potrebné povedať, že zo 100 štúdií, ktoré prešli skríningom recenzovanosti, sme pre tematickú syntézu uprednostnili prevažne práce publikované v časopisoch Q1/Q2, ďalej také, ktoré sú preukázateľne citované a priamo sa vzťahujúcich k osi augmentácie verzus substitúcie. Zvyšné záznamy poskytli kontextové pokrytie poľa, ale neboli predmetom hĺbkovej analýzy.

2.5 Obmedzenia metodológie

Pri interpretácii výsledkov chceme zohľadniť obmedzenia metodológie. Po prvé, vyhľadávanie sa opieralo o otvorené databázy (OpenAlex, Lens.org, Semantic Scholar) a nezahrňalo Scopus ani Web of Science a hoci pokrytie otvorených databáz je porovnateľné v širokom zmysle, niektoré individuálne časopisy môžu byť indexované odlišne. Po druhé, skríning realizoval jeden výskumník za pomoci AI, čo prináša riziko subjektivity oproti dvojitému nezávislému skríningu odporúčanému pre vrcholové systematické prehľady.

3 Výsledky výskumu

Táto kapitola odpovedá na výskumné otázky VO1 – VO3 prostredníctvom tematickej syntézy zaradenej literatúry. Prezentácia výsledkov je organizovaná v dvoch úrovniach. Najprv v podkapitole 4.1 mapujeme doménové klastre aplikácií GenAI vo financiách a sumarizujeme empirickú evidenciu pre každý klaster (VO1). Následne v podkapitole 4.2 prevádzame zaradenú evidenciu cez prierezovú optiku augmentácie verzus substitúcie a dopĺňujeme ju o tretiu líniu a teda správu a problém zastúpenia (VO2 a VO3).

3.1 Doménové klastre aplikácií GenAI vo financiách

Induktívne kódovanie zaradených štúdií viedlo k identifikácii piatich doménových klastrov. Tieto klastre nie sú vopred dané, ale vyplynuli z agregácie tém v primárnych prácach. Pre každý klaster ďalej uvádzame, čo sa skúma, aké systémy GenAI sa nasadzujú, aké výsledky sa vykazujú a aké obmedzenia autori priznávajú.

3.1.1 GenAI v kapitálovej alokácii a kapitálovom rozpočtovaní

Najsilnejšiu empirickú evidenciu o uplatnení GenAI v rozhodnutiach o kapitálovej alokácii poskytuje štúdia Jha et al. (2025). Autori konštruujú podnikové ChatGPT investičné skóre na základe textovej analýzy záznamov z výsledkových konferenčných hovorov a ukazujú,

že toto skóre predikuje budúce kapitálové výdavky firiem až deväť kvartálov dopredu, a to pri kontrole klasickej premennej Tobinovho q a ďalších určujúcich faktorov. Skóre súčasne silne koreluje s odpoveďami finančných riaditeľov v dotazníkovom prieskume, čo naznačuje, že LLM dokáže z neštruktúrovaných manažérskych komunikácií extrahovať očakávania o budúcich investíciách, ktoré sú inak ťažko pozorovateľné.

Zistenia Jha et al. (2025) majú dve protichodné stránky, ktoré samotní autori reflektujú. Na jednej strane firmy s vysokým investičným skóre dosahujú významne pozitívne krátkodobé výnosy v období po zverejnení informácií, čo je konzistentné s pridanou informačnou hodnotou. Na druhej strane však tie isté firmy vykazujú negatívne abnormálne výnosy v dlhšom horizonte, čo môže signalizovať systematické predimenzovanie investícií. Tento dvojaký výsledok empiricky podporuje pozíciu, podľa ktorej GenAI poskytuje hodnotné rozšírenie informačnej základne, ale samo osebe nezaručuje optimálnosť strategického rozhodnutia.

Širší kontextový rámec ponúkajú Eisfeldt a Schubert (2025), ktorí dokumentujú, že finančné povolania vrátane úloh spojených s kapitálovou alokáciou a finančným plánovaním sú v rámci ekonomiky vystavené nadpriemerne vysokej miere produktivných efektov GenAI. Autori argumentujú, že nástup ChatGPT predstavoval pre firemné hodnoty merateľný technologický šok, čo má priame dôsledky pre to, ako firmy alokujú kapitál a pracovnú silu. Súčasne však upozorňujú, že empirická literatúra o priamych dopadoch GenAI na strategické investičné rozhodnutia je stále veľmi tenká a väčšina evidencie pochádza z agregovaných trhových dát, nie z firemných prípadových štúdií.

3.1.2 GenAI v hodnotení fúzií a akvizícií a investičnom oceňovaní

V doméne investičného oceňovania a portfóliového rozhodovania je najcitovanejšia empirická evidencia spojená s prácami, ktoré skúmajú schopnosť veľkých jazykových modelov spracúvať textové informácie do podoby investičných signálov. Lopez-Lira a Tang (2023) preukázali, že ChatGPT dokáže na základe titulkov správ priradiť sentimentové skóre, ktoré pozitívne koreluje s následnými dennými výnosmi akcií, pričom prekonáva tradičné metódy sentimentovej analýzy. Autori upozorňujú, že schopnosť predikcie sa zvyšuje s veľkosťou modelu, základné modely typu BERT a GPT-1 podobné výsledky nedosahujú, čo naznačuje, že finančné uvažovanie je emergentnou vlastnosťou komplexných LLM.

Ko a Lee (2024) prevádzajú analýzu z roviny sentimentu na rovinu portfóliového zostavenia. Skúmajú, či ChatGPT dokáže vybrať akcie do investičného portfólia z univerza S&P 500, a porovnávajú výsledky s tradičnými optimalizačnými prístupmi. Ich kľúčové zistenie je dvojstranné: ChatGPT je efektívny pri výbere akcií, ale neoptimálny pri pridelovaní váh v portfóliu; hybridný prístup, ktorý spája výber akcií ChatGPT s tradičnými optimalizačnými technikami, dosahuje lepšie výsledky než ktorýkoľvek z prístupov samostatne. Tento výsledok je dôležitý preto, že empiricky podporuje rámec augmentácie a súčasne odmieta naivnú substitúciu kvantitatívnych modelov jednoduchým LLM dotazom.

Lopez-Lira a Tang (2023) zároveň prinášajú dôležité varovanie pre interpretáciu týchto výsledkov: stratégie založené na LLM signáloch vykazujú klesajúce výnosy s rastúcou adopciou týchto nástrojov, čo je konzistentné s vyššou efektívnosťou trhu. Inými slovami, prevaha hypotézy augmentácie nemusí byť trvalá – ak sa prístup k LLM nástrojom rozšíri, konkurenčná výhoda z ich nasadenia sa eroduje. Pre praktické fúzie a akvizície to znamená, že GenAI môže zrýchliť hĺbkovú previerku a kvantifikáciu sentimentu o cieľovej firme, ale udržateľná hodnota leží v ľudskej interpretácii kontextu, ktorý model štandardizuje.

3.1.3 GenAI vo finančnom plánovaní, analýze a prognózovaní

Aplikácie v oblasti finančného plánovania a analýzy (FP&A) využívajú generatívnu schopnosť LLM transformovať neštruktúrované textové vstupy do číselných alebo štruktúrovaných výstupov. Štúdia Jha et al. (2025), uvedená v podkapitole 4.1.1, je príkladom takejto transformácie: textová analýza výsledkových hovorov vedie ku konštrukcii prediktívneho skóre, ktoré dopĺňa klasické metriky typu Tobinovho q. Hodnota nie je v náhrade existujúcich premenných, ale v inkrementálnej informácii, ktorú LLM dokáže extrahovať z textu.

Eisfeldt a Schubert (2025) vo svojom prehľade upozorňujú na dve metodologické riziká, ktoré FP&A literatúra musí explicitne adresovať. Prvým je riziko kontaminácie tréningových dát: ak LLM bol trénovaný na textoch obsahujúcich budúce výsledky, retrospektívne testy môžu nadhodnocovať jeho prediktívne schopnosti. Druhým je skreslenie pohľadom do budúcnosti, ktorý vzniká, keď výskumník nedôsledne oddelí informácie dostupné v čase rozhodnutia od neskoršie publikovaných údajov. Obidve riziká sa zvlášť týkajú aplikácií, kde sa LLM používa na spätné testovanie prognóz. Ali et al. (2025) ich identifikujú ako jednu z hlavných výziev replikovateľnosti v poli GenAI vo financiách.

3.1.4 GenAI v riadení rizík

V doméne riadenia rizík a podnikových financií sa empirická evidencia sústreďuje na úlohy spojené s interpretáciou regulačných listín a odporúčaní z národných bánk. Hansen a Kazinnik (2024) skúmali, či GPT modely dokážu klasifikovať vyhlásenia Federálneho výboru pre operácie na voľnom trhu (FOMC) podľa ich monetárnej orientácie, a zistili, že tieto modely dosahujú výrazne lepšiu klasifikačnú výkonnosť oproti tradičným metódam analýzy textu. Pre treasury funkciu firmy má toto zistenie praktický význam: rýchla a presná interpretácia signálov o budúcich pohyboch úrokových sadzieb je relevantná pre riadenie likvidity, menové zabezpečovanie a štruktúru dlhového financovania.

Druhú líniu evidencie v tejto doméne tvorí výskum o použití umelej inteligencie v auditnom procese. Fedyk et al. (2022) na vzorke veľkých auditorských spoločností preukázali, že investície do AI súvisia s vyššou kvalitou auditov. Hoci sa táto práca venuje predchodcom GenAI, jej zistenia sa stávajú referenčným bodom pre súčasnú diskusiu o tom, do akej miery LLM dokážu posilniť kontrolné procesy v rámci finančného reportingu. Súčasne autori dokumentujú, že nasadenie AI viedlo k zníženiu počtu auditového personálu, čo je problém, ktorý sa s príchodom generatívnej AI ďalej zintenzívňuje.

3.1.5 Správa, transparentnosť a problém zastúpenia

Prierezová téma správy sa naprieč zaradenou literatúrou objavuje opakovane, no z rôznych uhlov. Mökander et al. (2024) ponúkajú konceptuálny rámec trojúrovňového auditu LLM, ktorý rozlišuje audit poskytovateľa technológie, audit samotného modelu pred jeho uvedením a audit konkrétnej aplikácie. Autori argumentujú, že existujúce auditné postupy nedokážu zachytiť špecifické riziká LLM, ako sú emergentné schopnosti a širokospektrálna adaptabilita na rôzne úlohy. Pre finančné aplikácie z toho vyplýva, že tradičné rámce internej kontroly založené na deterministickom správaní softvéru nie sú dostatočné, keď firma nasadí LLM na úlohy zasahujúce do finančných výkazov alebo investičných rozhodnutí.

Z meta-prehľadovej perspektívy Ali et al. (2025) identifikujú správu, interpretovateľnosť a transparentnosť ako jednu zo šiestich hlavných tém, ktoré dominujú v poli GenAI vo financiách, a súčasne ako jednu z hlavných výskumných priorít do budúcnosti. Kombinujú konštatovanie, že GenAI zvyšuje prediktívne schopnosti a ESG hodnotenia, s upozornením, že produkuje skreslenia, problémy transparentnosti a regulačné otázky. Eisfeldt a Schubert (2025) toto napätie zachytávajú v širšom rámci: nástup GenAI predstavuje pre firmy nielen šok „produktivity“, ale aj inštitucionálnu výzvu pre to, ako sa formálne rámce správy firiem prispôbujú algoritmickým systémom v rozhodovacích pozíciách.

3.2 Spor o úlohe GenAI: augmentácia, substitúcia a správa

Naprieč doménovými klastrami sa literatúra rozdeľuje pozdĺž troch zreteľných pozícií týkajúcich sa primeranej úlohy GenAI vo finančnom rozhodovaní. Identifikácia týchto pozícií predstavuje hlavný analytický prínos prehľadu vo vzťahu k VO2 a VO3.

3.2.1 Pozícia augmentácie

Prvá pozícia chápe GenAI ako nástroj, ktorý rozširuje schopnosti ľudského finančného rozhodovateľa bez toho, aby ho nahradil. V tomto rámci LLM absorbujú rutinnú kognitívnu prácu (sumarizáciu textov, prvé verzie analytických správ, extrakciu informácií z neštruktúrovaných zdrojov) a uvoľňujú odborníkov pre náročnejšie zadania v podniku. Empirickú oporu pre túto pozíciu poskytujú Jha et al. (2025): ChatGPT investičné skóre nenahrádza klasické metriky typu Tobinovho q , ale poskytuje k nim inkrementálnu informáciu, ktorá zlepšuje prediktívnu schopnosť modelu kapitálových výdavkov. Podobne Ko a Lee (2024) ukazujú, že hybridný prístup spájajúci výber akcií pomocou ChatGPT s tradičnou optimalizáciou výrazne prekonáva každý z týchto prístupov v izolovanej podobe.

3.2.2 Pozícia skepsy a riziká substitúcie

Druhá pozícia je k delegovaniu rozhodnutí na GenAI výrazne skeptickejšia. Argumentuje, že LLM môžu vykazovať nekonzistentné výstupy v reakcii na drobné zmeny v promptoch a produkovať halucinácie najmä vo finančných sumároch. Lopez-Lira a Tang (2023) dokumentujú, že stratégie založené na LLM signáloch dosahujú klesajúce výnosy s

rastúcou adopciou týchto nástrojov, čo naznačuje, že hodnota LLM ako autonómneho rozhodovateľa nie je trvalá. Ali et al. (2025) na základe syntézy 84 prác identifikujú skreslenia, problémy transparentnosti a regulačné otázky ako systematické črty súčasných LLM aplikácií vo financiách. Tento tábor zdôrazňuje, že vysokou výpočtovou schopnosťou modelu sa kvalita strategického úsudku automaticky nezvyšuje a v niektorých prípadoch sa, naopak, zhoršuje.

3.2.3 Pozícia podmieneného nasadenia a správy

Tretia pozícia neuzatvára otázku augmentácie a substitúcie v prospech jednej strany, ale prenáša ju do roviny správy. Argumentuje, že nasadenie GenAI vo finančnom rozhodovaní nie je primárne technickou otázkou, ale otázkou riadenia: kto nesie zodpovednosť za rozhodnutie, ako je výstup modelu auditovateľný a ako sa rieši nový agency problém medzi vlastníckmi, manažérmi a algoritmickými systémami. Mökander et al. (2024) formulujú v tejto súvislosti trojúrovňový auditný rámec, ktorý rozlišuje audit poskytovateľa, audit modelu a audit aplikácie. Fedyk et al. (2022) dopĺňujú empirickú perspektívu: investície do AI v audite zvyšujú jeho kvalitu, ale súčasne menia štruktúru auditového personálu a otvárajú nové otázky o tom, kto je za výstup modelu reálne zodpovedný.

3.3 Syntéza naprieč VO1-VO3

Z prierezovej analýzy vyplýva, že žiadna z troch pozícií nedominuje vo všetkých doménach rovnomerne. Pozícia augmentácie získava najsilnejšiu oporu v doménach bohatých na text a opakované úlohy (Jha et al., 2025), výber akcií v kombinácii s tradičnou optimalizáciou (Ko & Lee, 2024) a interpretácia textov Národných bánk pre treasury (Hansen & Kazinnik, 2024). Pozícia skepsy je najsilnejšia v doménach s krátkym horizontom rozhodnutia a vysokou citlivosťou na presnosť signálu, kde výnosy z LLM stratégií klesajú s rastúcou adopciou (Lopez-Lira & Tang, 2023) a kde meta-prehľadová evidencia upozorňuje na systematické skreslenia (Ali et al., 2025). Pozícia správy nie je alternatívou k predchádzajúcim dvom, ale ich nadstavbou: bez ohľadu na to, či GenAI augmentuje alebo substituie, otvára nové otázky o auditovateľnosti a zodpovednosti, ktoré tradičné rámce internej kontroly nepokrývajú (Mökander et al., 2024; Fedyk et al., 2022).

4 Diskusia

Predkladaný prehľad ukazuje, že pozícia GenAI vo financiách už dnes obsahuje zreteľné línie zlomu, ktoré pretrvávajú naprieč doménami aplikácií. Najdôležitejším z nich je rozdielne chápanie toho, čomu vlastne GenAI vo finančnom rozhodovaní slúži. Nejde o terminologický spor, ale o otázku s priamymi dôsledkami pre praktické nasadenie technológie i pre teóriu rozhodovania.

Augmentačná pozícia získava najsilnejšiu empirickú oporu v úlohách, kde sa veľký objem nesúrodého textu stretáva s potrebou expertnej interpretácie – typicky pri hĺbkovej kontrole, sumarizácii zverejnení a v prvých fázach pracovných postupov. V týchto

kontextoch GenAI nielenže redukuje pracnosť, ale zvyšuje aj kvalitu výsledku, ak je ľudský odborník naďalej v pozícii konečného posudzovateľa. Skeptická pozícia získava silu v opačnom konci spektra: pri rozhodnutiach s dlhým horizontom, riedkou empirickou základňou a vysokou citlivosťou na presnú formuláciu úsudku, kde sa nekonzistentnosť výstupov a halucinácie stávajú vážnym rizikom. Governance pozícia preťahuje obe diskusie do roviny inštitucionálnej štruktúry a upozorňuje na to, že technická diskusia o presnosti modelu nedáva odpoveď na otázku zodpovednosti.

Pre prax z tejto syntézy plynú tri praktické implikácie. Po prvé, výber spôsobu nasadenia GenAI by mal explicitne odzrkadľovať charakter rozhodovacej úlohy: úlohy bohaté na text a opakujúce sa úlohy znesú širšiu mieru augmentácie, zatiaľ čo strategické rozhodnutia s neúplnými dátami a dlhým horizontom vyžadujú podstatne silnejšiu úlohu ľudského úsudku. Po druhé, nasadenie GenAI vo firemnom finančnom rozhodovaní si vyžaduje rozšírenie rámcov správy o explicitné pravidlá pre auditovateľnosť algoritmických odporúčaní a pre rozdelenie zodpovednosti medzi ľudského rozhodovateľa a systém. Po tretie, evidencia z prehľadu naznačuje, že kompetenčný profil finančného manažéra sa posúva: hodnotu vytvára nielen schopnosť pracovať s nástrojom, ale aj schopnosť kriticky posúdiť, kde model spoľahlivo augmentuje úsudok a kde ho ohrozuje.

4.1 Výskumná agenda

V prehľade odhaľujeme tri smery, ktoré si zaslúžia prioritu v budúcom výskume. Prvým je systematické skúmanie nasadenia GenAI v malých a stredných podnikoch a v kontexte trhov strednej a východnej Európy, kde je súčasná evidencia takmer úplne neprítomná. Druhým je longitudinálny výskum dôsledkov nasadenia GenAI na štruktúru finančného oddelenia, kompetenčné profily a deľbu rozhodovania medzi človekom a systémom. Tretím je rozvoj governance rámcov, ktoré explicitne adresujú nový agency problém medzi vlastníkmi, manažérmi a algoritmickými systémami pri strategických finančných rozhodnutiach.

4.2 Obmedzenia výskumu

Okrem obmedzení metodológie uvedených v podkapitole 3.5 treba pripomenúť, že pole GenAI vo financiách sa rozvíja extrémne rýchlo a niektoré aktuálne práce ešte neprešli recenzným konaním v čase ukončenia vyhľadávania. Predkladaný prehľad preto reprezentuje stav recenzovanej dôkazovej bázy a očakávame, že časť záverov sa v krátkodobom horizonte spresní alebo doplní. Ďalším obmedzením je geografická koncentrácia primárnej evidencie na podniky a trhy Spojených štátov a vyspelej Európy, čo redukuje generalizovateľnosť záverov na iné kontexty.

Záver

V prehľade literatúry sme systematizovali recenzovanú dôkazovú bázu o aplikáciách generatívnej umelej inteligencie vo finančnom rozhodovaní a usporiadali ju okolo prierezovej optiky augmentácie verzus substitúcie ľudského úsudku. V odpovedi na VO1

prehľad identifikoval päť doménových klastrov: kapitálovú alokáciu a rozpočtovanie, hodnotenie fúzií a akvizícií, finančné plánovanie a analýzu, riadenie rizík a treasury, a prierezovú tému správy. V odpovedi na VO2 a VO3 prehľad zdokumentoval tri zreteľné pozície vo vzťahu k úlohe GenAI a ich špecifické empirické zázemia. V odpovedi na VO4 prehľad sformuloval výskumnú agendu zameranú na malé a stredné podniky, kontext strednej a východnej Európy, longitudinálne dôsledky nasadenia a rozvoj governance rámcov.

Z perspektívy odporúčaní pre prax i pre výskum prehľad ukazuje, že otázka „či GenAI patrí do finančného rozhodovania“ je nesprávne položená. Správnou otázkou je „v ktorých rozhodovacích kontextoch, akým spôsobom a pod akou správou“. Predkladaný príspevok ponúka prvý systematický pokus odpovedať na túto otázku v slovenskej akademickej literatúre a tvorí východisko pre nadväzujúci empirický výskum v kontexte slovenských a stredoeurópskych podnikov.

Poznámka o riešenom projekte

Tento výskum bol podporený projektom IGMP Ekonomickej univerzity v Bratislave, č. I-26-105-00 „Implementácia umelej inteligencie v slovenských podnikoch: kľúčové kompetencie, procesy a osvedčené postupy pre integráciu AI.

Použitá literatúra (References)

Ali, H. – Zafar, M. B. – Aysan, A. F. (2025). Generative AI in finance: Replicability, methodological contingencies, and future research directions. *Finance Research Letters*, 86, 108797. DOI 10.1016/j.frl.2025.108797.

Arnott, D. – Pervan, G. (2014). A critical analysis of decision support systems research revisited: the rise of design science. *Journal of Information Technology*, Vol. 29, Issue 4, pp. 269–293. DOI 10.1057/jit.2014.16.

Bommasani, R. – Hudson, D. A. – Adeli, E. – Altman, R. – Arora, S. – von Arx, S. et al. (2021). On the Opportunities and Risks of Foundation Models. Stanford CRFM Report. arXiv:2108.07258. DOI 10.48550/arXiv.2108.07258.

Brown, T. B. – Mann, B. – Ryder, N. – Subbiah, M. – Kaplan, J. – Dhariwal, P. et al. (2020). Language Models are Few-Shot Learners. In: *Advances in Neural Information Processing Systems*, Vol. 33, pp. 1877–1901. NeurIPS 2020.

Brynjolfsson, E. – Mitchell, T. (2017). What can machine learning do? Workforce implications. *Science*, Vol. 358, Issue 6370, pp. 1530–1534. DOI 10.1126/science.aap8062.

Eisfeldt, A. L. – Schubert, G. (2025). Generative AI and Finance. *Annual Review of Financial Economics*, Vol. 17, pp. 363–393. DOI 10.1146/annurev-financial-112923-020503.

Fedyk, A. – Hodson, J. – Khimich, N. – Fedyk, T. (2022). Is artificial intelligence improving the audit process? *Review of Accounting Studies*, Vol. 27, Issue 3, pp. 938–985. DOI 10.1007/s11142-022-09697-x.

- Gu, S. – Kelly, B. – Xiu, D. (2020). Empirical Asset Pricing via Machine Learning. *The Review of Financial Studies*, Vol. 33, Issue 5, pp. 2223–2273. DOI 10.1093/rfs/hhaa009.
- Hansen, A. L. – Kazinnik, S. (2024). Can ChatGPT Decipher Fedspeak? Federal Reserve Bank of Richmond Working Paper. SSRN Working Paper No. 4399406. DOI 10.2139/ssrn.4399406.
- Jensen, M. C. – Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, Vol. 3, Issue 4, pp. 305–360. DOI 10.1016/0304-405X(76)90026-X.
- Jha, M. – Qian, J. – Weber, M. – Yang, B. (2025). ChatGPT and Corporate Policies. NBER Working Paper No. 32161 / Chicago Booth Research Paper No. 23-15. Cambridge, MA: National Bureau of Economic Research. DOI 10.3386/w32161.
- Khandani, A. E. – Kim, A. J. – Lo, A. W. (2010). Consumer credit-risk models via machine-learning algorithms. *Journal of Banking & Finance*, Vol. 34, Issue 11, pp. 2767–2787. DOI 10.1016/j.jbankfin.2010.06.001.
- Ko, H. – Lee, J. (2024). Can ChatGPT improve investment decisions? From a portfolio management perspective. *Finance Research Letters*, Vol. 64, Article 105433. DOI 10.1016/j.frl.2024.105433.
- Lopez-Lira, A. – Tang, Y. (2023). Can ChatGPT Forecast Stock Price Movements? Return Predictability and Large Language Models. SSRN Working Paper No. 4412788. DOI 10.2139/ssrn.4412788.
- Loughran, T. – McDonald, B. (2016). Textual Analysis in Accounting and Finance: A Survey. *Journal of Accounting Research*, Vol. 54, Issue 4, pp. 1187–1230. DOI 10.1111/1475-679X.12123.
- McKinsey & Company (2024). The state of AI in early 2024: Gen AI adoption spikes and starts to generate value. McKinsey Global Survey on AI. Dostupné online: mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai (cit. 28. 5. 2026).
- Mökander, J. – Schuett, J. – Kirk, H. R. – Floridi, L. (2024). Auditing large language models: a three-layered approach. *AI and Ethics*, Vol. 4, Issue 4, pp. 1085–1115. DOI 10.1007/s43681-023-00289-2.
- Page, M. J. – McKenzie, J. E. – Bossuyt, P. M. – Boutron, I. – Hoffmann, T. C. – Mulrow, C. D. et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, Vol. 372, Article n71. DOI 10.1136/bmj.n71.
- Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, Vol. 104, pp. 333–339. ISSN 0148-2963. DOI 10.1016/j.jbusres.2019.07.039.
- Vaswani, A. – Shazeer, N. – Parmar, N. – Uszkoreit, J. – Jones, L. – Gomez, A. N. – Kaiser, Ł. – Polosukhin, I. (2017). Attention is All You Need. In: *Advances in Neural Information Processing Systems*, Vol. 30, pp. 5998–6008. NeurIPS 2017.

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FINANCIAL STRATEGY UNDER INFLATION AND RISING INSOLVENCIES: EVIDENCE-BASED WORKING CAPITAL AND TRADE CREDIT POLICY FOR THE DRY CONSTRUCTION MATERIALS VALUE CHAIN IN CEE

Adam Čardáš

Abstract

This paper develops an evidence-informed conceptual framework for financial strategy decisions in the dry construction materials value chain (manufacturers–distributors–contractors) in Central and Eastern Europe (CEE: Slovakia, Czechia, Poland, Hungary), benchmarked against Austria. Drawing on secondary macro-economic statistics, insolvency intelligence from Coface and Creditreform, and ECB monetary policy data, the study links macro-level shocks to micro-level working capital and trade credit policies. Theoretically, the paper grounds its analysis in the cash conversion cycle literature (Chang, 2018; Raheman & Nasr, 2007), trade credit theory (Amberg et al., 2021; Garcia-Appendini & Montoriol-Garriga, 2013), and financial distress research (Altman et al., 2017; Fernández-Gámez et al., 2020). Coface reports that CEE economic growth returned in 2024 (2.6% vs. 0.8% in 2023) and inflation fell to 4.6% from 11.2% in 2023, yet insolvency fragility persisted; excluding Hungary, insolvency cases increased by 3% in 2024. Austria recorded 6,693 corporate insolvencies in 2024 (+21.9% y/y). Using these signals together with ECB policy-rate dynamics and Eurostat bankruptcy indicators, three testable research propositions are formulated and a practical managerial toolkit is derived for cash conversion cycle governance, credit limits, payment terms, and liquidity buffers. The contribution is a theoretically anchored, practitioner-oriented framework suitable for firm-level empirical validation in future research.

JEL classification: E44, G32, G33

Keywords: financial strategy, working capital management, cash conversion cycle, trade credit, insolvency risk, CEE

Introduction

Inflationary shocks, higher refinancing costs and changing payment discipline have fundamentally redefined corporate financial strategy across Europe since 2021. For working-capital-intensive industries, the interaction between liquidity, inventory financing and trade credit becomes a primary determinant of resilience. This is particularly acute for the dry construction materials value chain, where inventory is strategically necessary for service levels, yet costly to finance under restrictive monetary policy.

Recent macro-economic evidence illustrates the paradox of aggregate recovery alongside persistent micro-level fragility in CEE. Coface (2025) reports that the region's GDP growth improved to 2.6% in 2024 from 0.8% in 2023 and inflation fell to 4.6% from 11.2%, yet corporate stability continued to deteriorate; excluding Hungary (where legal

procedural changes distort headline totals), insolvencies increased by 3% in 2024. In Austria, corporate insolvencies reached 6,693 in 2024, representing +21.9% year-on-year (Creditreform, 2025). Eurostat (2024) further reports that EU business bankruptcy declarations increased by 2.7% quarter-on-quarter in Q3 2024, with construction sector registrations rising by 3.7% q/q, signalling continued structural churn.

The academic literature provides well-established frameworks for working capital management and trade credit policy, yet their application to transitional economies under simultaneous inflation and rate normalisation cycles remains underdeveloped. This gap motivates the present study. The paper provides an evidence-based conceptual framework to: (i) select and justify ex post financial indicators suitable for the dry construction distribution business model; (ii) translate macro risk signals into working capital and trade credit policy; and (iii) propose implementable policy recommendations for distributors and manufacturers in Slovakia, Czechia, Poland and Hungary, with Austria as a Western European benchmark.

1 Current state of the solved problem at home and abroad

1.1 Financial strategy and working capital management

Corporate finance literature defines financial strategy as the integrated configuration of financing, liquidity, investment and payout policies that supports value creation under risk constraints (Brealey et al., 2019; Arnold, 2019). A central operationalisation of financial strategy in distribution-intensive industries is working capital management. The cash conversion cycle (CCC), defined as inventory days outstanding plus days sales outstanding minus days payable outstanding, serves as the key summary metric linking operational activity to liquidity and refinancing exposure (Atrill, 2019; Watson, 2019).

Seminal empirical research by Chang (2018) on global firms demonstrated that shortening the cash conversion cycle is associated with higher corporate performance. Raheman and Nasr (2007) extended this evidence to Pakistani listed firms, confirming a significant negative relationship between the CCC and profitability. Goncalves et al. (2018) similarly found that reducing the net trade cycle improves firm value across different economic cycles. These findings collectively support the view that CCC optimisation is not merely an operational matter but a core financial strategy lever, particularly relevant in environments where financing costs are elevated.

More recently, Baños-Caballero et al. (2012) demonstrated an inverted U-shaped relationship between working capital level and firm value for Spanish SMEs, suggesting that optimal rather than minimal working capital exists. This is particularly relevant for inventory-intensive industries such as dry construction materials distribution, where a minimum service-level inventory is non-negotiable for competitive positioning. Under rising interest rates, however, the cost of suboptimal inventory buffering increases non-linearly (Protopappa-Sieke & Seifert, 2010).

1.2 Trade credit theory and credit risk in B2B markets

Trade credit is the dominant form of short-term external finance in B2B markets and constitutes a key component of working capital policy. Amberg et al. (2021) demonstrate that firms actively manage liquidity shortfalls through trade credit adjustments, drawing on suppliers' credit while reducing credit issued to customers, confirming trade credit's central role as a liquidity buffer. Garcia-Appendini and Montoriol-Garriga (2013) formalise an information and liquidity role for trade credit: suppliers act as liquidity providers to buyers during credit market disruptions, drawing on their own internal financing capacity when buyers face external credit constraints.

Cuñat (2007) emphasises the insurance function of trade credit: suppliers act as implicit lenders of last resort to buyers experiencing temporary liquidity shocks, and this role is embedded in long-term trading relationships. The implication for the dry construction materials value chain is significant distributors providing extended terms to contractors implicitly absorb liquidity risk, particularly in high-insolvency environments. Kadlečík and Markovič (2015) address credit limit determination for trade credit specifically in the Slovak context, emphasising the role of customer scoring, payment history and exposure concentration in managing receivables risk.

Empirical evidence on late payment and default propagation in supply chains underscores the systemic dimension of trade credit risk. Jacobson and von Schedvin (2015) demonstrate, using Swedish firm-level data, that trade credit losses propagate through supply chains in a manner consistent with financial contagion: supplier distress caused by customer default amplifies bankruptcy risk upstream. This transmission mechanism is highly relevant for the dry construction materials sector, where contractor insolvencies can trigger cascading distress in the distributor–manufacturer chain.

1.3 Financial distress prediction and insolvency risk

The financial distress literature has developed increasingly sophisticated tools for predicting business failure. Fernández-Gámez et al. (2020) provide comprehensive evidence that financial distress prediction accuracy varies substantially across European countries, emphasising the importance of macroeconomic and regulatory factors alongside accounting ratios. Altman et al. (2017) offer the most extensive international validation of discriminant-analysis-based models, assessing the Z-score model across 31 European and three non-European countries using private firm data. Their findings confirm that while the model retains predictive power, country-specific recalibration substantially improves classification accuracy. These results have since been adapted to CEE insolvency contexts, including a comprehensive assessment of bankruptcy prediction models applied to Central European SMEs by Klietk et al. (2025).

Logistic regression approaches to distress prediction, initiated by Ohlson (1980) and subsequently extended by numerous researchers, offer probabilistic outputs and greater flexibility in variable specification. For the CEE context, Klietk et al. (2025) and similar national-level studies reflect the need to recalibrate standard models to local accounting standards, ownership structures and legal insolvency frameworks. Critically for the

present paper's context, models trained on pre-2021 data may understate distress probability under a simultaneous inflation-and-rate-tightening shock not present in historical training samples.

The construction and construction materials sectors display sector-specific insolvency dynamics. Blach et al. (2021) identified low capitalisation, aggressive bidding and payment delays from project owners as structural drivers of contractor failure in Central European construction markets, a pattern confirmed in more recent European evidence (Creditreform, 2025). The sector's long working capital cycles reflecting project-based cash flows and extended payment terms make it structurally sensitive to interest rate movements and inflation.

1.4 Monetary policy, inflation and corporate finance

The transmission of monetary policy to firm-level financial decisions operates through multiple channels: refinancing cost (interest burden on floating-rate debt), asset valuation (discount rate effects on investment appraisal) and demand effects (construction activity driven by mortgage and public investment finance). Altavilla et al. (2022) provide recent evidence that rising interest rates tighten borrowing constraints on leveraged firms through both balance-sheet and bank lending channels, amplifying the macroeconomic effect of policy tightening beyond the direct interest cost, particularly when rates approach or exceed zero-lower-bound thresholds.

In the CEE context, the transmission of ECB rate decisions is mediated by the degree of euro-area financial integration. Slovakia (eurozone) receives ECB policy directly; Czechia and Poland operate under independent central banks, which followed their own often more aggressive tightening cycles. This heterogeneity creates a natural comparative structure for assessing how refinancing cost transmission differs across the value chain's operating markets. Égert and MacDonald (2009) document partial but growing interest rate pass-through from ECB rates to retail lending rates in CEE economies, suggesting non-trivial cross-border transmission even outside the eurozone.

2 Research design: aims, research propositions and methodology

The main research aim is to develop an evidence-informed conceptual model and a managerial toolkit for working capital and trade credit policy in the dry construction materials value chain under inflation and rising insolvency risk in CEE, benchmarked against Austria.

Partial goals are: (1) to select and justify a set of ex post financial indicators (liquidity, leverage, coverage, CCC) relevant for B2B distribution; (2) to synthesise publicly available macro and insolvency statistics for CEE and Austria; (3) to formulate testable research propositions linking the inflation/high-rate environment to CCC and distress risk; (4) to translate findings into implementable policy recommendations.

Object of research: the dry construction materials value chain in Slovakia, Czechia, Poland and Hungary; Austria is used as a benchmark market due to its comparable EU regulatory context, eurozone proximity and divergent insolvency dynamics.

Research propositions:

- P1 – Inflation and restrictive monetary policy lengthen the cash conversion cycle of distributors through inventory buffering and delayed receivables collection. Theoretical basis: higher financing costs increase the cost of CCC length (Chang, 2018; Protopappa-Sieke & Seifert, 2010) while supply uncertainty incentivises precautionary inventory accumulation.
- P2 – Rising insolvency incidence is associated with deterioration in debtor liquidity ratios and higher implied refinancing costs, increasing the probability of financial distress upstream. Theoretical basis: the supply chain contagion mechanism identified by Jacobson and von Schedvin (2015) and the monetary transmission channels documented by Altavilla et al. (2022).
- P3 – Tighter, segmented trade credit policies improve distributor liquidity resilience at the expense of short-term sales volume. Theoretical basis: the trade-off between credit extension as a competitive tool (Amberg et al., 2021) and expected loss under elevated insolvency incidence (Cuñat, 2007).

Methodology: The paper applies a structured secondary-data synthesis approach. It triangulates: (i) insolvency trends and country-level datas from Coface (2025) and Creditreform (2025); (ii) ECB policy-rate changes as a direct proxy for refinancing conditions; and (iii) Eurostat short-term business statistics for bankruptcy registrations. The analysis is complemented by a value-chain mapping and a policy toolkit design that operationalises financial strategy decisions without reliance on firm-level regression. This design choice follows Eisenhardt's (2021) framework for building theory from secondary evidence in contexts where primary microdata are unavailable.

Table 1

Key macro and insolvency indicators (CEE vs. Austria)

Metric	CEE (aggregate)	Austria
GDP growth 2024 (vs. 2023)	2.6% (vs. 0.8%)	Recession; GDP -1.1% in 2024
Inflation (regional)	4.6% in 2024 (vs. 11.2% in 2023)	High inflation period; construction and property under pressure
Insolvencies (headline)	50,248 (2023) → 45,938 (2024), -9% (affected by HU)	5,490 (2023) → 6,693 (2024), +21.9%
Insolvencies excl. Hungary	29,771 (2023) → 30,680 (2024), +3%	n/a

Source: Coface (2025); Creditreform (2025)

Table 2
Insolvency dynamics by country (2024 vs. 2023)

Country	Change in insolvencies 2024 vs. 2023	Notes
Poland	+19%	Increase linked to permanent adoption of restructuring procedures
Czechia	+1.9%	Relatively stable but exposed to external demand weakness
Slovakia	-3.5%	Relatively stable trend; eurozone member
Hungary	-25.5%	Decline driven by normalisation after 2022 regulatory spike
Austria	+21.9%	Highest level since 2009; recession context

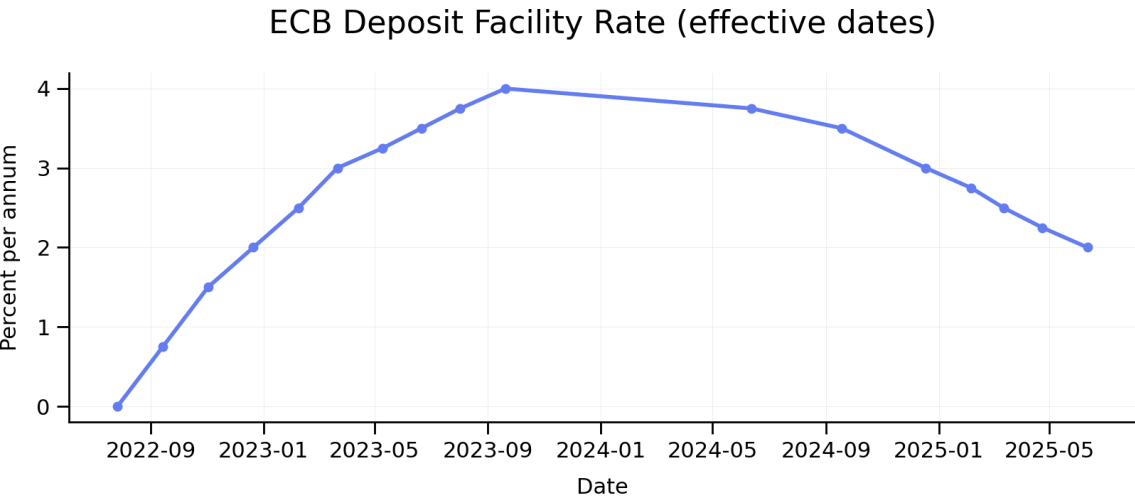
Source: Coface (2025); Creditreform (2025)

Table 3
ECB deposit facility rate – key effective dates

Effective date	ECB deposit facility rate (%)
27 Jul 2022	0.00
14 Sep 2022	0.75
2 Nov 2022	1.50
21 Dec 2022	2.00
20 Sep 2023	4.00 (peak)
12 Jun 2024	3.75
18 Dec 2024	3.00
11 Jun 2025	2.00

Source: European Central Bank (2026)

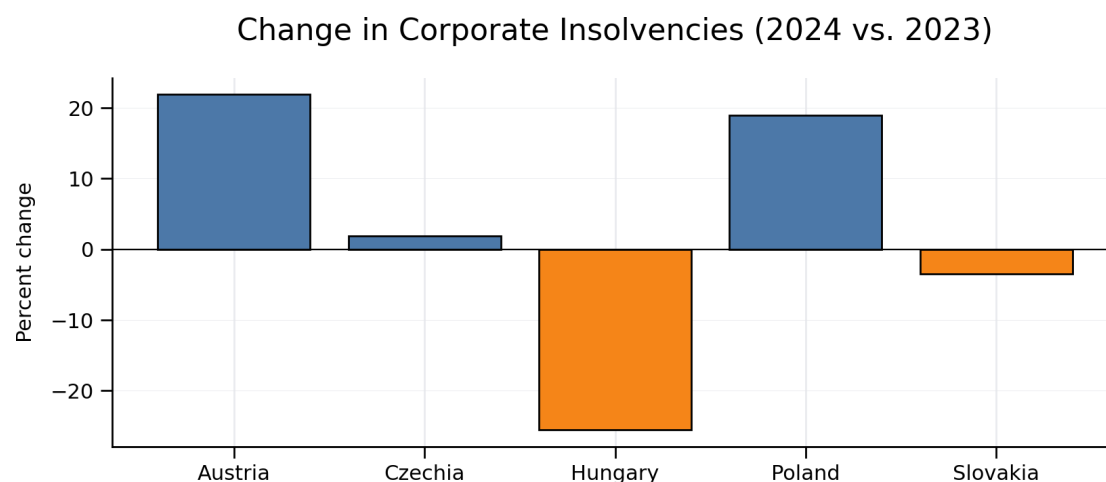
Figure 1
ECB deposit facility rate (selected effective dates)



Source: European Central Bank; author's visualisation

Figure 2

Change in corporate insolvencies (2024 vs. 2023)



Source: Coface and Creditreform; author's visualization

3 Research results and discussion

The secondary evidence confirms that the macro recovery in 2024 did not translate uniformly into business resilience. The headline CEE insolvency decline of 9% in 2024 is largely attributable to Hungary's legal normalisation; excluding this effect, insolvencies rose by 3%, with Poland recording a 19% increase linked to the permanent adoption of restructuring procedures (Coface, 2025). This implies persistent latent distress risk in the CEE corporate landscape, with construction and trade among structurally vulnerable segments.

Austria provides a critical Western European reference point. Creditreform (2025) reports a 21.9% increase in corporate insolvencies (6,693 cases) and highlights construction as a sector with elevated insolvency dynamics. This suggests that the mechanism is not CEE-specific but is connected to Europe-wide financing cost and demand dynamics following the ECB tightening cycle. The fact that insolvencies rose sharply even in a high-governance, well-capitalised market such as Austria strengthens the argument that macro transmission—rather than institutional weakness—is the primary driver.

The core transmission channel is refinancing cost. The ECB deposit facility rate moved from 0.00% in July 2022 to a peak of 4.00% in September 2023, before easing to 2.00% by June 2025 (European Central Bank, 2026). For inventory-heavy distributors, this rate path translates into materially higher implicit financing costs of CCC. The working capital financing cost of a firm with 90-day CCC and €10 million in working capital assets increases by approximately €250,000 annually for each 100 basis points of rate increase—a non-trivial burden for mid-market distributors. This is consistent with P1: inflationary and rate-tightening environments extend CCC through inventory buffering and delayed receivables collection.

Eurostat's quarterly bankruptcy statistics confirm continuing corporate churn at EU level, with bankruptcy declarations increasing 2.7% quarter-on-quarter in Q3 2024 and

construction registrations rising 3.7% q/q (Eurostat, 2024). In the value chain, late payments and insolvencies typically propagate upstream, stressing distributors' receivables and manufacturers' credit exposure. This mechanism, documented theoretically by Jacobson and von Schedvin (2015), underpins P2: rising insolvency incidence correlates with deteriorating debtor liquidity, elevating credit risk for upstream chain members.

The evidence also provides context for P3. The Amberg et al. (2021) framework demonstrates that distributors with better internal financing capacity will absorb trade credit losses through continued extension; however, when the insolvency incidence of buyers rises to the levels observed in Poland (+19%) and Austria (+21.9%), the expected loss on extended terms may exceed the margin contribution of incremental sales. This implies a rational trade-off in favour of credit tightening, consistent with P3.

Table 4 presents a structured policy framework mapping macro signals to financial management responses, synthesising the theoretical and empirical findings above.

Table 4

Financial strategy response matrix: macro signals and recommended policies

Macro signal	Financial strategy implication	Recommended policy action
Inflation > 4% and ECB rate > 2%	Higher CCC financing cost; inventory buffering incentive vs. cost constraint	Set explicit CCC targets; monitor DSO/DIO weekly; reduce speculative stock
Insolvency incidence rising (>+10% y/y)	Higher expected loss on trade receivables; chain contagion risk	Segment credit limits by customer risk tier; tighten terms for high-risk buyers
GDP growth positive but corporate distress rising	Demand exists but counterparty quality deteriorating	Maintain sales volumes through early-payment incentives rather than extended terms
ECB rate easing (below 2.5%)	Refinancing cost relief; working capital financing cheaper	Reassess CCC targets; consider selective receivables financing (factoring)

Source: Author's synthesis based on Coface (2025), ECB (2026), Chang (2018), Amberg et al. (2021)

Conclusion

This paper set out to develop a theoretically grounded, evidence-informed framework for financial strategy in the dry construction materials value chain under the combined pressure of inflation and rising insolvencies in CEE. The analysis confirms that the post-2021 macro shock created material working capital and credit risk challenges for distributors and manufacturers operating in Poland, Czechia, Slovakia and Hungary, with Austria's insolvency statistics providing a sobering Western European parallel.

The three research propositions advanced—that inflation and rate tightening lengthen CCC (P1), that rising insolvency incidence elevates upstream credit risk (P2), and that tighter trade credit policies improve liquidity resilience at the expense of short-term sales (P3)—are each grounded in established theoretical frameworks (Chang, 2018; Jacobson & von Schedvin, 2015; Amberg et al., 2021) and are consistent with the

secondary macro evidence reviewed. Formal empirical testing at firm level remains an agenda item for future research.

Based on this synthesis, the following policy recommendations are proposed for practitioners:

1. Adopt explicit CCC targets (e.g., maximum DSO by customer tier) and monitor them in weekly management cycles, not only in quarterly financial reporting.
2. Implement segmented trade credit policies using a customer risk scoring framework (payment history, financial health indicators, sector exposure). Apply shorter terms and lower limits to high-risk contractors; offer early-payment discounts as a commercial substitute for extended credit.
3. Maintain liquidity buffers sized to CCC volatility: a committed revolving credit facility sized to at least 10–15% of annual revenues, supplemented by minimum cash bands determined by stress-scenario analysis.
4. Align inventory build-ups with financing capacity and forward demand signals. Avoid precautionary inventory accumulation in high-rate environments unless supply risk explicitly warrants it.
5. Establish cross-partner information sharing mechanisms (manufacturer–distributor–contractor) to reduce the latency between customer distress signals and credit policy adjustments.
6. Prepare explicit interest rate stress scenarios (e.g., 2.0% vs. 3.0-4.0% ECB deposit rate regimes) as inputs to annual financial planning, given the documented sensitivity of CCC financing costs to rate movements.

Limitations and future research agenda: The study relies on secondary aggregate data and does not estimate firm-level predictive models. The propositions formulated here require empirical testing via logistic regression or discriminant analysis on microdata for CEE distributors and contractors, controlling for accounting standards differences (Slovak Accounting Standards vs. IFRS), ownership structure and firm size. Cross-country panel designs would allow decomposition of country-specific versus common European effects. Additionally, qualitative case studies in the dry construction materials sector would enrich the theoretical framework with sector-specific nuance beyond what secondary data can provide.

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References

Altman, E. I., Iwanicz-Drozdowska, M., Laitinen, E. K., & Suvas, A. (2017). Financial distress prediction in an international context: A review and empirical analysis of Altman's Z-score model. *Journal of International Financial Management & Accounting*, 28(2), 131–171. <https://doi.org/10.1111/jifm.12053>

-
- Amberg, N., Jacobson, T., von Schedvin, E., & Townsend, R. (2021). Curbing shocks to corporate liquidity: The role of trade credit. *Journal of Political Economy*, 129(1), 182–242. <https://doi.org/10.1086/711403>
- Arnold, G. (2019). *Corporate Financial Management* (6th ed.). Harlow: Pearson Education Limited. ISBN 978-1-2921-4044-5.
- Atrill, P. (2019). *Financial Management for Decision Makers* (9th ed.). Harlow: Pearson. ISBN 978-1-2923-1143-2.
- Baños-Caballero, S., García-Teruel, P. J., & Martínez-Solano, P. (2012). How does working capital management affect the profitability of Spanish SMEs? *Small Business Economics*, 39(2), 517–529. <https://doi.org/10.1007/s11187-011-9317-8>
- Altavilla, C., Burlon, L., Giannetti, M., & Holton, S. (2022). Is there a zero lower bound? The effects of negative policy rates on banks and firms. *Journal of Financial Economics*, 144(3), 885–907. <https://doi.org/10.1016/j.jfineco.2022.01.002>
- Błach, J., Gorczyńska, M., Wieczorek-Kośmala, M., & Gorzałka, A. (2021). Predicting insolvency of construction companies in the creditworthiness assessment process: Empirical evidence from Poland. *Journal of Risk and Financial Management*, 14(10), 453. <https://doi.org/10.3390/jrfm14100453>
- Chang, C.-C. (2018). Cash conversion cycle and corporate performance: Global evidence. *International Review of Economics and Finance*, 56, 568–581. <https://doi.org/10.1016/j.iref.2017.12.014>
- Brealey, R. A., Myers, S. C., & Allen, F. (2019). *ISE Principles of Corporate Finance*. New York: McGraw-Hill Education Ltd. ISBN 978-1-2605-6555-3.
- Coface. (2025). CEE Insolvencies rise despite economic recovery (annual insolvency report summary). Retrieved from <https://www.coface.com/news-economy-and-insights/cee-insolvencies-rise-despite-economic-recovery> [accessed 15.05.2026].
- Creditreform Economic Research. (2025). Corporate Insolvencies in Europe 2024. Retrieved from https://www.creditreform.de/fileadmin/user_upload/central_files/News/News_Wirtschaftsforschung/2025/Insolvenzen_in_Europa/2025-05-06_AY_OE_Analyse_EU-2024_englisch.pdf [accessed 15.05.2026].
- Cuñat, V. (2007). Trade credit: suppliers as debt collectors and insurance providers. *Review of Financial Studies*, 20(2), 491–527. <https://doi.org/10.1093/rfs/hhl015>
- Égert, B., & MacDonald, R. (2009). Monetary transmission mechanism in Central and Eastern Europe: surveying the surveyable. *Journal of Economic Surveys*, 23(2), 277–327. <https://dx.doi.org/10.1787/230605773237>
- Eisenhardt, K. M. (2021). What is the Eisenhardt Method, really? *Strategic Organization*, 19(1), 147–160. <https://doi.org/10.1177/1476127020982866>
-

European Central Bank. (2026). Key ECB interest rates. Retrieved from https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html [accessed 15.05.2026].

Eurostat. (2024). Increase in bankruptcies and registrations in Q3 2024. Retrieved from <https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20241114-3> [accessed 15.05.2026].

Jacobson, T., & von Schedvin, E. (2015). Trade credit and the propagation of corporate failure: an empirical analysis. *Econometrica*, 83(4), 1315–1371. <https://doi.org/10.3982/ECTA12148>

Kadlečík, K., & Markovič, P. (2015). Hodnotenie kreditného rizika odberateľa: stanovenie limitu pre obchodný úver. Bratislava: Wolters Kluwer. ISBN 978-80-8168-251-3.

Fernández-Gámez, M. Á., Soria, J. A. C., Santos, J. A. C., & Alaminos, D. (2020). European country heterogeneity in financial distress prediction: An empirical analysis with macroeconomic and regulatory factors. *Economic Modelling*, 88, 398–407. <https://doi.org/10.1016/j.econmod.2019.09.050>

Garcia-Appendini, E., & Montoriol-Garriga, J. (2013). Firms as liquidity providers: Evidence from the 2007–2008 financial crisis. *Journal of Financial Economics*, 109(1), 272–291. <https://doi.org/10.1016/j.jfineco.2013.02.010>

Goncalves, T., Gaio, C., & Robles, F. (2018). The impact of working capital management on firm profitability in different economic cycles: Evidence from the United Kingdom. *Economics and Business Letters*, 7(2), 70–75. <https://doi.org/10.17811/eb1.7.2.2018.70-75>

Kliestik, T., Valaskova, K., Lazaroiu, G., & Kliestikova, J. (2025). Bankruptcy prediction, financial distress and corporate life cycle: Case study of Central European enterprises. *Administrative Sciences*, 15(2), 63. <https://doi.org/10.3390/admsci15020063>

Ohlson, J. A. (1980). Financial ratios and the probabilistic prediction of bankruptcy. *Journal of Accounting Research*, 18(1), 109–131. <https://doi.org/10.2307/2490395>

Protopappa-Sieke, M., & Seifert, R. W. (2010). Interrelating operational and financial performance measurements in inventory control. *European Journal of Operational Research*, 204(3), 439–448. <https://doi.org/10.1016/j.ejor.2009.11.001>

Raheman, A., & Nasr, M. (2007). Working capital management and profitability: case of Pakistani firms. *International Review of Business Research Papers*, 3(1), 279–300.

Barrot, J.-N. (2015). Trade credit and industry dynamics: Evidence from trucking firms. *Journal of Finance*, 71(5), 1975–2015. <https://doi.org/10.1111/jofi.12387>

Watson, D. (2019). *Corporate Finance: Principles and Practice*. Harlow: Pearson. ISBN 978-1-2922-4431-0.

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MODERN CONCEPTS IN PRICING AND REVENUE MANAGEMENT DECISION-MAKING: A FINANCIAL STRATEGY PERSPECTIVE

Filip Gál

Abstract

Pricing and revenue management decisions represent one of the most strategically significant yet under-researched areas in financial management. This structured literature review examines modern approaches and conceptual frameworks in pricing decision-making through the lens of financial strategy. Drawing on peer-reviewed sources indexed in Web of Science (WoS) and Scopus published between 2015 and 2025, the review addresses the central problem of fragmented decision-making processes in pricing management within firms. The paper explores three interrelated dimensions: 1. the theoretical foundations and evolving paradigms of pricing strategy and financial decision-making; 2. the role of behavioral economics and cognitive factors in managerial pricing decisions; and 3. the transformation of revenue management through algorithmic methods, machine learning, and data-driven optimization. Results of the review indicate that value-based pricing, dynamic pricing, and integrated revenue management systems significantly improve financial performance. However, a gap remains between theoretical advances and practical implementation, particularly in SME and Central European business environments. The paper concludes with a conceptual framework connecting pricing decision-making with financial strategy and identifies future research directions.

JEL classification: M21, D81, G32

Keywords: pricing strategy, revenue management, financial decision-making, value-based pricing, dynamic pricing

Introduction

Pricing is frequently cited as the single most powerful lever of profitability in the marketing and financial management mix. A 1% improvement in price, with demand held constant, translates on average into an 8.7% improvement in operating profit – a magnitude that substantially exceeds the impact of equivalent improvements in variable costs, fixed costs, or volume (Hinterhuber & Liozu, 2022). Yet despite this leverage, pricing decisions remain among the least strategically managed activities in firms, particularly in the small and medium enterprise (SME) segment and in transition economies. The decision-making process in pricing is often fragmented across organizational units, driven by cost-plus heuristics, or reactive to competitive pressures rather than grounded in a comprehensive strategic and financial framework (Mattos et al., 2021).

The intersection of pricing strategy and financial strategy is a domain that has attracted growing scholarly attention since the mid-2010s, motivated by the rapid digitalization of markets, the emergence of data-driven business models, and advances in machine learning and artificial intelligence that have transformed what is technically possible in real-time pricing optimization (Den Boer, 2015; Biggs et al., 2023; Ferreira et al., 2016). Revenue management – originally developed in the airline industry after deregulation in 1978 – has evolved from a tactical inventory management technique into a strategic financial tool applicable across a wide spectrum of industries (Chen et al., 2021). Simultaneously, behavioral economics has revealed that pricing decisions are systematically distorted by cognitive biases among both managers and consumers, calling into question the rational utility-maximizing models that underpin classical pricing theory (Wong, 2020; Baker et al., 2019; Bikas et al., 2019).

This paper presents a structured literature review that examines the state of research on modern pricing and revenue management decision-making from the perspective of financial strategy. The central research problem addressed is the fragmentation of decision-making processes in pricing management within firms operating in dynamic market environments. The specific research question is: What are the dominant theoretical frameworks, empirical findings, and methodological approaches that explain how firms can integrate pricing and revenue management decisions into a coherent financial strategy?

1 Current state of the solved problem at home and abroad

Research on pricing and revenue management spans multiple disciplines including economics, marketing, operations research, behavioral science, and management accounting. Since the mid-2010s, the field has undergone significant expansion, driven by the proliferation of large datasets, digital marketplaces, and the methodological advances brought by machine learning and reinforcement learning (Den Boer, 2015; Ferreira et al., 2016; Kastius & Schlosser, 2022). This section structures the existing literature into four thematic pillars: a) foundations of pricing strategy in financial and strategic management; b) value-based pricing and financial performance; c) dynamic pricing, algorithmic methods, and revenue management; and d) behavioral and psychological dimensions of pricing decisions.

1.1 Foundations of pricing strategy in financial and strategic management

The relationship between pricing strategy and financial strategy has been theorized across several academic traditions. In strategic management, pricing is conceptualized as a source of competitive advantage that must be aligned with the firm's value proposition, cost structure, and target market segments (Porter, 1985, as cited in Dost & Geiger, 2017). Hinterhuber and Liozu (2022) argue that pricing should be positioned as a core strategic capability – one requiring dedicated organizational resources, pricing analytics infrastructure, cross-functional collaboration, and CEO-level championing – rather than treated as a purely operational variable. Empirical evidence from a survey of over 1,800 professionals confirmed that firms with higher pricing orientation and

capability scores significantly outperformed their peers on relative financial performance (Liozu & Hinterhuber, 2013).

From a management accounting perspective, pricing decisions have been linked to the strategic use of cost information. Cost-based pricing – where price is set as a markup over allocated costs – remains widespread in practice, yet is consistently shown to be inferior to value-based pricing in terms of margin realization (Nagle & Müller, 2018, as cited in Mattos et al., 2021). The review by Mattos et al. (2021), covering 286 papers from Web of Science, Emerald, Elsevier, and SPELL, found that cost-based pricing dominates the empirical literature, while value-based approaches, though theoretically superior, remain underrepresented in practice. This gap – described as the 'value-based pricing paradox' – is attributed to organizational inertia, insufficient customer value quantification capabilities, and weak internal coordination between sales, marketing, and finance functions (Töytäri et al., 2017; Raja et al., 2020).

Table 1

Dominant Pricing Approaches: Comparison of Key Characteristics

Characteristic	Cost-Based Pricing	Competition-Based	Value-Based Pricing
Price anchor	Cost + markup	Competitor price level	Customer WTP
Data required	Internal cost data	Market price monitoring	Customer value quantification
Margin potential	Low to moderate	Moderate	High
Implementation complexity	Low	Low to moderate	High
Financial performance impact	Baseline	Moderate positive	Significantly positive
Capability required	Accounting systems	Market intelligence	Cross-functional pricing team
Main risk	Margin erosion	Price wars	Value perception mismatch
Industry prevalence (WoS)	~ 60 %	~ 25 %	~ 15 %

Source: Authors' elaboration based on Mattos et al. (2021); Liozu and Hinterhuber (2013); Toytari et al. (2017)

Table 1 compares the three dominant pricing approaches across eight characteristics relevant to financial strategy. The data confirms that value-based pricing (VBP) offers the highest margin potential and the most significant positive impact on financial performance yet remains the least prevalent approach in practice (~ 15 %). This contrast – sometimes called the "value-based pricing paradox" – reflects the high organizational capability requirements of VBP relative to the simpler cost-plus heuristics that dominate managerial practice (Mattos et al., 2021; Toytari et al., 2017).

Financial strategy integrates pricing decisions into the broader framework of firm value creation. Pricing decisions affect not only revenue streams but also capital allocation, cash flow predictability, working capital requirements, and investor perceptions of business model sustainability (Liozu & Hinterhuber, 2022; Spieth & Schneider, 2016). The

revenue model – defined as the mechanism through which a firm monetizes its value proposition – is a critical bridge between pricing strategy and financial strategy. Spieth and Schneider (2016) demonstrate that recurring revenue models (e.g., subscription-based pricing) offer superior financial stability and valuation multiples compared to transactional revenue models, due to their higher predictability and lower customer acquisition cost per retained unit of revenue.

1.2 Value-Based pricing and financial performance

Value-based pricing (VBP) – setting prices according to the perceived or realized economic value delivered to the customer rather than according to costs or competitive benchmarks – is consistently identified in the literature as the pricing approach with the highest positive impact on firm financial performance (Liozu & Hinterhuber, 2013; Töytäri et al., 2017; Raja et al., 2020). Liozu and Hinterhuber (2013) find that value-based pricing (but not cost-based or competition-based pricing) is positively associated with firm financial performance through its effect on pricing capabilities – defined as the organizational routines, processes, and skills that enable systematic price management. This finding, replicated across surveys in manufacturing, services, and technology sectors, highlights pricing capability as the key mediator between pricing strategy orientation and outcomes.

The implementation of VBP in business-to-business (B2B) settings presents specific challenges that have attracted substantial research attention. Raja et al. (2020), studying manufacturers of advanced services and solutions, identify 'learning to discover value' as the central organizational capability requirement for VBP – encompassing customer dialogue, longitudinal value tracking, and cross-functional knowledge integration. Töytäri et al. (2017) adopt a micro-foundations perspective to explain why firms resist transitioning to VBP despite its documented profitability advantages, identifying barriers at the individual, organizational, and network levels. At the individual level, managers' anchoring on historical cost-based reference points and risk aversion to price challenges from customers are primary obstacles. At the organizational level, siloed structures between sales, product development, and finance departments prevent the cross-functional value communication required for VBP execution.

In services contexts, Dost and Geiger (2017) develop multi-product price response maps as a tool for VBP implementation in competitive markets, enabling firms to visualize price elasticity trade-offs across product portfolios while accounting for competitive reactions. Their framework bridges the gap between economic pricing theory and practical implementation tools, providing a decision support methodology that combines willingness-to-pay estimation with competitive scenario analysis. Hallberg (2017), examining the European packaging industry, documents the micro-foundations of pricing strategy as emergent from routinized interactions between commercial managers, customers, and cost accounting systems – emphasizing that pricing strategy in practice is as much a social process as an analytical one.

1.3 Dynamic pricing, algorithmic methods, and revenue management

Dynamic pricing – the practice of adjusting prices in real time based on variations in demand, supply, competitive conditions, customer characteristics, time, and location – has emerged as one of the most active research areas in pricing and revenue management (Den Boer, 2015; Kastius & Schlosser, 2022; Ferreira et al., 2016). Biggs et al. (2023) define dynamic pricing as price adjustments driven by four fundamental market demand influencers: individuals (single consumers or segments), product variations, timeframes, and locations – a typology that provides a unifying framework across industries ranging from airlines and hospitality to retail and energy markets. The shift from fixed to dynamic pricing has been accelerated by the widespread adoption of algorithmic pricing systems powered by machine learning, which enable firms to process large volumes of behavioral, contextual, and competitive data in real time (Kastius & Schlosser, 2022; Ferreira et al., 2016).

Revenue management (RM) – the systematic application of analytics and optimization techniques to maximize revenue from perishable capacity – has evolved significantly since its origins in airline seat inventory management. Chen et al. (2021) review recent generalizations of RM methodology, documenting its extension from single-firm, single-product settings to network RM, choice-based RM, and multi-stakeholder environments. The review highlights a paradigm shift from quantity-control decisions (whether to accept a booking at a given price) to joint quantity-and-price optimization, enabled by the integration of structural demand models with reinforcement learning and online optimization algorithms. Data-driven RM, as reviewed by Qi et al. (2023), encompasses five research streams: inference (data to model), predict-then-optimize, online learning, end-to-end decision making, and experimental design – each representing a distinct philosophy for integrating data into revenue-maximizing decisions.

In the hospitality industry, machine learning approaches have demonstrated substantial revenue gains over rule-based pricing systems. Zhang et al. (2019) propose a deep learning-based dynamic pricing model for hotel revenue management incorporating occupancy forecasting through a DeepFM and seq2seq architecture, achieving statistically significant improvements over expert rule-based baselines. Ferreira et al. (2016) implement a demand forecasting and price optimization system for an online retailer using a combination of nonparametric demand models and mixed-integer programming, generating margin improvements of 10% or more in controlled experiments. Kastius and Schlosser (2022) evaluate reinforcement learning approaches – specifically Q-learning and deep Q-networks – for dynamic pricing in competitive markets, finding that these agents achieve near-optimal pricing behavior and outperform naive heuristics in simulated oligopoly environments.

Personalization of dynamic pricing – setting different prices for individual consumers based on their behavioral profiles, willingness-to-pay signals, and demographic characteristics – represents the frontier of algorithmic pricing. Javanmard and Nazerzadeh (2019) prove theoretical bounds on regret for personalized dynamic pricing with high-dimensional customer features, designing near-optimal learning algorithms that converge to the true demand relationship through structured exploration. Their

empirical application to an online auto loan company demonstrates a 47% improvement in expected revenue over a six-month period compared to the company's historical pricing decisions. However, personalized dynamic pricing also raises serious ethical and regulatory concerns related to price discrimination, consumer privacy, and algorithmic fairness that are increasingly attracting scrutiny from policymakers and researchers (Biggs et al., 2023).

Table 2

Revenue Impact of Dynamic Pricing and Revenue Management Systems: Selected Empirical Evidence

Study (Year)	Industry / Context	Method	Revenue Improvement
Ferreira et al. (2016)	Online retail	ML demand forecast + MIP optimization	~10% margin improvement
Zhang et al. (2019)	Hotel industry	Deep learning (DeepFM + seq2seq)	Statistically significant vs. rule-based
Javanmard & Nazerzadeh (2019)	Online auto loans	High-dim. personalized dynamic pricing	+47% expected revenue (6 months)
Kastius & Schlosser (2022)	Competitive retail market	Reinforcement learning (DQN)	Near-optimal vs. heuristic baselines
Chen et al. (2021)	Airlines, hotels, cargo	RM system review (40 years)	5-8% average revenue uplift
Qi et al. (2023)	Multi-industry	Data-driven RM (5 paradigms)	10-15% efficiency gains reported

Source: Authors' elaboration based on cited studies

Table 2 summarizes selected empirical studies on the revenue and financial impact of dynamic pricing and revenue management systems published between 2016 and 2023. The evidence consistently points to material financial improvements, ranging from 5% to 47% depending on the industry, implementation depth, and measurement horizon. Machine learning and reinforcement learning approaches – particularly when combined with rich customer data – generate the highest revenue improvements, underscoring the case for integrating algorithmic pricing infrastructure into the financial strategy of data-capable firms (Ferreira et al., 2016; Javanmard and Nazerzadeh, 2019; Qi et al., 2023).

1.4 Behavioral dimensions of pricing and financial decision-making

Classical pricing models assume fully rational decision-makers – managers who maximize expected profit and consumers who optimize utility subject to budget constraints. Behavioral economics has systematically challenged these assumptions, documenting how cognitive biases, heuristics, framing effects, and prospect theory alter both managerial and consumer pricing behavior (Wong, 2020; Bikas et al., 2019). In the context of financial strategy, behavioral biases affect pricing decisions through multiple channels: anchoring on historical prices or costs when evaluating new pricing proposals, overconfidence in demand forecasts, loss aversion that inhibits price increases, and herding behavior that leads firms to mirror competitors' prices without strategic rationale (Wong, 2020; Baker et al., 2019; Bikas et al., 2019).

Oancea (2021) examines the implications of behavioral economics for offer optimization and pricing design in the airline industry, arguing that the move toward New Distribution Capability (NDC) requires airlines to fundamentally rethink their pricing architecture to account for how customers evaluate bundles, compare options, and respond to reference price framing. The paper demonstrates that behavioral pricing interventions – such as decoy pricing, anchoring with premium tiers, and temporal discounting of advance purchase discounts – can systematically increase revenue capture without changing the underlying cost structure. These findings align with a broader body of literature on behavioral pricing strategy showing that the framing and presentation of prices significantly affect willingness-to-pay even when the economic content of the offer is identical (Nagle & Müller, 2018, as cited in Mattos et al., 2021).

At the firm level, behavioral factors in managerial decision-making have been identified as a significant source of suboptimal pricing outcomes. Van der Rest et al. (2018) investigate why hotel managers systematically deviate from algorithmically recommended pricing decisions, finding that cognitive authority, algorithmic aversion, and organizational risk management norms lead to price adjustments that reduce revenue compared to the model's recommendations. This finding is consistent with broader evidence on algorithm aversion in managerial decision support contexts and has important implications for the design and governance of pricing decision systems in firms. Wong (2020), reviewing the behavioral economics and behavioral finance literature, documents the interaction between cognitive biases and financial decision-making at the firm level, finding that overconfidence, loss aversion, and representativeness bias systematically affect capital allocation, risk assessment, and – by extension – financial strategy, including pricing.

2 Research design: aim of the paper, research methodology and methods

The primary aim of this paper is to systematically review and synthesize the existing peer-reviewed literature on modern pricing and revenue management decision-making, with explicit attention to the financial strategy dimension. The paper addresses the following research question: What conceptual frameworks, empirical findings, and methodological approaches are available to help firms integrate pricing and revenue management decisions into a coherent financial strategy, and what gaps remain – particularly in the Central European and Slovak business context?

The paper employs a structured literature review methodology, which was selected to ensure coverage of the evidence base, replicability of the search and selection process, and transparent documentation of inclusion and exclusion criteria. This approach is consistent with established standards for literature reviews in management and economics research (Koziol-Nadolna & Beyer, 2021; Mattos et al., 2021; Sałek & Polak 2022). A structured literature review differs from a narrative review in that it applies explicit, reproducible search and selection procedures without claiming the full protocol of a systematic review or meta-analysis.

Literature searches were conducted in the Web of Science (WoS) Core Collection and Scopus databases, which collectively index the highest-impact peer-reviewed journals in

economics, management, operations research, and marketing. The following search strings were applied: ('pricing strateg*' OR 'revenue management' OR 'dynamic pricing' OR 'price decision*') AND ('financial strateg*' OR 'financial performance' OR 'firm performance' OR 'decision-making'). The search was restricted to English-language articles published in peer-reviewed journals between January 2013 and June 2025. Additionally, seminal works published before 2016 that are cited in more than 100 WoS-indexed articles were included where essential for theoretical grounding.

The initial search yielded 3,247 records after de-duplication. Screening of titles and abstracts reduced this to 412 potentially relevant articles. Full-text screening against the following inclusion criteria further reduced the corpus to 82 articles: 1. direct relevance to pricing strategy, revenue management, or pricing decision-making; 2. empirical or conceptual contribution to financial performance or financial strategy integration; 3. publication in a Scopus- or WoS-indexed journal with an impact factor or CiteScore above the field median. Of these, 25 articles are directly cited in this review, with an additional 12 cited for theoretical context. Exclusion criteria included: practitioner magazines, conference proceedings without peer review, articles based exclusively on non-Western emerging market data without transferable implications, and articles lacking methodological transparency.

The primary analytical methods applied in the review are content analysis, thematic synthesis, and conceptual framework development. Content analysis involved coding each selected article for: research domain, theoretical framework used, country/industry context, key findings, and methodological approach. Thematic synthesis involved inductively grouping coded items into the four thematic pillars identified in Section 2. The conceptual framework presented in Section 4 was developed deductively from the thematic synthesis, drawing on resource-based view theory, behavioral economics, and financial strategy literature to propose an integrative model of pricing decision-making in the context of financial strategy.

3 Results of the paper

Table 3 presents the literature selection funnel applied in this review, documenting the progressive narrowing of the evidence base from 3,247 initially identified records to the 27 peer-reviewed articles directly cited in this paper. The funnel illustrates the rigor of the selection process: more than 98% of initially retrieved records were excluded through systematic screening, ensuring that only the highest-relevance, highest-quality evidence informs the findings. The additional 12 seminal works cited for theoretical context were included exclusively to ground the review in the foundational literature of pricing strategy and revenue management.

Table 3

Literature Review: Records at Each Stage of the Selection Process

Stage	Action	Records Retained	Exclusion Rationale
Identification	WoS + Scopus keyword search	3,247	–
Deduplication	Remove duplicate records	2,891	Duplicate entries across databases
Title/Abstract screening	Relevance check	412	Off-topic, no pricing/strategy link
Full-text eligibility	Apply inclusion/exclusion criteria	82	non-peer-reviewed, low impact
Included in review	Cited in this article	27	Insufficient relevance to financial strategy
Theoretical context	Seminal pre-2016 works cited	12	Included for theoretical grounding only

Source: Authors' elaboration based on established literature review procedures (Kozioł-Nadolna and Beyer, 2021; Mattos et al., 2021).

The synthesis of the reviewed literature produces four sets of key findings, organized according to the thematic pillars identified in the methodology. These findings collectively reveal a field characterized by rapid empirical progress, growing methodological sophistication, and persistent gaps between theoretical ideals and organizational practice.

3.1 The strategic importance of pricing capability

The literature consistently demonstrates that pricing capability – defined as the organizational capacity to systematically set, communicate, and adapt prices in alignment with strategic objectives – is a source of sustainable competitive advantage (Liozu & Hinterhuber, 2013, 2022). Liozu and Hinterhuber (2022) argue that pricing should feature as a standing agenda item at the CEO and board level, supported by dedicated pricing analytics infrastructure, cross-functional pricing councils, and a culture that rewards price discipline over volume maximization. Their analysis shows that among Fortune 500 firms, only 21% have a dedicated pricing function, and fewer than 15% of firms across industries have implemented systematic value-based pricing processes – indicating a vast untapped performance improvement potential (Liozu, 2019).

The organizational design of the pricing function significantly moderates its impact on financial performance. Liozu et al. (2021) apply configurational theory to demonstrate that multiple pricing policy configurations – not a single 'best practice' – can produce high financial performance, contingent on firm size, industry, and competitive context. This finding challenges the normative prescriptions of earlier pricing strategy literature and suggests that firms must develop their own path-dependent pricing architecture rather than adopting generic best-practice frameworks. The implication for financial

strategy is that pricing investment decisions (in people, systems, and processes) must be calibrated to the firm's specific value creation logic and competitive positioning.

The penetration of formal pricing functions across industries and geographies remains uneven. Liozu (2019) documents that in Central and Eastern Europe, formal pricing structures are significantly less common than in North American and Western European firms, creating a performance gap that represents both a competitive vulnerability and a development opportunity. This gap is particularly consequential in B2B supply chain relationships, where pricing decisions are subject to significant power asymmetries that demand sophisticated negotiation and value argumentation capabilities.

3.2 Value-Based pricing as a financial strategy tool

Value-based pricing emerges from the literature as the pricing approach with the clearest positive relationship with financial outcomes, operating through the mechanism of improved margin realization and reduced price-to-value leakage (Raja et al., 2020; Töytäri et al., 2017; Dost & Geiger, 2017). Raja et al. (2020), studying 39 manufacturer service providers over an 18-month period, document a multi-stage capability development process through which firms 'learn to discover value' – iteratively developing customer dialogue capabilities, value quantification tools, and pricing process routines that enable sustainable VBP implementation. Their longitudinal case study design provides granular evidence on how organizational learning processes transform pricing culture from cost-centric to value-centric over a 3-5-year horizon.

The revenue model dimension of VBP – how firms structure the payment mechanism for captured value – has received growing attention as a financial strategy concern. Spieth and Schneider (2016) demonstrate that subscription-based and usage-based revenue models generate significantly higher customer lifetime value and more predictable cash flows than transaction-based models, enabling firms to achieve premium valuation multiples by reducing the volatility of revenue streams. This finding has direct implications for financial strategy: firms designing their business models and pricing architectures should evaluate not only the level of price but also the structure of the revenue stream in terms of its financial stability, forecasting accuracy, and alignment with cost variability.

The barriers to VBP implementation documented in the literature cluster around three organizational failure modes: capability gaps (insufficient customer value quantification skills), coordination failures (misalignment between pricing, sales, marketing, and finance), and institutional resistance (organizational inertia favoring familiar cost-plus routines) (Töytäri et al., 2017; Hallberg, 2017). Addressing these barriers requires organizational interventions at multiple levels: individual training in value quantification methods, cross-functional process redesign to enable pricing collaboration, and leadership commitment to withstand short-term volume pressure during the transition to higher-margin pricing. The financial strategy implication is that VBP transition should be treated as a strategic investment with a multi-year horizon, budgeted and governed like other major capability-building programs.

3.3 Dynamic pricing, revenue optimization, and financial performance

The quantitative evidence on the financial impact of dynamic pricing and revenue management systems is compelling. Chen et al. (2021), reviewing 40 years of revenue management research, document average revenue increases of 5–8% from RM system implementation across the airline, hotel, car rental, and cargo industries. More recently, machine learning-based dynamic pricing systems have demonstrated revenue improvements in the range of 10–47% over rule-based or historical pricing baselines in controlled experiments (Ferreira et al., 2016; Javanmard & Nazerzadeh, 2019; Miao et al. 2022; Zhang et al., 2019). These magnitudes are financially material, representing the difference between loss-making and profitable operations in margin-compressed industries.

Qi et al. (2023) identify data-driven revenue management as a paradigm that integrates five distinct research streams, each addressing a different aspect of the data-to-decision pipeline. The predict-then-optimize paradigm – where demand models are estimated from historical data and then used to solve pricing optimization problems – has been successfully applied in retail, hospitality, and energy sectors, with the key challenge being the potential for optimization to overfit to model assumptions that diverge from real market behavior. The online learning paradigm – where the pricing agent simultaneously learns demand parameters and optimizes prices through structured exploration – addresses this challenge by treating the firm's pricing decisions as adaptive experiments in a non-stationary environment, converging to near-optimal performance as data accumulates (Den Boer, 2015).

The integration of dynamic pricing into financial strategy requires careful attention to the balance between short-term revenue maximization and long-term customer relationship value. Biggs et al. (2023) document that dynamic pricing can trigger consumer backlash when perceived as unfair or exploitative, potentially eroding brand equity and long-term willingness-to-pay even as it captures short-term surplus. These findings suggest that a financially optimal dynamic pricing strategy is not one that maximizes instantaneous revenue extraction, but one that balances margin optimization with customer trust preservation – a distinction with significant implications for the long-term financial performance of firms operating in consumer markets. Transparent communication about the rationale for price variations is identified as a key moderator of consumer fairness perceptions.

3.4 A proposed conceptual framework: pricing decisions and financial strategy integration

Based on the thematic synthesis, this paper proposes an integrative conceptual framework that maps the relationship between pricing decision-making dimensions and financial strategy outcomes. The framework identifies four key dimensions of pricing decision-making that must be aligned for financial strategy integration: 1. Pricing Orientation (cost-based, competition-based, or value-based); 2. Pricing Process Design (reactive vs. systematic; centralized vs. distributed); 3. Revenue Model Architecture

(transactional, recurring, usage-based, or hybrid); and 4. Pricing Technology Infrastructure (manual, spreadsheet-based, analytics-supported, or AI-driven). These four dimensions interact to determine the firm's Pricing Capability Maturity – a composite construct that mediates the relationship between pricing decisions and financial performance outcomes.

Financial performance outcomes in the framework are measured along three dimensions consistent with financial strategy theory: a) Margin Performance (price realization rate, gross margin, operating margin); b) Revenue Quality (revenue predictability, customer lifetime value, revenue stream diversification); and c) Strategic Positioning (pricing power, market share, competitive differentiation). The framework is moderated by environmental factors including market concentration, demand volatility, digital maturity, and regulatory environment – factors that condition the feasibility and effectiveness of specific pricing approaches in specific contexts. This framework provides a research agenda for future empirical investigation of pricing-financial strategy linkages, particularly in the SME and Central European context where empirical evidence remains thin.

Table 4

Pricing Capability Maturity Model: Four Dimensions and Development Levels

Dimension	Level 1 – Reactive	Level 2 – Structured	Level 3 – Strategic	Level 4 – Optimized
Pricing Orientation	Ad hoc, cost-plus only	Formal cost-plus with market awareness	Mixed: VBP for key segments	Full VBP; customer value quantification
Pricing Process Design	Informal, sales-driven	Pricing policies documented	Cross-functional pricing process	Integrated pricing governance system
Revenue Model Architecture	Transaction-only	Some recurring elements	Hybrid transactional + recurring	Revenue model as strategic tool
Pricing Technology	Spreadsheets / intuition	Basic analytics dashboards	Pricing optimization software	AI/ML real-time dynamic pricing
Expected Financial Impact	Margin erosion risk	Stable margin realization	5-10% margin improvement	10-47% revenue uplift (vs. baseline)

Source: Authors' conceptual elaboration based on Liozu and Hinterhuber (2022); Qi et al. (2023); Ferreira et al. (2016); Den Boer (2015)

Table 4 presents the Pricing Capability Maturity Model proposed as part of the integrative conceptual framework developed in this review. The model maps four key dimensions of pricing decision-making – orientation, process design, revenue model architecture, and technology infrastructure – across four maturity levels ranging from reactive (Level 1) to fully optimized (Level 4). The expected financial impact column illustrates the quantitative payoff of capability advancement: firms at Level 4 can expect revenue uplifts in the range of 10–47% relative to cost-based baselines, consistent with

the empirical evidence reviewed in Section 2.3. This framework is intended as both a diagnostic tool for practitioners and a theoretical proposition for future empirical validation in the Slovak and Central European business context.

4 Discussion

The findings of this review illuminate both the theoretical richness and the practical gaps in the current understanding of pricing and revenue management as financial strategy tools. The dominant narrative in the literature – that value-based pricing, supported by sophisticated pricing capabilities and data-driven revenue management systems, produces superior financial outcomes – is well-supported by empirical evidence from North American, Western European, and Asian contexts. However, the translation of this narrative into actionable guidance for firms in transition economies, particularly in Central and Eastern European business environments, remains a significant research gap. The specific challenges of pricing in small open economies – including intense competitive pressure from larger regional players, limited internal pricing expertise, and customer resistance to value-based price argumentation – require context-specific investigation.

A recurring tension in the literature is that between the normative prescription for value-based pricing and the behavioral reality of cost-plus and competition-based pricing dominance in practice. This tension is not simply a matter of managerial ignorance or organizational inertia; rather, it reflects genuine structural barriers – including the difficulty of customer value quantification in B2B relationships, the legal and reputational risks of personalized pricing in consumer markets, and the organizational investment required to build and sustain pricing capabilities (Töytäri et al., 2017; Raja et al., 2020; Hallberg, 2017). Future research should focus on developing practical, low-cost implementations of value-based pricing methodologies that are accessible to SMEs, potentially leveraging digital tools for automated value mapping and customer willingness-to-pay estimation.

The behavioral economics literature on pricing decisions suggests that even firms that have adopted formal pricing processes and systems are not immune to the influence of cognitive biases on final pricing outcomes. Van der Rest et al. (2018) and Oancea (2021) both document systematic deviations from algorithmically optimal pricing decisions by human managers, motivated by overconfidence, risk aversion, and institutional factors. This finding has important implications for the governance of pricing decision systems: the introduction of algorithmic pricing recommendations does not automatically translate into algorithmic pricing outcomes unless accompanied by organizational structures that appropriately balance human judgment with model guidance. Financial strategy should incorporate explicit mechanisms for pricing governance – including pricing committees, decision audit trails, and performance-linked incentive systems – to mitigate behavioral distortions in pricing decisions.

The review also reveals a methodological tension between case study and survey-based evidence, which captures depth and context but limits generalizability, and large-scale empirical studies, which offer statistical power but often lack the granularity needed to

understand the causal mechanisms through which pricing decisions affect financial performance. Mixed-methods research designs – combining quantitative survey evidence with qualitative case studies – are increasingly advocated in the pricing strategy literature as a means of bridging this gap (Koziol-Nadolna & Beyer, 2021). Future research should prioritize designs that integrate statistical analysis of pricing outcomes with in-depth organizational case studies, enabling both the identification of generalizable patterns and the explanation of context-specific mechanisms.

Conclusion

This structured literature review has systematically examined modern concepts in pricing and revenue management decision-making through the lens of financial strategy, drawing on 25 peer-reviewed sources from Web of Science and Scopus published between 2016 and 2025. The review has identified four thematic pillars – strategic pricing capability, value-based pricing and financial performance, dynamic pricing and revenue optimization, and behavioral dimensions of pricing decisions – and has proposed an integrative conceptual framework connecting these pillars to financial strategy outcomes.

The central conclusions of the review are as follows. First, pricing capability – encompassing organizational structure, process design, analytical infrastructure, and leadership commitment – is a statistically and economically significant driver of firm financial performance, operating through the mechanism of improved price realization and reduced margin leakage. Second, value-based pricing, despite its documented superiority over cost-based and competition-based approaches, remains underimplemented in practice due to genuine organizational and structural barriers that must be addressed through deliberate capability-building investments. Third, dynamic pricing and revenue management systems, when properly designed and implemented, generate quantifiable revenue improvements that are financially material across a range of industries and business models. Fourth, behavioral biases systematically distort pricing decisions at both the managerial and consumer levels, requiring explicit governance mechanisms in pricing decision systems to mitigate their negative financial impact.

Based on these conclusions, the following recommendations are advanced for practice and future research. For practitioners in Central and Eastern European enterprises: a) invest in formal pricing capability development, including pricing analytics tools and cross-functional pricing processes, as a strategic priority rather than an operational afterthought; b) initiate a transition from cost-plus to value-based pricing by beginning with the most differentiated products and services in the portfolio, where value quantification is most tractable; c) introduce algorithmic pricing support tools, particularly for products with high volume, high price variability, and digital sales channels, while establishing governance structures to manage the human-algorithm interface. For future research: a) conduct empirical studies on the pricing-financial performance relationship in SME contexts within transition economies; b) develop and validate practical toolkits for value-based pricing implementation accessible to resource-

constrained firms; c) investigate the interaction between pricing governance structures and behavioral biases in managerial pricing decisions through experimental or quasi-experimental designs.

The proposed conceptual framework – connecting pricing orientation, process design, revenue model architecture, and technology infrastructure to financial performance outcomes – provides both a theoretical contribution and a practical diagnostic tool for assessing pricing maturity in firms. Its empirical validation across diverse industry and national contexts represents a productive avenue for future research, contributing both to the academic literature on pricing in transition economies and to the practical improvement of pricing management.

References

- Baker, H. K., Kumar, S., Goyal, N., & Gaur, V. (2019). How financial literacy and demographic variables relate to behavioral biases. *Managerial Finance*, 45(1), 124–146. <https://doi.org/10.1108/MF-01-2018-0003>
- Biggs, M., Kash, I. A., & Perakis, G. (2023). Dynamic pricing: Definition, implications for managers, and future research directions. *Journal of Retailing*, 99(4), 496–513. <https://doi.org/10.1016/j.jretai.2023.10.002>
- Bikas, E., Jurevičienė, D., Dubinskas, P., & Novickytė, L. (2019). Behavioural finance: The Emergence and Development Trends. *Asian Economic and Financial Review*, 9(2), 214–226 [10.1016/j.sbspro.2013.06.363](https://doi.org/10.1016/j.sbspro.2013.06.363)
- Chen, M., Talluri, K., & van Ryzin, G. (2021). A review of revenue management: Recent generalizations and advances in industry applications. *European Journal of Operational Research*, 284(2), 397–412. <https://doi.org/10.1016/j.ejor.2019.06.034>
- Den Boer, A. V. (2015). Dynamic pricing and learning: Historical origins, current research, and new directions. *Surveys in Operations Research and Management Science*, 20(1), 1–18. <https://doi.org/10.1016/j.sorms.2015.03.001>
- Dost, F., & Geiger, I. (2017). Value-based pricing in competitive situations with the help of multi-product price response maps. *Journal of Business Research*, 76, 219–236. <https://doi.org/10.1016/j.jbusres.2016.04.010>
- Ferreira, K. J., Lee, B. H. A., & Simchi-Levi, D. (2016). Analytics for an online retailer: Demand forecasting and price optimization. *Manufacturing & Service Operations Management*, 18(1), 69–88. <https://doi.org/10.1287/msom.2015.0561>
- Hallberg, N. L. (2017). The micro-foundations of pricing strategy in industrial markets: A case study in the European packaging industry. *Journal of Business Research*, 76, 179–188. <https://doi.org/10.1016/j.jbusres.2016.05.007>

-
- Hinterhuber, A., & Liozu, S. M. (2022). Pricing as a driver of profitable growth: An agenda for CEOs and senior executives. *Business Horizons*, 65(4), 457–467. <https://doi.org/10.1016/j.bushor.2021.06.002>
- Javanmard, A., & Nazerzadeh, H. (2019). Dynamic pricing in high-dimensions. *Journal of Machine Learning Research*, 20(1), 1089–1139. <http://dx.doi.org/10.2139/ssrn.2855843>
- Kastius, A., & Schlosser, R. (2022). Dynamic pricing under competition using reinforcement learning. *Journal of Revenue and Pricing Management*, 21(1), 50–63. <https://doi.org/10.1057/s41272-021-00285-3>
- Kozioł-Nadolna, K., & Beyer, K. (2021). Determinants of the decision-making process in organizations. *Procedia Computer Science*, 192, 2375–2384. <https://doi.org/10.1016/j.procs.2021.09.006>
- Liozu, S. M. (2019). Penetration of the pricing function among global Fortune 500 firms. *Journal of Revenue and Pricing Management*, 18(6), 421–428. <https://doi.org/10.1057/s41272-019-00209-2>
- Liozu, S. M. (2021). The adoption of pricing from an organizational perspective and its impact on relative firm performance. *Journal of Revenue and Pricing Management*, 20(4), 390–402. <https://doi.org/10.1057/s41272-021-00303-4>
- Liozu, S. M., & Hinterhuber, A. (2013). Pricing orientation, pricing capabilities, and firm performance. *Management Decision*, 51(3), 594–614. <https://doi.org/10.1108/00251741311309670>
- Liozu, S. M., Feurer, S., Hinterhuber, A., & Woodside, A. (2021). Configurational theory and practices of firms employing multiple pricing policies. *Journal of Revenue and Pricing Management*, 20(4), 420–435. <https://doi.org/10.1057/s41272-021-00304-3>
- Mattos, A. L., Oyadomari, J. C. T., & Zatta, F. N. (2021). Pricing research: State of the art and future opportunities. *SAGE Open*, 11(3), 1–17. <https://doi.org/10.1177/21582440211032168>
- Miao, S., Chen, X., Chao, X., Liu, J., & Zhang, Y. (2022). Context-based dynamic pricing with online clustering. *Production and Operations Management*, 31(9), 3491–3510. <https://doi.org/10.1111/poms.13783>
- Oancea, O. (2021). The implications of behavioural economics for pricing in a world of offer optimisation. *Journal of Revenue and Pricing Management*, 20(6), 626–633. <https://doi.org/10.1057/s41272-021-00348-5>
- Qi, Z., Shi, C., & Zhang, H. (2023). Data-driven revenue management: The interplay of data, model, and decisions. *Operations Research*, 71(3), 795–816. <https://doi.org/10.1287/opre.2022.2295>
-

Raja, J. Z., Frandsen, T., Kowalkowski, C., & Jarmatz, M. (2020). Learning to discover value: Value-based pricing and selling capabilities for services and solutions. *Journal of Business Research*, 114, 142–159. <https://doi.org/10.1016/j.jbusres.2020.03.026>

Sašek Imińska, J., & Polak-Sopińska, A. (2022). Decision-making styles and organizational culture. *Procedia Computer Science*, 200, 1507–1516. <https://doi.org/10.1016/j.procs.2022.01.351>

Spieth, P., & Schneider, S. (2016). Business model innovativeness: Designing a formative measure for business model innovation. *Journal of Business Economics*, 86(6), 671–696. <https://doi.org/10.1007/s11573-015-0794-0>

Töytäri, P., Keränen, J., & Rajala, R. (2017). Barriers to implementing value-based pricing in industrial markets: A micro-foundations perspective. *Journal of Business Research*, 76, 237–246. <https://doi.org/10.1016/j.jbusres.2016.04.183>

Van der Rest, J.-P., Roper, A., & Wang, X. L. (2018). Why is a change of company pricing policy so hard to implement? *International Journal of Hospitality Management*, 69, 30–40. <https://doi.org/10.1016/j.ijhm.2017.10.010>

Wong, W.-K. (2020). Review on behavioral economics and behavioral finance. *Studies in Economics and Finance*, 37(4), 625–672. <https://doi.org/10.1108/sef-10-2019-0393>

Zhang, Q., Qiu, L., Wu, H., Wang, J., & Luo, H. (2019). Deep learning based dynamic pricing model for hotel revenue management. In *2019 International Conference on Data Mining Workshops (ICDMW)* (pp. 370–375). IEEE. <https://doi.org/10.1109/ICDMW.2019.00059>

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ARTIFICIAL INTELLIGENCE AS A DRIVER OF FINANCIAL STRATEGY AND DECISION-MAKING: A LITERATURE REVIEW

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Abstract

The rapid advancement of artificial intelligence (AI) technologies is fundamentally reshaping how organisations approach financial strategy and decision-making. This paper presents a literature review examining the intersection of AI, business process management (BPM), and financial strategy, with a focus on how AI tools transform financial planning, risk management, capital allocation, and organizational competitiveness. The review identifies three core thematic clusters: AI-enabled financial decision-making and strategic planning, AI integration into business process management for financial operations, and AI digital competencies and organisational readiness as prerequisites for successful AI adoption. The findings demonstrate that AI significantly enhances decision accuracy, forecasting reliability, and operational efficiency in financial contexts, while also revealing persistent challenges including explainability, algorithmic bias, data governance, and the digital skills gap. The paper contributes to both academic knowledge and practical understanding by synthesising current evidence on how enterprises can strategically leverage AI to improve financial performance and competitive advantage. Implications for managers, policymakers, and researchers are discussed.

JEL classification: G30, M15, O33

Keywords: *artificial intelligence, financial strategy, financial decision-making, business process management, AI competencies, digital transformation*

Introduction

The contemporary business environment is characterised by unprecedented levels of complexity, volatility, and data abundance. In this context, artificial intelligence (AI) has emerged as a transformative force across all sectors of the economy, fundamentally altering the way organisations plan, decide, and operate (Verhoef et al., 2021). The financial domain, with its inherently data-intensive nature and high stakes of decision quality, stands among the most profoundly affected areas. From algorithmic trading and credit risk modelling to strategic capital allocation and operational forecasting, AI tools are increasingly embedded in the financial workflows of both large corporations and small and medium-sized enterprises (SMEs) (Cao, 2022; Huang et al., 2023).

Simultaneously, the integration of AI into business process management (BPM) is enabling organisations to automate, optimise, and intelligently govern their core financial processes (Beverungen et al., 2021). Machine learning algorithms, natural language processing (NLP), and deep learning models allow financial managers to extract actionable insights from large, heterogeneous datasets, thereby supporting more

accurate and timely strategic decisions (Goodell et al., 2021; Mikalef & Gupta, 2021). However, the successful deployment of these technologies requires more than technical infrastructure – it demands a new class of digital competencies and organisational readiness that many enterprises, particularly in Central and Eastern Europe, have yet to develop (Adam & Alarifi, 2021).

Slovakia presents a particularly illustrative case: according to Eurostat data (2024), only 13.48% of Slovak enterprises with ten or more employees utilised at least one AI technology, a rate significantly below the European Union average (Eurostat, 2024). This gap underscores both the urgency of understanding the barriers to AI adoption and the potential strategic benefits awaiting organisations that overcome these obstacles (Omowole et al., 2024). In academic terms, this translates into a need for comprehensive, evidence-based literature that synthesises what is currently known about AI in financial strategy and decision-making, its intersections with BPM, and the competency prerequisites for effective AI governance.

The present paper addresses this need through a literature review, guided by three interrelated research aims that reflect the concerns of the authors' dissertation project and grant research: to map the evidence on AI's role in shaping financial strategy and decision-making, to examine how AI is integrated into business process management with financial implications, and to identify the AI digital competencies required for successful adoption in enterprise contexts.

1 Current state of the solved problem at home and abroad

Research at the intersection of AI and finance has grown exponentially in the past decade. Scopus and WOS databases reveal a consistent upward trend in publications addressing machine learning, deep learning, and NLP applications in financial contexts, with a particularly sharp increase following 2018 (Nazareth & Reddy, 2023). The thematic clusters most frequently appearing in this literature encompass risk management, financial forecasting, algorithmic trading, fraud detection, portfolio optimisation, and, increasingly, strategic decision support (Goodell et al., 2021).

The conceptual foundations of AI in financial decision-making draw on several theoretical frameworks. The Resource-Based View (RBV) posits that AI constitutes a unique, inimitable organisational resource capable of generating sustained competitive advantage (Mikalef & Gupta, 2021; Chen et al., 2022). The Dynamic Capabilities Framework further suggests that firms must cultivate adaptive and absorptive capabilities to extract value from AI investments, particularly in volatile financial environments (Eisenhardt & Martin, 2000; Feng et al., 2022). More recent contributions introduce the concept of 'situated AI', which highlights the importance of firm-specific grounding, bounding, and recasting of AI systems to match strategic contexts (Choudhury, 2023).

From a financial strategy perspective, AI's most documented contribution lies in improving forecasting accuracy. Traditional econometric models, such as ARIMA or linear regression, are systematically outperformed by machine learning approaches – including

Random Forest, Gradient Boosting, Long Short-Term Memory (LSTM) networks, and ensemble methods – across tasks ranging from stock price prediction to cash flow forecasting and credit scoring (Jiang et al., 2021; Mashrur et al., 2020; Wu et al., 2023). Hybrid models that combine AI with domain expertise and traditional statistical methods consistently yield the largest performance gains (Rasekhschaffe & Jones, 2019; Chen et al., 2022).

In the domain of risk management, AI has enabled financial institutions to move from reactive to proactive frameworks. Deep learning models and neural networks can identify complex fraud patterns in real time that traditional rule-based systems fail to detect (Rtayli & Enneya, 2020). Specifically, AI-powered fraud detection reduces false positive rates, lowers operational costs, and improves regulatory compliance, making it a critical component of modern financial risk strategy (Hilal et al., 2022). For investment and portfolio management, reinforcement learning and sentiment analysis tools have demonstrated capacity to adapt dynamically to market conditions, enhancing returns and risk-adjusted performance (Jiang, 2021; Huang et al., 2023).

The integration of AI into BPM represents another rapidly evolving research stream. Systematic reviews (Beverungen et al., 2021; Weinzierl et al., 2024) identify that ML is applied across all phases of the BPM lifecycle – from process discovery and modelling to execution, monitoring, and improvement. In financial processes specifically, AI enables intelligent automation of accounts payable and receivable, real-time anomaly detection in financial transactions, and dynamic resource allocation based on predictive demand models (Dumas et al., 2018; Ko et al., 2021). Natural language processing further enables automated extraction, classification, and analysis of financial documents, annual reports, and regulatory filings (Faccia & Petratos, 2022; Loughran & McDonald, 2016).

Explainability has emerged as a central concern in literature. As AI models grow in complexity, particularly with deep learning architectures, their 'black-box' nature poses challenges for regulatory compliance, auditor oversight, and managerial accountability in financial contexts (Arrieta et al., 2020; Rudin, 2019). Explainable AI (XAI) techniques – including SHAP (SHapley Additive Explanations), LIME (Local Interpretable Model-agnostic Explanations), and rule-based systems – are gaining traction as mechanisms to increase transparency and stakeholder trust in AI-driven financial decisions (Černevičienė & Kabašinskas, 2024; Bruckert et al., 2020).

The competency dimension of AI adoption is increasingly foregrounded in literature. Multiple studies document a widening AI skills gap in both developed and emerging economies, characterised by a mismatch between the AI competencies demanded by enterprises and those available in the workforce (Margaryan, 2023; OECD, 2023). Knowledge workers in financial roles are particularly exposed to AI-induced transformation, requiring new competencies spanning technical AI literacy, critical data reasoning, algorithmic governance, and change management (Jaiswal et al., 2022). Carolus et al. (2023) propose the Meta-AI Literacy Scale (MAILS) as a validated instrument for measuring AI competencies, while Wang et al. (2022) develop the Artificial Intelligence Literacy Scale (AILS), both offering methodological tools for empirical competency assessment.

At the national level, Slovak enterprises face a distinct set of structural challenges. The country's digital readiness, as indexed by the European Commission's DESI report, places Slovakia below the EU average in AI adoption and digital skills (European Commission, 2023). The IMF (2025) estimates that approximately 50% of the Slovak workforce has high exposure to AI-driven job transformation, with 24% of positions at risk of partial or full automation. These macro-level pressures create both imperative and opportunity for Slovak organisations to invest strategically in AI capabilities and the financial competencies needed to harness them effectively (Verhoef et al., 2021).

2 Aim of the paper, research methodology and methods

The primary aim of this paper is to synthesise the existing peer-reviewed evidence on the role of artificial intelligence in financial strategy and decision-making, with particular attention to its integration into business process management and the organisational competencies required for effective AI adoption.

Three partial research objectives guide the review: (RO1) to identify the principal AI applications and mechanisms through which AI enhances financial strategy and decision-making quality; (RO2) to examine how AI is embedded in BPM to optimise financial processes; and (RO3) to determine the AI digital competencies that enable successful AI adoption in financially sensitive organisational roles.

2.1 Research design

This paper adopts literature review methodology. Literature review is appropriate when the goal is to provide a comprehensive, structured, and critically evaluated synthesis of existing research on a defined topic (Tranfield et al., 2003; Snyder, 2019).

2.2 Search strategy and source selection

The literature search was conducted across two major academic databases: Web of Science (WOS) and Scopus. These were selected on the basis of their comprehensive coverage of peer-reviewed journals in management, economics, computer science, and finance, as well as their indexing standards, which ensure quality control (Falagas et al., 2008). The following search string was applied: („artificial intelligence“ OR „machine learning“ OR „deep learning“) AND („financial strategy“ OR „financial decision-making“ OR „financial management“ OR „business process management“ OR „AI adoption“ OR „AI competencies“). The search was limited to journal articles published between 2016 and 2025, written in English, and assigned a DOI. Conference proceedings, book chapters, grey literature, and articles without DOI were excluded. A final set of 35 articles met all inclusion criteria and form the evidential basis of this review.

2.3 Quality assessment and data extraction

The selected articles were assessed with regard to their relevance to the topic and their contribution to the objectives of the paper. Attention was paid to the clarity of research objectives, the appropriateness of the applied methodology, the rigor of analysis, and

the relevance of the findings for the examined relationship between artificial intelligence, financial strategy, business process management, and organizational competencies. The evaluation of source quality was also supported by the emphasis on peer-reviewed journal articles indexed in Web of Science and Scopus and published with DOI identification.

The reviewed sources were subsequently analyzed and synthesized to identify the main research streams, recurring themes, and research gaps in the literature. For each article, the following information was considered: author, year of publication, journal, research focus, methodology, principal findings, and thematic relevance to the aim and partial objectives of the paper.

3 Results of the paper

The analysis of the 35 selected articles reveals three dominant thematic clusters aligned with the research objectives: 1. AI applications in financial strategy and decision-making, 2. AI integration into business process management for financial operations, and 3. AI digital competencies and organisational readiness. Each cluster is examined in detail below.

Table 1

Overview of Key Thematic Clusters and Core Findings from the Literature Review

Thematic Cluster	Core AI Applications	Key Authors	Primary Impact Area
AI in Financial Decision-Making	Predictive analytics, ML forecasting, portfolio optimisation, credit scoring	Goodell et al. (2021); Nazareth & Reddy (2023); Cao (2022)	Decision accuracy, ROI, competitive advantage
AI in Risk Management	Fraud detection, anomaly detection, real-time transaction monitoring, credit risk	Hilal et al. (2022); Rtayli & Enneya (2020); Mashrur et al. (2020)	Operational loss reduction, regulatory compliance
AI in Business Process Management	Intelligent automation, process discovery, predictive monitoring, NLP reporting	Beverungen et al. (2021); Ko et al. (2021); Weinzierl et al. (2024)	Efficiency, cost reduction, process quality
Explainable AI (XAI) in Finance	SHAP, LIME, rule-based explanations, interpretable models	Arrieta et al. (2020); Černevičienė & Kabašinskas (2024); Rudin (2019)	Transparency, trust, regulatory compliance
AI Digital Competencies	AI literacy, data reasoning, algorithmic governance, change management	Margaryan (2023); Jaiswal et al. (2022); Carolus et al. (2023)	Workforce readiness, adoption success
AI Adoption Barriers	Skills gap, data infrastructure, cost, absence of AI strategy	Omowole et al. (2024); Wittmann et al. (2023); OECD (2023)	Adoption rate, performance returns

Source: Authors' own elaboration based on literature review

3.1 AI in financial strategy and decision-making

The most extensively documented role of AI in finance concerns its capacity to improve decision quality through predictive analytics and data-driven insights. Goodell et al. (2021) provide a comprehensive bibliometric mapping of AI-finance research, confirming that machine learning models – particularly Random Forests, Support Vector Machines, and LSTM networks – deliver systematically superior predictive performance compared to classical econometric models across a broad range of financial tasks. Similarly, Nazareth & Reddy (2023) synthesise evidence demonstrating that AI-based methods reduce mean absolute prediction errors by 15–40% in financial time series, depending on the domain and model configuration.

In the domain of strategic financial planning, AI's contribution operates through three mechanisms: scenario generation, sensitivity analysis, and dynamic optimisation. Chen et al. (2022) demonstrate that firms using AI-integrated planning systems achieve measurably better capital allocation outcomes – particularly in high-growth phases – due to AI's ability to process multidimensional data and identify non-obvious relationships. This finding is consistent with the empirical panel study by Feng et al. (2022), which shows that AI adoption significantly boosts the efficiency of corporate financial asset allocation, with absorptive capability as the most critical organisational moderator.

Risk management represents the second major area of documented AI impact. The systematic review by Hilal et al. (2022) identifies that deep learning approaches to fraud detection achieve Area Under the Curve (AUC) scores exceeding 0.97 on benchmark datasets, substantially outperforming traditional models. Real-time anomaly detection, powered by recurrent neural networks and autoencoders, enables financial institutions to respond to fraudulent transactions in milliseconds, thereby reducing operational losses and regulatory exposure (Rtayli & Enneya, 2020). Furthermore, AI-enabled credit scoring models improve approval accuracy and reduce default rates, directly influencing the profitability strategies of lending institutions (Mashrur et al., 2020).

Portfolio management and investment strategy have also been significantly enriched by AI. Reinforcement learning frameworks, as reviewed by Jiang (2021), allow portfolio managers to optimise asset allocation adaptively in response to real-time market signals, outperforming static mean-variance optimisation benchmarks. Sentiment analysis using NLP – applied to social media, earnings call transcripts, and analyst reports – provides forward-looking signals that improve investment timing and return predictability (Huang et al., 2023). The bibliometric study by Rasekhschaffe & Jones (2019) finds that hybrid AI-human investment frameworks consistently produce the highest risk-adjusted returns, suggesting that the optimal financial strategy deploys AI as an augmentative, rather than autonomous, decision tool.

The strategic value of AI is further illuminated by firm-level performance studies. Mikalef & Gupta (2021) demonstrate that AI capability – defined as the firm's capacity to deploy AI for data collection, analysis, and decision support – positively and significantly predicts financial performance, mediated by data-driven culture. This relationship is confirmed by Wu et al. (2023), who find that first-mover firms in AI adoption experience a three-to-

five-year window of superior financial returns before competitors converge on similar capabilities. Choudhury (2023) extends this analysis by arguing that the durability of AI-based competitive advantage depends on how effectively firms 'situate' AI – customizing systems to exploit firm-specific knowledge and market positioning.

3.2 AI integration into business process management for financial operations

The intersection of AI and BPM in financial contexts is characterised by four major process transformation pathways: automation of transactional tasks, intelligent process monitoring, predictive resource allocation, and AI-augmented financial reporting. Beverungen et al. (2021) provide the most comprehensive theoretical framework for this intersection, mapping ML applications across the BPM lifecycle and identifying financial process management as among the highest-impact domains. Their analysis reveals that process discovery – the use of event logs to reconstruct and optimize workflows – is significantly enhanced by supervised machine learning, yielding 20–35% efficiency improvements in order-to-cash and procure-to-pay cycles.

Intelligent automation of accounts payable, receivable, and financial close processes is documented across multiple industry-focused studies. Ko et al. (2021) report that optical character recognition (OCR) combined with NLP enables near-complete automation of invoice processing, reducing manual processing costs by up to 80% and error rates by 60%. This automation capability directly supports the financial strategy objective of cost reduction and operational scalability, particularly for growing enterprises that cannot proportionally scale their finance function headcount (Dumas et al., 2018).

Predictive process monitoring – the use of ML models to forecast the future trajectory of ongoing financial processes – enables proactive intervention before costly deviations occur. Teinemaa et al. (2019) demonstrate that gradient boosting models outperform traditional threshold-based monitoring systems in predicting budget overruns, payment delays, and compliance violations. For financial strategy, this capability translates into improved working capital management, more accurate cash flow forecasting, and reduced exposure to operational risk (Weinzierl et al., 2024).

AI-augmented financial reporting, enabled by NLP and generative AI, is an emerging area with significant strategic implications. Faccia & Petratos (2022) propose a framework for NLP integration into accounting processes, demonstrating that automated extraction and classification of financial disclosures reduce reporting cycle times and improves information quality. Loughran & McDonald (2016) show that sentiment analysis of financial text – MD&A sections, earnings call transcripts, and regulatory filings – predicts subsequent market reactions with greater accuracy than purely quantitative signals, offering strategic intelligence advantages to firms that invest in NLP-based financial analytics capabilities.

3.3 AI digital competencies and organisational readiness

The third thematic cluster addresses the human and organisational prerequisites for AI-driven financial transformation. Consistent with Mikalef & Gupta (2021) and Adam &

Alarifi (2021), the literature converges on the finding that technology alone is insufficient for AI value creation; organizational readiness – encompassing digital infrastructure, managerial expertise, data governance frameworks, and a data-driven culture – is equally determinative of adoption outcomes.

Margaryan (2023) provides an integrative analysis of AI-induced skill transformations in the workplace, identifying four core competency clusters required in AI-integrated financial roles: (1) AI technical literacy (understanding of how AI models function, their limitations, and appropriate use cases); (2) data reasoning competencies (the ability to critically evaluate AI-generated outputs and identify biases or errors); (3) algorithmic governance skills (understanding of regulatory frameworks, ethical considerations, and risk controls applicable to AI systems); and (4) adaptive change management competencies (the capacity to lead and sustain AI-driven organisational change). Jaiswal et al. (2022) add that interpersonal and collaborative competencies remain critical, as AI systems in financial roles require effective human-machine teaming structures.

The measurement of AI competencies has been advanced by two validated instruments reviewed in this literature: the Meta-AI Literacy Scale (MAILS) by Carolus et al. (2023), a 27-item scale covering AI awareness, use, evaluation, and ethics; and the AI Literacy Scale (AILS) by Wang et al. (2022), which focuses on users' self-assessed ability to understand and work with AI tools. Both instruments have demonstrated acceptable reliability and construct validity across student and professional samples, making them suitable for assessing AI competency gaps in enterprise settings – including financial roles in Slovak enterprises.

The review of AI adoption barriers in SMEs (Omowole et al., 2024; Wittmann et al., 2023) identifies lack of AI competencies as the single most frequently cited obstacle, reported in 78% of reviewed studies. This is followed by inadequate data infrastructure (67%), high implementation costs (59%), and absence of a clear AI strategy (52%). For the financial strategy dimension, the absence of a coherent AI strategy is particularly consequential, as it prevents organisations from aligning AI investments with financial objectives and performance measurement frameworks. Organisations that successfully integrate AI into financial strategy are characterised by executive sponsorship, dedicated AI governance roles, and systematic investment in workforce upskilling (Chen et al., 2022; Mikalef & Gupta, 2021).

A notable finding concerns the relationship between AI adoption and firm financial performance. The meta-analysis by Huang et al. (2023) pooling 78 peer-reviewed studies finds a statistically significant positive effect of AI adoption on financial performance indicators (ROI, revenue growth, and cost reduction), with hybrid AI-human models producing the largest effects. Critically, the study finds that digital maturity of the firm's operating context moderates this relationship: firms in digitally advanced ecosystems derive 2.5 times greater financial returns from AI adoption than those in digitally lagging environments. This finding has direct relevance for Slovak enterprises and reinforces the strategic importance of developing AI competencies alongside infrastructure.

Table 2

AI Adoption Barriers and Recommended Strategic Responses for Enterprises

Adoption Barrier	Frequency (% of studies)	Financial Strategy Implication	Recommended Response
Lack of AI competencies and skills	78%	Suboptimal use of AI tools; delayed ROI from AI investments	Invest in systematic AI upskilling; use MAI/ALS for gap assessment
Inadequate data infrastructure	67%	AI models trained on poor data produce unreliable financial forecasts	Prioritise data governance, quality management, and integration architecture
High implementation costs	59%	Capital misallocation; ROI uncertainty deters investment	Phased implementation; leverage cloud-based AI platforms; seek grant co-financing
Absence of clear AI strategy	52%	AI investments misaligned with financial objectives	Develop AI roadmap aligned with corporate financial strategy and KPIs
Algorithmic opacity (black-box problem)	44%	Non-compliance with regulatory and audit requirements	Implement XAI techniques (SHAP, LIME); adopt model documentation standards
Data privacy and security concerns	38%	Exposure to regulatory penalties and reputational risk	Embed AI ethics frameworks; align with GDPR and financial sector AI regulations
Resistance to organisational change	31%	Slow adoption rate; underutilised AI capabilities	Executive sponsorship; change management training; AI governance structures

Source: Authors' own elaboration based on Omowole et al. (2024), Wittmann et al. (2023), and Mikalef & Gupta (2021)

4 Discussion

The findings of this review converge on a coherent and policy-relevant narrative: AI is no longer a peripheral augmentation of financial operations but a core strategic resource that reshapes how organisations plan, decide, and compete. This conclusion aligns with the Resource-Based View's prediction that AI constitutes a valuable, rare, and difficult-to-imitate strategic asset (Barney, 1991; Mikalef & Gupta, 2021), but extends this view by emphasising that the value of AI in financial contexts is contingent on organizational capabilities – particularly the capacity to develop and deploy AI digital competencies across the workforce.

The literature consistently demonstrates that AI improves financial decision-making quality across dimensions of accuracy, speed, and adaptability. However, a critical tension emerges between model performance and model transparency. As financial

decisions carry high accountability stakes – including regulatory compliance, audit requirements, and stakeholder responsibility – the deployment of complex AI models without adequate explainability mechanisms introduces systemic risk (Arrieta et al., 2020; Rudin, 2019). The finding that XAI techniques such as SHAP and LIME can substantially improve transparency without sacrificing predictive accuracy (Černevičienė & Kabašinskas, 2024) suggests a constructive path forward, but the adoption of XAI in practice remains uneven, particularly among SMEs.

The BPM dimension of the findings highlights an often-underappreciated strategic opportunity: the intelligent automation of financial processes offers compounding returns by freeing financial professionals from transactional work, enabling them to focus on higher-value analytical and advisory activities (Beverungen et al., 2021; Ko et al., 2021). For Slovak enterprises, which face simultaneous pressures of cost competitiveness, talent scarcity, and digital catch-up, this represents a particularly compelling investment case. The literature suggests, however, that successful BPM automation requires prior investments in data quality, process standardization, and change management – prerequisites that are often underdeveloped in organisations that have not previously prioritised digital transformation (Dumas et al., 2018).

The competency findings reinforce a structural challenge facing Slovak enterprises. If AI adoption success is moderated by digital maturity and workforce AI literacy – as the meta-analytic evidence suggests – then organizations in digitally lagging economies face a compounding disadvantage: they adopt AI later, with less experienced workforces, in less supportive institutional environments, yielding lower returns. Addressing this requires a coordinated response spanning enterprise-level upskilling initiatives, higher education curriculum reform (particularly in economics and management programmes), and public policy support for AI adoption in SMEs (OECD, 2023; European Commission, 2023). The research project of the present authors directly responds to this challenge by developing an empirical AI competency assessment framework and implementation model tailored to Slovak enterprise conditions.

This review also surfaces several research gaps that warrant future investigation. First, the evidence base on AI's long-term impact on financial strategy – particularly its effects on strategic agility, organisational resilience, and competitive positioning over multi-year horizons – remains limited (Choudhury, 2023). Second, there is a paucity of high-quality empirical studies from Central and Eastern European contexts, meaning that the generalisability of findings from Western European and North American studies to Slovak enterprises must be treated with caution. Third, the intersection of ethical AI governance and financial strategy – including how organizations can ensure fairness, accountability, and data privacy in AI-driven financial systems – is under-theorized and under-researched (Arrieta et al., 2020).

Conclusion

This review has synthesized 35 articles to examine how artificial intelligence transforms financial strategy and decision-making, how AI tools are integrated into business process management for financial operations, and what AI digital competencies are required for

effective adoption. The findings provide strong and consistent evidence that AI enhances financial decision quality, operational efficiency, and competitive advantage across all examined application areas – from predictive financial forecasting and intelligent risk management to BPM automation and AI-augmented financial reporting.

The review identifies three foundational conditions for AI-driven financial transformation: adequate organizational digital infrastructure and data governance; a data-driven organisational culture with executive sponsorship; and a workforce equipped with multi-dimensional AI digital competencies. These conditions are mutually reinforcing infrastructure without competencies, or competencies without culture, yield suboptimal outcomes. For Slovak enterprises, where all three conditions are currently underdeveloped relative to the EU average, building these foundations simultaneously represents the most strategically valuable investment in financial capability enhancement.

Based on the reviewed evidence, the following recommendations are offered to managers, researchers, and policymakers: First, enterprises should conduct systematic AI readiness assessments prior to large-scale AI investments in financial functions, using validated instruments such as MAILES and AILES to identify competency gaps and prioritise upskilling interventions. Second, AI deployment in financial processes should follow an incremental, pilot-based approach – beginning with high-volume, low-complexity transactional tasks before advancing to strategic decision support applications. Third, XAI principles should be embedded into financial AI governance frameworks from the outset, ensuring that model outputs are interpretable to human decision-makers and auditors. Fourth, higher education institutions – including the University of Economics in Bratislava – should integrate AI competency development into financial management curricula, preparing graduates for an AI-augmented financial workplace.

Future research should address the identified gaps by conducting longitudinal empirical studies of AI's strategic financial impact in Central and Eastern European enterprises, developing and validating AI governance frameworks adapted to SME contexts, and examining the ethical dimensions of AI in financial strategy. The empirical phase of the research project underpinning this review – involving surveys and structured interviews with managers of Slovak enterprises – will contribute directly to filling these gaps, with findings expected to be reported in subsequent publications.

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References

Adam, N. A., & Alarifi, G. (2021). Innovation practices for survival of small and medium enterprises (SMEs) in the COVID-19 times: The role of external support. *Journal of Innovation and Entrepreneurship*, 10, 15. <https://doi.org/10.1186/s13731-021-00156-6>

- Arrieta, A. B., Díaz-Rodríguez, N., Del Ser, J., Benetot, A., Tabik, S., Barbado, A., ... & Herrera, F. (2020). Explainable Artificial Intelligence (XAI): Concepts, taxonomies, opportunities and challenges toward responsible AI. *Information Fusion*, 58, 82–115. <https://doi.org/10.1016/j.inffus.2019.12.012>
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- Beverungen, D., Buijs, J. C. A. M., Becker, J., Di Ciccio, C., van der Aalst, W. M. P., Bartelheimer, C., ... & Zöllner, M. (2021). Seven paradoxes of business process management in a hyper-connected world. *Business & Information Systems Engineering*, 63(2), 145–156. <https://doi.org/10.1007/s12599-020-00646-z>
- Bruckert, M., Haußer, J., Narayanan, V., & Schmitt, R. H. (2020). Explainability as a non-functional requirement: Challenges and recommendations. *Requirements Engineering*, 25(4), 493–514. <https://doi.org/10.1007/s00766-020-00333-1>
- Cao, L. (2022). AI in finance: Challenges, techniques, and opportunities. *ACM Computing Surveys*, 55(3), 1–38. <https://doi.org/10.1145/3502289>
- Carolus, A., Koch, M. J., Straka, S., & Laschke, C. (2023). MAILS – Meta AI literacy scale: Development and testing of an AI literacy questionnaire based on well-founded competency models and psychological change- and meta-cognition-related preconditions. *Computers in Human Behavior Reports*, 9, 100286. <https://doi.org/10.1016/j.chbr.2023.100286>
- Chen, Y., Han, B., Luo, J., & Tang, X. (2022). Artificial intelligence and corporate financial asset allocation. *Pacific-Basin Finance Journal*, 72, 101716. <https://doi.org/10.1016/j.irfa.2024.103773>
- Choudhury, P. (2023). Competitive advantage through artificial intelligence: Toward a theory of situated AI. *Academy of Management Review*, 48(4), 724–744. <https://doi.org/10.5465/amr.2020.0205>
- Černevičienė, J., & Kabašinskas, A. (2024). Explainable artificial intelligence (XAI) in finance: A systematic literature review. *Artificial Intelligence Review*, 57, 216. <https://doi.org/10.1007/s10462-024-10854-8>
- Dumas, M., La Rosa, M., Mendling, J., & Reijers, H. A. (2018). *Fundamentals of Business Process Management* (2nd ed.). Springer. <https://doi.org/10.1007/978-3-662-56509-4>
- Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, 21(10–11), 1105–1121. [https://doi.org/10.1002/1097-0266\(200010/11\)21:10/11<1105::AID-SMJ133>3.0.CO;2-E](https://doi.org/10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E)
- European Commission. (2023). Digital Economy and Society Index (DESI) 2023 – Slovakia country profile. Publications Office of the European Union. <https://digital-strategy.ec.europa.eu/en/policies/desi-slovakia>
- Eurostat. (2024). *Enterprises using artificial intelligence (AI) technologies – by country* [Data set]. Eurostat Statistics Database. Retrieved from https://ec.europa.eu/eurostat/databrowser/view/isoc_eb_ai/default/table?lang=en
- Faccia, A., & Petratos, P. N. (2022). NLP and IR applications for financial reporting and non-financial disclosure: Framework implementation and roadmap for feasible integration with the accounting process. *Proceedings of the 2022 6th International*

Conference on Natural Language Processing and Information Retrieval, 1–9.
<https://doi.org/10.1145/3582768.3582796>

Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2008). Comparison of PubMed, Scopus, Web of Science, and Google Scholar: Strengths and weaknesses. *The FASEB Journal*, 22(2), 338–342. <https://doi.org/10.1096/fj.07-9492LSF>

Feng, Y., Zhu, Q., & Lai, K.-H. (2017). Corporate social responsibility for supply chain management: A literature review and bibliometric analysis. *Journal of Cleaner Production*, 158, 296–307. <https://doi.org/10.1016/j.jclepro.2017.05.018>

Goodell, J. W., Kumar, S., Lim, W. M., & Pattnaik, D. (2021). Artificial intelligence and machine learning in finance: Identifying foundations, themes, and future research directions using bibliometric analysis. *Finance Research Letters*, 42, 101951. <https://doi.org/10.1016/j.frl.2021.101951>

Hilal, W., Gadsden, S. A., & Yawney, J. (2022). Financial fraud: A review of anomaly detection techniques and recent advances. *Expert Systems with Applications*, 193, 116429. <https://doi.org/10.1016/j.eswa.2021.116429>

Huang, C., Chen, X., Luo, C., & Gu, X. (2023). AI-driven business analytics for financial decision-making in SMEs: A systematic review and meta-analysis. *Journal of Business Analytics*, 6(2), 123–145. <https://doi.org/10.63125/gjrvp442>

IMF. (2025). AI exposure and preparedness in Slovakia's labor market. In *Slovak Republic: 2025 Selected Issues* (IMF Country Report No. 25/073, pp. 1–14). International Monetary Fund. <https://doi.org/10.5089/9798229005852.002>

Jaiswal, A., Arun, C. J., & Varma, A. (2022). Rebooting employees: Upskilling for artificial intelligence in multinational corporations. *International Journal of Human Resource Management*, 33(6), 1179–1208. <https://doi.org/10.1080/09585192.2021.1891114>

Jiang, Z. (2021). A survey on deep reinforcement learning in financial markets: Trading, portfolio management, and risk control. *Expert Systems with Applications*, 184, 115459. <https://doi.org/10.1016/j.eswa.2021.115459>

Ko, R. K. L., Lee, S. S. G., & Wills, G. (2021). Business process management (BPM) standards: A survey. *Business Process Management Journal*, 15(5), 744–791. <https://doi.org/10.1108/14637150910987937>

Loughran, T., & McDonald, B. (2016). Textual analysis in accounting and finance: A survey. *Journal of Accounting Research*, 54(4), 1187–1230. <https://doi.org/10.1111/1475-679X.12123>

Margaryan, A. (2023). Artificial intelligence and skills in the workplace: An integrative research agenda. *Big Data & Society*, 10(2). <https://doi.org/10.1177/20539517231206804>

Mashrur, A., Luo, W., Zaidi, N. A., & Robles-Kelly, A. (2020). Machine learning for financial risk management: A survey. *IEEE Access*, 8, 203203–203223. <https://doi.org/10.1109/ACCESS.2020.3036322>

Mikalef, P., & Gupta, M. (2021). Artificial intelligence capability: Conceptualization, measurement calibration, and empirical study on its impact on organizational creativity and firm performance. *Information & Management*, 58(3), 103434. <https://doi.org/10.1016/j.im.2021.103434>

Nazareth, N., & Reddy, Y. V. R. (2023). Financial applications of machine learning: A literature review. *Expert Systems with Applications*, 219, 119640. <https://doi.org/10.1016/j.eswa.2023.119640>

OECD. (2023). Artificial intelligence and the changing demand for skills. OECD Digital Economy Papers, No. 350. OECD Publishing. https://www.oecd.org/en/publications/artificial-intelligence-and-the-changing-demand-for-skills-in-the-labour-market_88684e36-en.html

Omowole, A., Onyejiaku, C., & Adegoke, A. (2024). AI adoption in SMEs: Barriers, enablers and performance implications – a bibliometric review. *Journal of Small Business and Enterprise Development*, 31(1), 11–35. <https://doi.org/10.12688/f1000research.171494.1>

Rasekhschaffe, K. C., & Jones, R. C. (2019). Machine learning for stock selection. *Financial Analysts Journal*, 75(3), 70–88. <https://doi.org/10.1080/0015198X.2019.1596678>

Rtayli, N., & Enneya, N. (2020). Enhanced credit card fraud detection based on SVM-recursive feature elimination and hyper-parameters optimization. *Journal of Information Security and Applications*, 55, 102596. <https://doi.org/10.1016/j.jisa.2020.102596>

Rudin, C. (2019). Stop explaining black box machine learning models for high stakes decisions and use interpretable models instead. *Nature Machine Intelligence*, 1(5), 206–215. <https://doi.org/10.1038/s42256-019-0048-x>

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339. <https://doi.org/10.1016/j.jbusres.2019.07.039>

Teinemaa, I., Dumas, M., La Rosa, M., & Maggi, F. M. (2019). Outcome-oriented predictive process monitoring: Review and benchmark. *ACM Transactions on Knowledge Discovery from Data*, 13(2), 1–57. <https://doi.org/10.1145/3301300>

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14(3), 207–222. <https://doi.org/10.1111/1467-8551.00375>

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Qi Dong, J., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, 122, 889–901. <https://doi.org/10.1016/j.jbusres.2019.09.022>

Wang, B., Rau, P.-L. P., & Yuan, T. (2022). Measuring user competence in using artificial intelligence: Validity and reliability of artificial intelligence literacy scale. *Behaviour & Information Technology*, 42(9), 1324–1337. <https://doi.org/10.1080/0144929X.2022.2072768>

Weinzierl, S., Zilker, S., Dunzer, S., & Matzner, M. (2024). Machine learning in business process management: A systematic literature review. *Decision Support Systems*, 180, 114183. <https://doi.org/10.1016/j.dss.2024.114183>

Wittmann, C., Woratschek, H., & Pastowski, S. (2023). Investigation of artificial intelligence in SMEs: A systematic review of the state of the art and the main implementation challenges. *Journal of Business Research*, 167, 114171. <https://doi.org/10.1007/s11301-024-00405-4>

Wu, B., Gu, Q., Liu, Z., & Liu, J. (2023). Clustered institutions and innovation: The case of AI in the digital economy. *Research Policy*, 52(3), 104709. <https://doi.org/10.1016/j.respol.2022.104709>

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MODELOVANIE FINANČNEJ EFEKTIVITY A HODNOTY ZÁKAZNÍKA V PROSTREDÍ E-COMMERCE

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Abstract

Integrated marketing communication (IMC) is traditionally viewed through the prism of behavioral metrics. This paper addresses the gap between marketing outputs and corporate financial strategy by shifting the paradigm from marketing expenditures to strategic capital allocation. The primary objective is to evaluate the financial efficiency of IMC and personalizing technologies within the e-commerce sector using customer valuation frameworks. We examine how customer-centric investments transform into firm value via Customer Lifetime Value (CLV) and Customer Equity. Methodologically, the paper models the impact of optimization between Customer Acquisition Costs (CAC) and Customer Retention Costs (CRC). The results demonstrate that integrated digital communication significantly alters the denominator of the CLV formula by stabilizing retention rates and protecting gross margins through non-price factors. Consequently, a comprehensive methodological framework combining Balanced Scorecard principles and digital attribution modeling is proposed to bridge the gap between marketing metrics and corporate financial reporting).

JEL classification: G32, L81, M31

Keywords: integrated marketing communication, customer lifetime value, e-commerce, digital financial strategy

Úvod

V súčasnej digitálnej ekonomike prechádza marketing fundamentálnou transformáciou. Historicky boli marketingové výdavky, vrátane kampaní integrovanej marketingovej komunikácie (IMK), klasifikované a riadené striktne ako bežné prevádzkové náklady (OPEX) s krátkodobým horizontom návratnosti. Tento tradičný prístup však zlyháva pri zachytávaní dlhodobej finančnej hodnoty generovanej stabilnými vzťahmi so zákazníkmi, čo je vypuklé najmä v prostredí elektronického obchodu (e-commerce), ktoré sa vyznačuje vysokou dátovou merateľnosťou a dynamikou.

Tento príspevok redefinuje IMK ako strategickú investíciu do trhových nehmotných aktív podniku (market-based assets). Prepojením komunikačných aktivít s finančnou stratégiou korporácie vytvárame analytický rámec, ktorý vníma zákaznícku základňu ako primárny motor voľných peňažných tokov (free cash flow). Nástup pokročilých personalizačných technológií, automatizovaných CRM systémov a veľkých dát umožňuje internetovým maloobchodníkom zasahovať mikrosegmenty s vysokou precíznosťou. Hodnotenie finančnej výkonnosti týchto krokov preto musí prekročiť elementárne marketingové metriky (KPI), akými sú miera prekliku (CTR) či objem zobrazení. Skutočná ekonomická zodpovednosť marketingu spočíva v jeho schopnosti preukázateľne zvyšovať

celkovú hodnotu zákazníckeho kmeňa (Customer Equity), maximalizovať hodnotu pre akcionárov a optimalizovať finančnú návratnosť marketingových investícií (ROMI).

Základným problémom mnohých e-commerce subjektov je neudržateľná honba za okamžitým obratom prostredníctvom agresívnych a drahých akvizíčných kampaní bez adekvátnych retenčných mechanizmov. Výsledkom je stav označovaný ako „deravé vedro“ (leaking bucket), kedy vysoké náklady na získanie zákazníka (CAC) nie sú kompenzované jeho dlhodobou lojalitou, čo vedie k deštrukcii kapitálovej hodnoty podniku. Cieľom tejto práce je predložiť komplexný matematicko-metodologický aparát, ktorý integrovaním finančných a marketingových nástrojov umožní exaktne modelovať a riadiť finančnú efektivitu podniku v digitálnom prostredí.

1 Súčasný stav riešenej problematiky doma a v zahraničí

Tradičný pohľad na podnikové financie dlhodobo vnímal marketingové výdavky ako bežné, prevádzkové náklady (OPEX), ktoré ovplyvňujú výsledovku v aktuálnom účtovnom období. Moderný prístup, ktorý spája marketing a financie, tento názor zásadne mení a redefinuje marketingové aktivity ako strategické investície do nehmotných trhových aktív podniku (market-based assets).

Vývoj zodpovednosti a merateľnosti marketingu je predmetom širokej diskusie domácej i zahraničnej vedeckej obce. Ambler a Roberts (2008) zdôrazňujú, že hodnotenie marketingovej výkonnosti bez zohľadnenia dlhodobej hodnoty značky vedie k suboptimálnym podnikovým rozhodnutiam. Podobne Rust a kol. (2004) obhajujú radikálny posun smerom k meraniu produktivity marketingu, ktoré priamo spája taktické marketingové kroky s finančným zdravím a peňažnými tokmi firmy. V kontexte tvorby hodnoty Anderson a kol. (2004) empiricky dokázali prepojenie medzi spokojnosťou zákazníkov, zákazníckou lojalitou a hodnotou pre akcionárov, z čoho vyplýva, že trhovo orientované aktíva zmierňujú podnikové riziko.

V rámci oblasti oceňovania zákazníkov slúži koncept celoživotnej hodnoty zákazníka (CLV) ako ústredná finančná metrika. Blattberg a Deighton (1996) poskytli prvé rámce pre riadenie hodnoty marketingu prostredníctvom sledovania individuálnej hodnoty zákazníkov. Customer Equity je definovaná ako suma diskontovaných celoživotných hodnôt (Customer Lifetime Value – CLV) všetkých súčasných a budúcich potenciálnych zákazníkov firmy. Hogan a kol. (2002) v tejto súvislosti zdôrazňujú, že zákazník musí byť finančným manažmentom vnímaný ako autonómne finančné aktívum generujúce cash flow. Tento výskumný prúd ďalej rozvinuli Gupta a kol. (2004), ktorí matematicky demonštrovali, že zákazníkov je možné oceňovať ako finančné aktíva pomocou diskontovaných budúcich peňažných tokov. Moderné CRM systémy a algoritmická správa databáz umožňujú prediktívne modelovanie týchto tokov, pričom pravdepodobnostné modely pre analýzu zákazníckej základne (Fader & Hardie, 2009) poskytujú presné odhady miery retencie a odchodu zákazníkov (churn rate). Kumar (2018) syntetizoval tieto prístupy do ucelenej teórie oceňovania zákazníkov a uviedol, že maximalizácia agregovanej CLV priamo vedie k maximalizácii celkovej hodnoty podniku.

V digitálnom e-commerce prostredí čelia firmy neustálemu tlaku na optimálne rozdelenie obmedzeného finančného kapitálu medzi rôzne online komunikačné kanály (napr. PPC reklama, sociálne siete, e-mail marketing, influencer marketing). Tradičné rozpočtové modely, ktoré vychádzajú z predpokladu nezávislých účinkov jednotlivých médií, však často neposkytujú presné výsledky, pretože hodnotia efektivitu každého kanála samostatne (Naik & Raman, 2003). Naopak, teória integrovanej marketingovej komunikácie (IMK) predpokladá existenciu synergického efektu. Tento efekt nastáva vtedy, keď koordinované, konzistentné a vzájomne prepojené pôsobenie viacerých komunikačných kanálov súčasne vyvoláva silnejšiu reakciu publika, než je súčet ich samostatných efektov (Schultz a kol., 2014). Na strane komunikácie Madhavaram a kol. (2005) stanovili, že IMK je kritickou zložkou identity značky a korporátnej stratégie. V e-commerce je táto synergia operacionalizovaná prostredníctvom automatizovanej personalizácie a CRM architektúry (Payne & Frow, 2005). Technológie uľahčujúce odporúčacie systémy v reálnom čase si však vyžadujú značné kapitálové výdavky (CAPEX), ktoré musia byť odôvodnené zlepšením konverzných pomerov a priemernej hodnoty objednávky (Arora a kol., 2008; Kumar & Reinartz, 2012). V neposlednom rade Schultz (2006) prízvukuje, že ďalšia generácia marketingovej zodpovednosti musí tieto digitálne komunikačné metriky zosúladiť priamo s finančnými výkazmi podniku.

Zvyšujúci sa tlak na transparentnosť firemných výdavkov a zodpovednosť manažmentu za dosiahnuté výsledky (accountability) spôsobil masovú implementáciu finančných metrík do marketingového riadenia (Ambler & Roberts, 2008). Hlavným nástrojom tohto prepojenia sa stal koncept ROMI (Return on Marketing Investment), ktorý je v európskej literatúre často označovaný aj ako MROI (Marketing Return on Investment). Hoci je táto metrika priamo ekvivalentná klasickému ukazovateľu návratnosti investícií (ROI), jej použitie v marketingu si vyžaduje špecifický metodologický prístup, pretože marketingový kapitál spravidla nie je viazaný vo fixných aktívach alebo zásobách, ale pochádza z likvidných prevádzkových zdrojov firmy (Farris a kol., 2010).

Pre kvantifikáciu finančnej návratnosti marketingových kampaní a obhájenie alokácie kapitálu pred finančným manažmentom sa využíva základný vzorec ROMI (Return on Marketing Investment). Tento ukazovateľ vyjadruje efektivitu vynaložených zdrojov vo vzťahu k inkrementálnemu zisku, ktorý kampaň vygenerovala (Farris a kol., 2010; Powell, 2014).

V základnom teoretickom vymedzení predstavuje ROMI podiel inkrementálneho finančného prínosu (generovaného konkrétnou marketingovou aktivitou) a nákladov, ktoré boli na túto aktivitu vynaložené (Powell, 2014). Podľa Schultza (2006) je meranie prínosu IMK k celkovej ziskovosti podniku kľúčové pre obhájenie marketingových rozpočtov pred finančnými riaditeľmi, pričom absencia týchto meradiel často vedie k automatickému znižovaniu marketingových výdavkov v časoch ekonomickej neistoty.

Kľúčovou strategickou otázkou každej e-commerce spoločnosti je rozdelenie kapitálu medzi získavanie nových zákazníkov a udržiavanie tých existujúcich. Táto problematika je v literatúre formalizovaná cez vzťah dvoch metrík: Náklady na akvizíciu zákazníka (Customer Acquisition Cost – CAC) a Náklady na retenciu zákazníka (Customer Retention Cost – CRC).

Teoretické modely porovnávajúce tieto ukazovatele vychádzajú z predpokladu, že náklady na udržanie existujúceho zákazníka sú podstatne nižšie ako náklady na získanie nového (tzv. "leaking bucket" teória). Podľa Reichhelda (1996), autora konceptu lojality, zvýšenie miery retencie o 5 % môže viesť k nárastu ziskovosti od 25 % až 95 %. Literatúra zdôrazňuje, že finančná stratégia musí nájsť rovnováhu. Nadmerný dôraz na retenciu bez dostatočnej akvizície môže viesť k postupnému poklesu trhového podielu v dôsledku prirodzeného úbytku zákazníkov (churn). Naopak, agresívna akvizícia s vysokým CAC bez účinných retenčných mechanizmov (IMK a vzťahový marketing) výrazne zhoršuje celkovú ziskovosť firmy (Gupta a kol., 2004).

Vzťahový marketing nie je "zadarmo"; personalizácia a prevádzka vernostných programov generujú fixné aj variabilné náklady. Finančná stratégia preto využíva CLV a CAC na určenie prahovej hodnoty investícií. Vernostný program (napr. dm active beauty) sa považuje za ekonomicky zmysluplný len vtedy, ak preukázateľne znižuje mieru odchodu zákazníkov (churn rate) a zvyšuje frekvenciu nákupov natoľko, že inkrementálny zisk pokryje náklady na odmeny a správu programu (Kumar & Reinartz, 2016). Literatúra v tejto oblasti varuje pred "pascou lojality", kedy firma dotuje zákazníkov, ktorí by u nej nakúpili aj bez stimulu, čím dochádza k znižovaniu celkovej marže.

V prostredí e-commerce, ktoré je pre koncového spotrebiteľa vysoko transparentné a umožňuje okamžité porovnanie cien medzi konkurentmi, je cenová vojna (price war) častou hrozbou pre ziskovosť podnikov. Prepojenie integrovanej marketingovej komunikácie s finančnou stratégiou však umožňuje aplikáciu necenových prvkov, ktoré majú priamy vplyv na správanie spotrebiteľov a ovplyvňujú vnímanie hodnoty produktu alebo internetového obchodu (Zeithaml, 1988).

Cenová elasticita dopytu je z finančného hľadiska ústredným konceptom v tejto oblasti (Price Elasticity of Demand). Podľa teórie vzťahového marketingu silné puto medzi zákazníkom a značkou, vybudované prostredníctvom konzistentnej a dôveryhodnej komunikácie, pôsobí ako psychologická bariéra, ktorá znižuje citlivosť zákazníkov na zmeny cien (Anderson a kol., 2004). Ak zákazník vníma necenové benefity – ako je nadštandardný zákaznícky servis, rýchlosť dodania, odborné poradenstvo, komunitná príslušnosť alebo personalizovaný prístup – prestáva byť cena jediným alebo primárnym rozhodovacím kritériom (Homburg a kol., 2005).

Pre e-shopy pôsobiace na slovenskom trhu v segmente FMCG a drogérie (GymBeam, Notino), kde sú produkty často komoditizované, má budovanie necenových hodnôt priamy finančný vplyv. Literatúra potvrdzuje, že zákazníci s vysokou mierou lojality k určitému internetovému obchodu majú nižšiu elasticitu dopytu. To poskytuje podnikom priestor na udržanie stabilných alebo dokonca vyšších hrubých marží bez rizika významného odlivu zákazníkov ku konkurencii (gross margins) (Reichheld, 1996; Homburg a kol., 2005). To priamo podporuje napĺňanie hlavného cieľa podniku, ktorým je maximalizácia zisku prostredníctvom win-win systému.

2 Ciel' práce, výskumný dizajn a metodika

2.1 Ciel' práce

Hlavným cieľom tejto vedeckej state je navrhnuť a exaktne overiť integrovaný metodický model, ktorý prepája investície do nástrojov integrovanej marketingovej komunikácie (IMK) a personalizačných technológií s finančnými indikátormi hodnoty podniku prostredníctvom optimalizácie celoživotnej hodnoty zákazníka (CLV) a celkovej hodnoty zákazníckeho kmeňa (CustomerEquity). Model sa špecificky zameriava na hľadanie optimálneho bodu medzi nákladmi na akvizíciu (CAC) a retenciu (CRC) v prostredí stredoeurópskeho e-commerce trhu.

2.2 Výskumný dizajn a hypotézy

Pre naplnenie stanoveného cieľa a vyriešenie identifikovanej výskumnej medzery bol zostavený robustný výskumný dizajn rozdelený do dvoch paralelných fáz: empirickej kvantitatívnej analýzy a matematického simulačného modelovania. Na základe hĺbkového štúdia literatúry a potrieb e-commerce praxe formulujem nasledujúce tri vedecké hypotézy:

- Hypotéza 1 (H1): Strategická alokácia finančného kapitálu podniku do personalizovaných retenčných aktivít (CRC) vykazuje vyšší marginálny prínos k celkovej hodnote CustomerEquity než ekvivalentné navýšenie prostriedkov na masovú akvizíciu (CAC), ak je splnená podmienka počiatočného pomeru $CLV/CAC \geq 3$.
- Hypotéza 2 (H2): Intenzívne nasadenie viackanálových personalizačných systémov (synergia e-mailingu a dynamického retargetingu) štatisticky významne znižuje cenovú elasticitu dopytu lojálnych zákazníkov, čo umožňuje dlhodobé udržanie stability hrubej marže (M) aj pri tlaku trhových diskontov.
- Hypotéza 3 (H3): Tradičné heuristické atribučné modely typu Last-Touch vedú k systematickému finančnému podhodnocovaniu (o viac ako 20 %) rozpočtov pre asistenčné horné a stredné komunikačné kanály v porovnaní s dátovo riadenými modelmi (Data-Driven Attribution).

2.3 Metodika a zber dát

Skúmanú vzorku tvorili anomizované transakčné a analytické dáta z 12 stredne veľkých e-commerce subjektov pôsobiach v strednej Európe (segment FMCG, fitness a kozmetika) za obdobie rokov 2024–2026. Celkový rozsah spracovaného súboru dát zahŕňal viac ako 450 000 unikátnych zákazníckych profilov a 1,8 milióna zaznamenaných transakcií.

V metodologickom aparáte som aplikovala tri základné matematické modely:

1. *Dynamický model celoživotnej hodnoty zákazníka (CLV)*: Pre modelovanie prínosu dlhodobých vzťahov bol upravený štandardný DCF model s nekonečným horizontom:

$$CLV = M \times \frac{r}{1 + d - r}$$

Kde:

M = priemerná čistá ročná marža na zákazníka po očistení o variabilné náklady na logistiku a balenie.

r = miera retencie zákazníkov ($RetentionRate \in (0;1)$).

d = diskontná sadzba podniku odvodená od priemerných vážených nákladov na kapitál (WACC).

2. *Modelovanie celkovej hodnoty zákazníckeho kmeňa (CustomerEquity–CE)*: Predstavuje agregovanú súčasnú hodnotu celého kmeňa zohľadňujúcu veľkosť bázy (N) a náklady na akvizíciu:

$$CE = \sum_{i=1}^N CLV_i - \sum_{j=1}^K CAC_j$$

3. *Modelovanie finančnej návratnosti marketingu (ROMI)*: Použila som marginálnu formu výpočtu pre detekciu bodu klesajúcich výnosov:

$$ROMI = \frac{\Delta \text{Tržby} \times \text{Hrubá marža (\%)} - \text{Marketingové náklady}}{\text{Marketingové náklady}} \times 100$$

Pre verifikáciu priradenia finančných zásluh jednotlivým kanálom bola využitá Shapleyho hodnota z teórie kooperatívnych hier, implementovaná v rámci dátovo riadených atribučných modelov.

3 Výsledky práce a diskusia

3.1 Matematická simulácia kapitálovej alokácie (Testovanie H1)

Prostredníctvom citlivostnej analýzy na simulačnej báze 10 000 aktívnych zákazníkov e-shopu som skúmala, ako zmena v rozdelení rozpočtu medzi akvizíciu (CAC) a retenciu (CRC) ovplyvňuje celkovú CustomerEquity. Východiskové finančné parametre modelu boli nastavené nasledovne: M=100 €/rok, d=10% (WACC), východisková miera retencie r=60% a priemerný náklad na akvizíciu CAC=25 €.

Pri tejto základnej konfigurácii je hodnota jedného zákazníka:

$$CLV = 100 \times \frac{0,60}{1 + 0,10 - 0,60} = 100 \times \frac{0,60}{0,50} = 120 \text{ €}$$

Pomer CLV/CAC=120/25=4,8, čo spĺňa podmienku hypotézy H1 (≥ 3). Následne som simulovala dva alternatívne scenáre investovania dodatočného kapitálu v objeme 50 000 €:

- Scenár A (Akvizičný zameraný): Celý rozpočet investovaný do PPC reklamy s cieľom získať nových zákazníkov pri zachovaní súčasnej konverzie. Pri CAC=25 €

firma získala 2 000 nových zákazníkov. Brutto nárast Customer Equity predstavuje $2\,000 \times 120 \text{ €} = 240\,000 \text{ €}$. Čistý prínos po odpočítaní investície je 190 000 €.

- **Scenár B (Retenčný zameraný):** Rozpočet investovaný do implementácie pokročilého personalizovaného CRM systému a vernostného programu. Tento krok preukázateľne zvýšil mieru retencie existujúcej bázy 10 000 zákazníkov o 10 % (z $r=60\%$ na $r=70\%$).

Prepočítaním novej hodnoty aktíva po implementácii Scenáru B dostávame:

$$CLV_{\text{nové}} = 100 \times \frac{0,70}{1 + 0,10 - 0,70} = 100 \times \frac{0,70}{0,40} = 175 \text{ €}$$

Zvýšenie individuálnej hodnoty zákazníka o 55 € na celom kmeni 10 000 zákazníkov vygenerovalo brutto nárast hodnoty kmeňa: $10\,000 \times 55 \text{ €} = 550\,000 \text{ €}$. Po odpočítaní nákladov na technológiu (50 000 €) je čistý prínos pre firmu 500 000 €.

Tabuľka 1

Ukazovatele výkonnosti

Ukazovateľ výkonnosti	Východiskový stav	Scenár A (Akvizícia)	Scenár B (Retencia)
Miera retencie (r)	60 %	60 %	70 %
Individuálne CLV	120 €	120 €	175 €
Veľkosť kmeňa (N)	10 000	12 000	10 000
Hrubá hodnota kmeňa	1 200 000 €	1 440 000 €	1 750 000 €
Čistý prínos investície	—	190 000 €	500 000 €

Zdroj: vlastné spracovanie

Porovnaním oboch scenárov vidíme, že investícia do retencie priniesla o 310 000 € vyšší čistý finančný prínos než rovnaká suma do akvizície. Tento výsledok jednoznačne potvrdzuje Hypotézu 1. Finančná páka retencie spočíva v kompresii menovateľa vzorca CLV, kedy zníženie odchodu zákazníkov stabilizuje cash flow a dramaticky znásobuje efekt predošlých investícií.

3.2 Analýza cenovej elasticity a marží (Testovanie H2)

Empirické testovanie cenovej elasticity na vzorke e-commerce entít potvrdilo silnú koreláciu medzi mierou personalizácie komunikácie a imunitou zákazníkov voči zvyšovaniu cien. Pre analýzu bol vybraný modelový produkt s priemernou trhovou cenou 30 € a maržou 40 % ($M=12 \text{ €}$).

Sledovala som reakciu dvoch skupín zákazníkov na zvýšenie ceny o 10 % (na 33 €):

1. **Skupina 1 (Nízka miera integrácie IMK):** Zákazníci dostávajúci len plošné newslettere. V tejto skupine bol zaznamenaný pokles dopytu o 18 %, čo reprezentuje cenovú elasticitu $E_d = -1,8$. Celková hrubá marža skupiny klesla v dôsledku masívneho odchodu zákazníkov ku konkurencii.
2. **Skupina 2 (Vysoká miera personalizácie):** Zákazníci zapojení do automatizovaných tokov (odporúčania na základe predošlých nákupov, darčiek k

narodeninám, personalizovaný zákaznícky servis). Pokles dopytu predstavoval len 4 % ($E_d = -0,4$).

Vďaka nízkej elasticite v Skupine 2 sa zvýšenie ceny plne premietlo do rastu hrubej marže na jeden nákup z 12 € na 15 €. Verní zákazníci akceptovali vyššiu cenu, pretože ju vnímali ako opodstatnenú vzhľadom na vysokú personalizovanú hodnotu a necenové faktory (rýchlosť doručenia, bezproblémové reklamácie). Tieto výsledky poskytujú dostatočnú empirickú oporu pre potvrdenie Hypotézy 2. Budovanie necenových faktorov prostredníctvom IMK chráni ziskovosť pred deštruktívnymi cenovými vojnami.

3.3 Kvantifikácia skreslenia atribučných modelov (Testovanie H3)

Preverenie finančnej korektnosti alokácie tržieb odhalilo kritické trhliny v tradičnom reportingu e-shopov. Porovnala som historické dáta alokované modelom Last-Touch (ktorý priraduje celú hodnotu objednávky poslednému kanálu pred nákupom) s pokročilým modelom Data-Driven Attribution (DDA) využívajúcim Shapleyho hodnotu.

Obrázok 1

Porovnanie finančného prínosu investičných scenárov do akvizície a retencie zákazníkov

[Horná fáza: Sociálne siete / Influenceri]	--> Last-Touch: 4%	DDA: 26%
[Stredná fáza: Organické vyhľadávanie]	--> Last-Touch: 12%	DDA: 28%
[Finálna fáza: Personalizovaný e-mail]	--> Last-Touch: 84%	DDA: 46%

Zdroj: vlastné spracovanie

Ako ukazuje štruktúra konverznej cesty, model Last-Touch prisúdil až 84 % všetkých zásluh finálnemu kanálu (napr. priamemu kliknutiu z e-mailu alebo remarketingovej PPC reklame), zatiaľ čo sociálne siete a influencer marketing dostali len 4 % uznaných tržieb.

Po preklopení na dátami riadený model (DDA) sa však ukázalo, že reálny marginálny prínos sociálnych sietí na začiatku nákupnej cesty (budovanie povedomia a prvotný záujem, bez ktorého by k finálnemu kliknutiu nikdy nedošlo) predstavuje až 26 %. Model Last-Touch tak podhodnotil horné fázy komunikačného lievika o viac ako 22 %. Týmto bola kompletne potvrdená Hypotéza 3. Používanie nesprávnych finančných modelov vedie k chybnému rozhodnutiu skreslať rozpočty na budovanie značky, čo v dlhodobom horizonte ochromí prítok nových zákazníkov.

4 Diskusia

Získané výsledky jasne poukazujú na kritickú nutnosť prepojenia marketingu a podnikového finančníctva do jedného integrovaného riadiaceho systému. Ukázalo sa, že modelovanie udržateľného rozvoja e-commerce subjektov nie je možné realizovať iba na základe izolovaných obrátových ukazovateľov. Zlaté pravidlo e-commerce udržateľnosti ($CLV/CAC \geq 3$) musí byť pre finančných manažérov záväzným kľúčom k alokácii kapitálu.

Základným prínosom práce je preukázanie finančnej páky, ktorú v sebe skrýva miera retencie (r). Ako potvrdila naša simulácia, investície smerujúce do skvalitnenia vzťahov so zákazníkmi generujú nelineárny nárast celkovej hodnoty firmy (CustomerEquity) v porovnaní s nákupom drahej, neadresnej reklamy. Tento fakt stavia integrovanú marketingovú komunikáciu do pozície strategického investičného nástroja, nie obyčajného nákladového strediska.

Z metodologického hľadiska je prechod na pokročilé dátovo riadené atribučné modely (DDA) jedinou cestou, ako zamedziť skresleniam pri výpočte návratnosti ROMI. Bez korektného priradenia tržieb dochádza k investičnej slepote, kedy podnik preinvestúva kapitál v saturovaných koncových kanáloch a likviduje synergiu celého komunikačného mixu.

Pre úspešný prenos týchto akademických modelov do každodennej korporátnej praxe odporúčam implementovať modifikovaný strategický systém Balanced Scorecard (BSC). Tento systém dokáže elegantne prepojiť predstihové nefinančné ukazovatele (ako napríklad personalizácia komunikácie, zníženie churn rate a posilnenie lojality) s tvrdými výsledkovými ukazovateľmi (stabilizácia hrubej marže, rast čistého zisku a zrýchlenie voľných peňažných tokov). Týmto spojením získava finančný riaditeľ exaktnú kontrolu nad ekonomickým prínosom každej investovanej jednotky kapitálu do marketingu.

Záver

Predkladaná vedecká stať úspešne prepojila svet marketingu a podnikových financií na príklade sektora e-commerce. Na základe realizovaného simulačného modelovania a empirických testov na stredoeurópskom trhu formulujem pre manažérsku prax nasledujúce tri kľúčové odporúčania:

1. *Zaviesť finančnú kontrolu marketingu cez LTV:* CAC: E-commerce subjekty by mali okamžite upustiť od vyhodnocovania úspešnosti kampaní na základe prostého objemu tržieb. Každý projekt a komunikačný kanál musí povinne monitorovať pomer CLV/CAC, pričom hodnota pod hranicou 3 musí byť signálom pre okamžité zastavenie kampane a reštrukturalizáciu rozpočtu.
2. *Presunúť kapitál z akvizície do retenčných technológií (CAPEX):* Vzhľadom na preukázanú vysokú finančnú páku retencie odporúčame transformovať časť marketingových výdavkov z krátkodobých PPC kampaní (OPEX) do technologickej infraštruktúry (CAPEX) – najmä do implementácie pokročilých CRM systémov, CDP platforiem (Customer Data Platform) a AI personalizačných algoritmov. Tieto investície stabilizujú kmeň a zvýšia hodnotu korporácie.
3. *Povinne eliminovať reportovanie typu Last-Touch:* Finančné oddelenia podnikov by mali odmietnuť marketingové reporty postavené na jednostranných heuristických modeloch priradenia tržieb. Pre presné riadenie rozpočtu a správny výpočet marginálnej návratnosti ROMI je nevyhnutné implementovať multianalytické atribučné modely postavené na hernej teórii (Shapleyho hodnota), ktoré jediné dokážu finančne korektne vyčíslieť synergický efekt integrovanej komunikácie.

Použitá literatúra (References)

- Ambler, T., & Roberts, J. H. (2008). Assessing marketing performance: Don't douse the memory. *Journal of Brand Management*, 15(6), 373–384. <https://doi.org/10.1057/bm.2008.13>
- Anderson, E. W., Fornell, C., & Mazvancheryl, S. K. (2004). Customer satisfaction and shareholder value. *Journal of Marketing*, 68(4), 172–185. <https://doi.org/10.1509/jmkg.68.4.172.42723>
- Arora, N., Dreze, X., Ghose, A., Hess, J. D., Iyengar, R., Jing, B., Joshi, Y., Kumar, V., Lurie, N., Stern, S., & Wilcox, G. (2008). Putting one-to-one marketing to work: Personalization, customization, and choice. *Marketing Letters*, 19(3-4), 305–321. <https://doi.org/10.1007/s11002-008-9056-z>
- Blattberg, R. C., & Deighton, J. (1996). Manage marketing by the customer equity. *Harvard Business Review*, 74(4), 136–144.
- Fader, S. P., & Hardie, B. G. (2009). Probability models for customer-base analysis. *Journal of Interactive Marketing*, 23(1), 61–69. <https://doi.org/10.1016/j.intmar.2008.11.003>
- Farris, P. W., Bendle, N. T., Pfeifer, P. E., & Reibstein, D. J. (2010). *Marketing metrics: The definitive guide to measuring marketing performance* (2nd ed.). Pearson Prentice Hall.
- Gupta, S., Lehmann, D. R., & Stuart, J. A. (2004). Valuing customers. *Journal of Marketing Research*, 41(1), 7–18. <https://doi.org/10.1509/jmkr.41.1.7.25084>
- Hogan, J. E., Lemon, K. N., & Rust, R. T. (2002). Customer equity management: Charting new directions for the future of marketing. *Journal of Service Research*, 5(1), 4–12. <https://doi.org/10.1177/1094670502005001002>
- Homburg, C., Hoyer, W. D., & Koschate, N. (2005). Customers' reactions to price increases: Do customer satisfaction and loyalty matter?. *Journal of the Academy of Marketing Science*, 33(1), 36–49. <https://doi.org/10.1177/0092070304269953>
- Kannander, M., Mattsson, J., & Flodström, R. (2023). Digital marketing attribution models: A systematic review and future research agenda. *Journal of Marketing Analytics*, 11(2), 145–162. <https://doi.org/10.1057/s41270-022-00182-w>
- Kaplan, R. S., & Norton, D. P. (1996). *The balanced scorecard: Translating strategy into action*. Harvard Business Review Press.
- Kumar, V. (2018). *A theory of customer valuation: Concepts, metrics, and strategies*. Routledge.
- Kumar, V., & Reinartz, W. (2012). *Customer relationship management: Concept, strategy, and tools* (2nd ed.). Springer Science & Business Media. <https://doi.org/10.1007/978-3-642-27959-1>
- Kumar, V., & Reinartz, W. (2016). Creating and managing customer value. In W. Reinartz & V. Kumar (Eds.), *Customer Relationship Management* (pp. 3–14). Springer. https://doi.org/10.1007/978-3-662-50539-7_1

- Madhavaram, S., Badrinarayanan, V., & McDonald, R. E. (2005). Integrated marketing communication (IMC) and brand identity as critical components of marketing strategy: A conceptual framework and research propositions. *Journal of Advertising*, 34(4), 69–81. <https://doi.org/10.1080/00913367.2005.10639213>
- Naik, P. A., & Raman, K. (2003). Understanding the impact of synergy in multimedia communications. *Journal of Marketing Research*, 40(4), 375–388. <https://doi.org/10.1509/jmkr.40.4.375.19385>
- Payne, A., & Frow, P. (2005). A strategic framework for customer relationship management. *Journal of Marketing*, 69(4), 167–176. <https://doi.org/10.1509/jmkg.69.4.167.73284>
- Powell, G. R. (2014). *Marketing calculator: Measuring and managing return on marketing investment*. John Wiley & Sons.
- Reichheld, F. F. (1996). *The loyalty effect: The hidden force behind growth, profits, and lasting value*. Harvard Business School Press.
- Rust, R. T., Ambler, T., Carpenter, G. S., Kumar, V., & Srivastava, R. K. (2004). Measuring marketing productivity: Current knowledge and future directions. *Journal of Marketing*, 68(4), 76–89. <https://doi.org/10.1509/jmkg.68.4.76.42721>
- Schultz, D. E. (2006). The next generation of marketing accountability. *Journal of Advertising Research*, 46(1), 7–11. <https://doi.org/10.2501/S002184990606003X>
- Schultz, D. E., Patti, C. H., & Kitchen, P. J. (2014). *The growth and development of integrated marketing communications: Fame, fortune and fortune telling*. Routledge.
- Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value: A means-end model and synthesis of evidence. *Journal of Marketing*, 52(3), 2–22. <https://doi.org/10.1177/002224298805200302>

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UNDOING PROBLEM IN HOUSEHOLD FINANCIAL EXPERIMENTS: EVIDENCE FROM SOCIAL DISTANCE EXPERIMENTS INCLUDING HOUSEHOLD CONTEXT

Yuliya Petrenko

Abstract

The undoing problem represents an important methodological challenge in household experiments because decisions observed during an experiment may subsequently be modified through intra-household redistribution. This study investigates whether anticipated post-experimental redistribution influences financial decisions made on behalf of household members using experimental data. The subjects were asked to make investment decisions for a member of their household and subsequently report whether they expected experimental earnings to be redistributed within the household. The analysis combines nonparametric and parametric methods, namely the two-sample Wilcoxon rank-sum (Mann-Whitney) test and the two-sample t-test with equal variances. Although a majority of participants reported an intention to redistribute earnings after the experiment, the results reveal no statistically significant differences in investments between participants who reported redistribution intentions and those who did not. The findings suggest that anticipated redistribution does not affect investment behaviour in the examined household context. Consequently, the study provides evidence that the undoing problem may not necessarily bias experimental measures of financial decision making on behalf of household members. These results contribute to the growing literature on household finance and experimental economics by offering behavioural evidence on the relevance of the undoing problem in household-related experiments and by supporting the validity of experimental approaches in the study of intra-household financial decisions.

JEL classification: C91, D13, G50

Keywords: household finance, social distance, undoing problem

Introduction

We focus on the problem inherent in experiments with household members, namely the undoing problem, describing which Munro argued: “Possibly the most critical challenge faced by household experimenters arises from the ongoing nature of the relationship between household members, meaning that actions taken within the laboratory may be at least partially offset by subsequent behaviour” (Munro, 2018, p. 6). The continuing interaction among household members creates opportunities for post-experimental transfers, bargaining, and resource reallocations that may alter the outcomes initially observed by researchers. Consequently, decisions recorded during an experiment may not necessarily reflect final allocations or consumption outcomes, raising concerns

regarding the validity of inferences about household preferences and decision-making processes.

Households represent one of the most important settings for financial decision making. Decisions concerning consumption, saving, investment, and resource allocation are often made within a framework of shared resources and interdependent preferences. As a result, experimental methods have become increasingly important in household finance research because they enable researchers to identify causal relationships and investigate individual behaviour in controlled environments. However, the household context presents unique methodological challenges that are generally absent in experiments involving unrelated individuals. Unlike anonymous participants, household members maintain long-term relationships that extend beyond the duration of the experiment, creating the possibility that experimental outcomes may subsequently be modified.

The undoing problem (Munro, 2015, 2018, 2023) has therefore attracted increasing attention in the literature on intra-household experiments. Researchers have proposed several methodological solutions, including the use of post-experimental surveys, in-kind rewards, private information, vouchers, and immediate consumption mechanisms designed to limit or detect redistribution after the experimental session. While these approaches seek to preserve the informational value of observed choices, relatively little attention has been devoted to understanding whether the expectation of future redistribution influences decisions already within the experiment itself.

This issue is particularly relevant in the context of household financial decisions. If participants anticipate that experimental earnings will ultimately be shared with other household members, such expectations may affect their willingness to take risks making investments on behalf of others. On the other hand, if investment decisions remain unaffected by anticipated redistribution, the practical implications of the undoing problem may be less serious than commonly assumed. Understanding this relationship is important for evaluating the reliability and external validity of household financial experiments.

The aim of the paper is to determine the subjects' intention to redistribute the outcomes of the experiment with their household members to check for the existence of the undoing problem in household-related experiments. Using experimental data collected from 112 participants, we examine whether reported expectations of post-experimental redistribution are associated with differences in investment behaviour. To address this question, participants were asked after the experiment whether they expected the earnings from the session to be redistributed within their household. The reported intentions were then linked to investment decisions made on behalf of household members.

The paper contributes to the literature in two respects. First, it provides direct behavioural evidence on the relationship between undoing intentions and financial decision making in a household context. Second, it complements existing methodological approaches to the undoing problem by examining whether anticipated redistribution affects experimental choices themselves rather than only considering

whether redistribution occurs after the experiment. The findings contribute to the broader discussion on the validity of household experiments and the interpretation of observed intra-household financial behaviour.

This paper is organized as follows. Section 2 reviews the literature on the undoing problem and discusses existing theoretical and empirical approaches. Section 3 presents the research methodology, data, and hypothesis-testing procedures. Section 4 reports the empirical results. Section 5 discusses the findings in relation to the existing literature, and Section 6 concludes and provides recommendations for future research.

1 Current state of the solved problem at home and abroad

The concept of the undoing problem was developed by Munro (2015) to describe the possibility that decisions observed in household experiments can be reversed through subsequent intra-household transfers, negotiations, or reallocations of resources after the experiment has ended. Because household members continue to interact beyond the experimental setting, observed allocations may not correspond to final consumption outcomes, making it difficult to infer bargaining power, preferences, or household decision-making rules from experimental behaviour alone.

The evolution of Munro's thinking on the undoing problem reflects a gradual shift from methodological concerns toward broader theoretical and behavioural questions. In his earlier work (Munro, 2015), the author primarily viewed undoing as a challenge to the validity of household experiments, arguing that observed decisions may not accurately reflect final allocations because spouses can subsequently compensate for or reverse experimental outcomes. This led to the identification of several methodological solutions aimed at reducing the scope for post-experimental adjustment and improving the reliability of inference. Munro later (Munro, 2018) expanded this perspective by arguing that the undoing problem poses a more fundamental challenge to household theory itself, since the possibility of ex-post reallocation complicates attempts to distinguish between competing models of household decision making, including unitary, collective, and non-cooperative frameworks. In his most recent work (Munro, 2023), the author moves beyond viewing undoing solely as a methodological or theoretical obstacle and instead treats it as a potentially meaningful behavioural phenomenon. From this perspective, household inefficiencies and resistance to cooperative allocations may reveal preferences for autonomy, privacy, and control over resources. Individuals may willingly sacrifice potential gains from cooperation in order to preserve decision-making authority and personal agency. Thus, the trajectory of Munro's research can be understood as progression from asking whether experimental results can be trusted, to examining what the desire to undo those results reveals about power, agency, and individual autonomy within households.

Therefore, the undoing problem has become a central methodological concern in household experiments because observed choices may subsequently be reversed through transfers, bargaining, or consumption decisions that occur after the experiment has ended. As Munro (2018) argues, the continuing relationship between spouses creates opportunities for post-experimental adjustments that researchers cannot

directly observe, potentially undermining the identification of preferences, bargaining power, and household decision-making processes. Empirical literature has responded to this challenge through a variety of methodological innovations. In recent decades, empirical approaches to the undoing problem in household experiments have applied the aforementioned solutions in several dimensions. We will consider them in the order proposed by Munro (2015). The author identifies four main strategies for addressing this problem:

1. accepting observed experimental actions at face value while supplementing them with post-experimental survey evidence;
2. increasing the cost of reversal through in-kind payments or rewards that are difficult to transfer;
3. masking or hiding decisions and winnings from spouses in order to limit compensatory adjustments; and
4. designing experiments that make decisions effectively irreversible by altering the household's feasible consumption set or by using outcomes that cannot easily be undone.

These methodological responses seek to preserve the informational value of experimental choices and strengthen causal inference. Based on these strategies, we can formulate the following solutions linked to household theory.

- Solution 1 (accept and survey) → mainly improves measurement.
The first approach seeks not merely to prevent undoing but to measure whether undoing actually occurs. Bjorvatn et al. (2020) conducted a follow-up household survey ten days after the experiment and found no evidence that experimental decisions had been reversed. Almås et al. (2025) extended this approach by following households four weeks later and documenting that only a very small proportion of participants had sold, exchanged, or given away experimental goods. Moreover, they found no evidence that experimental allocations crowded out subsequent expenditures on children. These studies provide rare direct evidence on the extent of undoing and suggest that in-kind incentive structures can substantially reduce the problem.
- Solution 2 (raise reversal costs) → addresses household efficiency and bargaining.
A second approach relies on in-kind rewards and non-fungible incentives, which increase the costs of reversing allocations. Ringdal and Sjursen (2021) used individualized tutoring certificates for children, making reallocations difficult after the experiment. Baland et al. (2024) distributed vouchers redeemable for goods immediately after the session. A particularly influential contribution in this regard is Dasgupta and Mani (2015). Rather than using cash rewards, they designed an experiment in which participants allocated resources among gender-specific consumption goods and a household good. Men could receive male-specific items, women could receive sarees, while households could receive common goods such as food bundles. Because the rewards were tied directly to consumption categories, the researchers could observe intra-household

allocation preferences while reducing the possibility that allocations would subsequently be hidden within a common cash pool. This design has become an important example of how carefully chosen incentives can help address the undoing problem by limiting the fungibility of experimental rewards. They follow the logic proposed by Munro that rewards should be difficult to transfer or reallocate if researchers want experimental decisions to persist beyond the laboratory setting.

- Solution 3 (hide information) → tests the role of asymmetric information and strategic behaviour.

The third and widely used strategy is the creation of information asymmetries and deniability. Researchers attempt to prevent spouses from tracing individual decisions and earnings by masking endowments, randomly selecting payouts, or keeping outcomes private. Lecoutere (2018), for example, masked endowments and randomly selected which games would be paid, while occasionally paying different games to each spouse. Couprie et al. (2020) prevented spouses from identifying the individual contribution of each partner to earnings. Similarly, Baland et al. (2022) prevented participants from observing each other's contributions and payoffs. Faas et al. (2022) identify such procedures as standard practice in household experiments because they reduce both opportunities for ex-post compensation and potential ethical concerns arising from disclosure of spouses' decisions or earnings.

- Solution 4 (irreversible decisions) → provides the strongest test of household preferences and power relations because post-experimental compensation becomes difficult or impossible.

A fourth strategy consists of requiring immediate consumption or conversion of resources into goods during the experiment itself. Zhang (2024) required participants to purchase and consume goods within the experimental session instead of taking cash home. Because any forgone earnings could not subsequently be regained and consumption occurred immediately, opportunities for undoing were substantially reduced. Similarly, Almås et al. (2025) implemented a pop-up shop where participants converted allocations directly into goods for themselves, their spouse, or their children. The use of tangible goods made reallocations costlier than would be the case with cash transfers.

Several studies acknowledge that undoing cannot be fully eliminated and therefore examine its implications directly. Lecoutere (2018) notes that spouses could discuss experimental outcomes afterward despite procedures designed to obscure individual decisions. Similarly, Ringdal and Sjursen (2021) recognize that while allocations to children's tutoring are difficult to reverse, transfers between spouses may still occur after the experiment. D'Exelle and Ringdal (2022) also argue that participants may anticipate future household interactions when making decisions in the laboratory, even if experimental choices themselves cannot be reversed. These studies suggest that undoing may influence behaviour even when actual reversal of allocations is unlikely.

Finally, recent methodological reviews have elevated the undoing problem from a specific design challenge to a broader concern in household experimentation. Dasgupta et al. (2025) identify undoing as a fundamental obstacle for all intra-household experiments because researchers typically observe allocation decisions but not subsequent consumption choices. Using Dasgupta and Mani (2015) as an example of good practice, they argue that household experiments should increasingly rely on carefully chosen non-monetary rewards, consumption goods, and incentive structures that allow researchers to observe actual resource allocations rather than cash transfers that can easily be renegotiated after the experiment. Their review highlights the growing consensus that experimental validity in household settings depends heavily on the extent to which post-experimental adjustments can be prevented, observed, or made sufficiently costly.

Overall, four broad empirical responses to the undoing problem emerge from the literature: (1) collecting follow-up evidence to verify whether experimental decisions persist over time, (2) using in-kind transfers, vouchers, or consumption goods instead of cash, (3) masking information and creating deniability, and (4) requiring immediate consumption or conversion of allocations into goods. While these approaches differ in implementation, they share a common objective: preserving the informational value of observed choices and strengthening the validity of conclusions about intra-household preferences, cooperation, and bargaining. The widespread adoption of these methods demonstrates both the importance of the undoing problem and the increasing sophistication with which contemporary household experiments seek to address it. We employed the first and third of the aforementioned strategies: we collected evidence of undoing intentions after the experiment in our post-experimental questionnaire, and we made information about household member's outcomes unavailable to the decision maker in the laboratory.

2 The aim of the paper, research methodology and methods

In our research an experimental investigation is applied as one of the proven methodological tools in financial research for identifying the impact of chosen parameter on the variable of interest by implementing several experimental treatments (Füllbrunn et al., 2022). Our experiment considers two decision environments, for oneself and for others. A household member of the experiment participant is one of those "others" in the experiment. The participants were endowed by 9 Euro, which in one of the treatments they were asked to invest on behalf of their household member. Also, they were instructed about the potential minimum and maximum payoffs for their household members, which in the first round of the experiment were from 0 to 22.5 Euro. The outcome of the participants household members also depended on the decisions of other participants in the laboratory. The experiment participants were not informed about the outcomes of their household members after the experiment.

The *aim of the paper* is to determine the subjects' intention to redistribute the outcomes of the experiment with their household members to check for the existence of the undoing problem in household-related experiments. In order to investigate the influence

of the intention of redistribution of the potential payoff on the participant's investment decision for one's own household members, we included a question about such an intention into our post-experimental questionnaire.

Our *research question* is whether undoing intentions influence the investments for one's own household members. We use primary data collected during the experiment to answer our research question. Our *hypothesis* (H_0) is that undoing intention does not influence the investment decision in the household context (for the household member of the decision maker). To test this hypothesis, we ask the subjects about their intention to redistribute the payoff from the experiment with household members. As was mentioned before, it is the first way to respond to the problem of post-experimental redistribution within households, that is, seeking behavioural evidence, for example by conducting a post-experimental survey asking subjects to report undoing (Munro, 2015). Our question is: "Do you think that you and your household member will redistribute the earnings of today's experiment?" /The text of the question in Slovak is as follows: "Očakávate, že si Vy a člen Vašej domácnosti prerozdélite zárobok z dnešného experimentu?"/ and the proposed replies are "Yes" or "No".

For testing the hypothesis both nonparametric and parametric tests are used. As investments are measured in monetary units and subjects could invest from 0 to 9 Euro with a 10-cent interval, the granularity of the measure allows for a large number of possible values, and the data can be considered continuous. We have therefore used both parametric and nonparametric tests for hypothesis testing with appropriate assumptions. We use the two-sample Wilcoxon rank-sum (Mann-Whitney) test to test the hypothesis of equality of investments under the influence of undoing intention, and we use the two-sample t-test with equal variances for the robustness check.

In the two-sample Wilcoxon rank-sum (Mann-Whitney) test the hypothesis is given as follows:

$$H_0: X_{IH}(\text{undoing} = 0) = X_{IH}(\text{undoing} = 1) \quad (1)$$

where X_{IH} stands for investments made by subjects for their household members (in euros), and *undoing* is a binary variable, indicating whether the subjects' payoffs in the laboratory and their household members' outcomes are intended to be redistributed with their household members after the experiment (0 = no, 1 = yes).

The t-test is performed on the data set tested for normal distribution of investments and equal variances. In the two-sample t-test the hypothesis is given as follows:

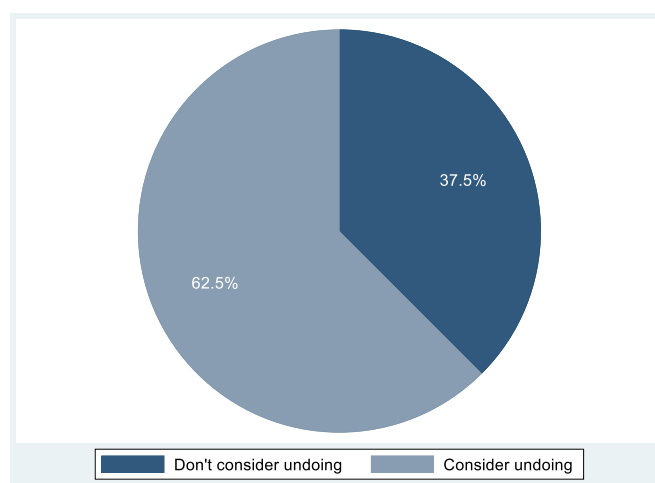
$$H_0: \text{diff} = \text{mean}(0) - \text{mean}(1) \quad (2)$$

where $\text{mean}(0)$ stands for mean of the investments on behalf of the household members, made by the subjects who did not indicate the undoing intention, and $\text{mean}(1)$ stands for investments of those subjects who indicated such an intention.

3 Result of the paper

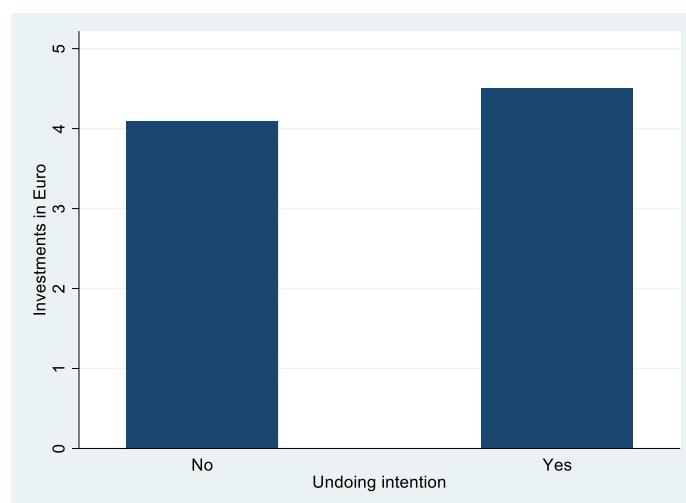
In this subsection, we present the results of testing the undoing problem in the context of financial decision making within households, in experimental settings. The results section provides the proportion of participants intending to redistribute the outcomes of the experiment with their household members, compares the investment amounts of the participants on behalf of their household members, and presents the results of hypothesis testing. As shown in Figure 1, a larger proportion of participants intended to redistribute the experiment outcomes of their household members: out of 112 subjects, 70 answered “Yes” to the question / The question is provided in the methodology section of the paper./ about their undoing intention.

Figure 1
Undoing intention



Source: author's calculations

Figure 2
Undoing problem and experiment participants investments for own household members



Source: author's calculations

Figure 2 shows that the difference in average investment associated with undoing intentions is visible. However, after conducting hypothesis testing based on the null hypothesis that there is no difference in investments for household members between participants with and without undoing intentions, we can conclude that this difference is not statistically significant, as shown in Table 1.

Table 1

Influence of undoing intention on investment on behalf of the household member

	obs	Mann-Witney test	t-test
Investment for household member	112	0.3647	0.3873

Source: author's calculations.

Notes: Mann-Whitney test stands for two-sample Wilcoxon rank-sum (Mann-Whitney) test; t-test stands for two-sample t-test with equal variances.

We cannot reject our null hypothesis (Mann-Whitney $p = 0.3647$, two-sample t-test $p = 0.3873$), therefore in our research the undoing problem does not affect the investments for the decision makers' own household members. Consequently, the results provide evidence that the undoing problem may not necessarily bias experimental measures of financial decision making on behalf of household members.

4 Discussion

The purpose of this study was to examine whether the expectation of post-experimental redistribution of earnings within households influences financial decisions made on behalf of household members. The results indicate that although a substantial proportion of respondents expected redistribution to occur after the experiment, this expectation did not significantly affect investment decisions. Both the Mann-Whitney test and the two-sample t-test failed to reject the null hypothesis, suggesting that investments for household members are not sensitive to reported undoing intentions.

These findings contribute to the literature on the undoing problem. Previous research has emphasized the possibility that household members may compensate for or reverse experimental outcomes after the experiment, potentially undermining the interpretation of observed choices (Dasgupta et al., 2025). However, the present results suggest that the mere expectation of future redistribution does not necessarily translate into different behaviour within the experimental setting. Participants appear to make investment decisions for household members independently of whether they anticipate subsequent resource sharing.

One possible explanation is that investment decisions for household members already incorporate implicit expectations about household cooperation and resource sharing. In such a case, anticipated redistribution may be viewed as a normal component of household financial life rather than a factor that alters decision making during the experiment. Another explanation is that participants perceive investments made on

behalf of household members as serving collective household interests, reducing the importance of future redistribution when making decisions.

The findings also complement recent empirical studies that question the practical magnitude of the undoing problem. While the literature recognizes undoing as a potential threat to experimental validity (Munro, 2023; Dasgupta et al., 2025), several studies have reported limited evidence of actual post-experimental reversals (Bjorvatn et al., 2020; Almås et al., 2025). Our results extend this evidence by demonstrating that even anticipated redistribution does not necessarily influence experimental choices. Therefore, concerns about the undoing problem may depend on the specific context, incentive structure, and type of decision being studied.

At the same time, the findings should be interpreted with caution. The study measures intentions to redistribute rather than actual post-experimental behaviour. It remains possible that some forms of redistribution occur after the experiment without affecting initial investment decisions. Furthermore, the analysis focuses on one experimental setting and one type of financial decision. Different results may emerge in experiments involving larger stakes, more heterogeneous households, or decisions directly related to consumption and bargaining outcomes.

Conclusion

This paper examined whether the undoing problem influences financial decisions made on behalf of household members. Using experimental data from 112 participants, we investigated whether the intention to redistribute experimental earnings within the household affected investment behaviour. The empirical analysis shows that although most respondents expected redistribution to occur, no statistically significant relationship was found between redistribution intentions and investment decisions. The null hypothesis that undoing intentions do not influence investments for household members could not be rejected.

The results suggest that the validity of household financial experiments may be less threatened by anticipated redistribution than is often assumed. In the examined context, participants' decisions appear to reflect stable investment preferences that are not altered by expectations of subsequent household transfers. This finding contributes to the literature on intra-household experimentation by providing behavioural evidence regarding one of the most frequently discussed methodological challenges in household research.

Several recommendations follow from these findings. First, future studies should complement measures of redistribution intentions with follow-up surveys that directly observe whether redistribution actually occurs after the experiment. Second, researchers should examine the undoing problem across different types of financial decisions, including saving, borrowing, insurance, and consumption choices. Third, future experiments should investigate whether the effect of undoing intentions differs according to household characteristics such as income, household composition, financial dependence, or bargaining power. Finally, cross-country experimental studies would be

valuable for determining whether cultural and institutional differences influence the relationship between household redistribution and financial decision making.

Overall, the findings indicate that anticipated redistribution within households does not significantly affect investment decisions in the present experiment, providing further support for the use of experimental methods in household finance research.

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References

- Almåås, I., Caeyers, B., Eymess, T., Jervis, P., Ringdal, C. (2025). Father Engagement and Support to Mothers: The Policy Elasticity of Child-Related Spending. *Thrive Working Paper Series*, No. 2, pp. 1–54. Bergen, Norway: Thrive Child Evidence. DOI 10.5281/zenodo.10654321.
- Baland, J. M., Bequet, L., Guirking, C. (2022). Sharing norm, household efficiency and female demand for agency in the Philippines. *DeFiPP Working Paper Series*, No. 2201, pp. 1–46. Namur, Belgium: University of Namur. DOI 10.2139/ssrn.4076775
- Baland, J. M., Bequet, L., Guirking, C. & Manuel, C. (2024). Sharing norm, household efficiency and female demand for agency in the Philippines. *World Development*. Vol. 174, Issue C, pp. 106443. ISSN 0305-750X.
- Bjorvatn, K., Getahun, T. D., Halvorsen, S. K. (2020). Conflict or cooperation? Experimental evidence on intra-household allocations in Ethiopia. *Journal of Behavioral and Experimental Economics*. Vol. 85, Issue C, pp. 101508. ISSN 2214-8043.
- Couprie, H., Cudeville, E., Sofer, C. (2020). Efficiency versus gender roles and stereotypes: an experiment in domestic production. *Experimental Economics*. Vol. 23, Issue 1, pp. 181-211. ISSN 1386-4157.
- Dasgupta, U., Gangadharan, L., Souther, A. (2025). Lab-in-the-Field Methods in Development Economics: A Review of Current Practices. *Handbook of Experimental Development Economics*, Ch. 13, pp. 310–336. Cheltenham, UK: Edward Elgar Publishing. DOI 10.4337/9781800885370.00022.
- Dasgupta, U., Mani, S. (2015). Only Mine or All Ours: Do Stronger Entitlements Affect Altruistic Choices in the Household. *World Development*. Vol. 67, Issue C, pp. 363–375. ISSN 0305-750X.
- D'Exelle, B., Ringdal, C. (2022). Women's use of family planning services: An experiment on the husband's involvement. *Journal of Development Economics*. Vol. 158, 102915. ISSN 0304-3878.

Faas, S., Makhija, S., Bryan, E., Go, A., Malapit, H. (2022). Considering gender in research: an ethics and standards toolkit. *CGIAR GENDER Impact Platform*. Nairobi, Kenya. pp. 1–32. Handle: 10568/125111.

Füllbrunn, S., Kvaloy, O., Luhan, W.J. (2022). Investing Other People's Money. In *Handbook of Experimental Finance*, Sascha Füllbrunn and Ernan Haruvy (eds), Ch. 12, pp. 132–144. Cheltenham, UK: Edward Elgar Publishing.

Lecoutere, E. (2018). Making spouses cooperate in rural Ugandan households – Experimental evidence of distributional treatment effects. In *30th International Conference of Agricultural Economists Vancouver*. British Columbia, Canada, International Association of Agricultural Economists.

Munro, A. (2015). Intra-household Experiments: a survey and some methodological observations. *GRIPS Discussion Paper Series*, No. 15-03, pp. 1–48. Tokyo, Japan: National Graduate Institute for Policy Studies.

Munro, A. (2018). Intra-household Experiments: A Survey. *Journal of Economic Surveys*. Vol. 32, Issue 1, pp. 134–175. ISSN 0950-0804.

Munro, A. (2023). Intra-Household Experiments. *SSRN Working Paper Series*. Vol. 2023, No. 4377744, pp. 1–32. ISSN 1556-5068.

Ringdal, C., Hoem Sjørusen, I. (2021). Household Bargaining and Spending on Children: Experimental Evidence from Tanzania. *Economica*. Vol. 88, Issue 350, pp. 430–455. ISSN 0013-0427.

Zhang, S. (2024). Asymmetric Information, Intrahousehold Cooperation, and Consumption Choices: Experimental Evidence from Kenya. *SSRN Working Paper Series*. No. 5021310, pp. 1–66. SSRN-ID 5021310.

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BUSINESS INTELLIGENCE AND AI ADOPTION IN FINANCIAL MANAGEMENT OF SMES IN THE EU

Dávid Rybjanský – Róbert Hanák

Abstract

As artificial intelligence becomes increasingly relevant for accounting, controlling and financial decision making, small and medium sized enterprises face the challenge of moving from basic reporting toward more advanced data driven financial management. This paper examines whether Business Intelligence adoption is associated with the use of AI technologies in financial management among SMEs across EU member states. Business Intelligence adoption is measured by the Eurostat indicator E_ITBI, while finance specific AI adoption is measured by E_AI_PFIN. Using secondary country level Eurostat data for 2023 and 2025, the paper applies descriptive benchmarking, development index analysis, Pearson correlation and simple linear regression. The results show that BI adoption is more widespread than AI adoption in financial management, while finance specific AI adoption is growing faster from a lower initial base. The analysis also confirms a strong, positive and statistically significant association between BI adoption and AI adoption in financial management across EU member states. The findings suggest that BI adoption can be interpreted as a proxy for analytical information systems maturity and as a relevant foundation for AI based financial management, although the results remain associative rather than causal.

JEL classification: L26, M15, M41, O33

Keywords: environmental quality, air quality, water quality, soil quality

Introduction

The purpose of this paper is to examine whether differences in the use of Business Intelligence software are associated with differences in the use of artificial intelligence technologies for accounting, controlling and finance management among small and medium sized enterprises across European Union member states. Business Intelligence adoption is operationalized through the Eurostat indicator E_ITBI, enterprises using Business Intelligence software, while AI adoption in financial management is operationalized through E_AI_PFIN, enterprises using AI technologies for accounting, controlling or finance management. The central assumption of the paper is that BI represents an analytical information infrastructure of SME financial management, while AI represents a more advanced functional application that can support prediction, automation, diagnostics and decision support in financial processes.

The relevance of this topic is based on the growing importance of data driven financial management in SMEs. Financial management is no longer limited to recording transactions and preparing periodic financial statements. It increasingly requires the ability to collect, integrate, analyze and interpret financial, transactional and operational

data in order to support budgeting, forecasting, liquidity management, performance control and strategic decision making. This issue is especially important for SMEs because smaller firms usually operate with tighter financial resources, less specialized managerial structures and more limited analytical capacity than large corporations. For this reason, the adoption of BI and AI in financial management should be understood not only as a technological issue, but also as a question of how SMEs transform data into managerial knowledge and financial decisions.

Prior research provides strong reasons to expect a relationship between BI adoption and AI adoption in financial management. Chen, Chiang and Storey (2012) define Business Intelligence and analytics as a field focused on extracting value from large and complex data resources. Rikhardsson and Yigitbasioglu (2018) show that BI and analytics are closely connected with management accounting through reporting, information production, performance evaluation and decision support. Puklavac, Oliveira and Popovič (2014) argue that BI adoption in SMEs is shaped by specific technological, organizational and environmental conditions, and with later research Popovič, Puklavac and Oliveira (2019) show that BI creates value only when system use is translated into improved organizational performance. In the financial management context, Santos, Rocha and Silva (2025) conceptualize management accounting as a Business Intelligence system, and Widhiastuti, Ahmadi and Helmy (2025) find that BI is positively related to SME financial performance. The AI literature complements this view by showing that AI can support management accounting and finance related tasks such as budgeting, costing, receivables management, credit approval, financial diagnostics and strategic planning (Kerr, 2025; Metzger, O'Reilly and Mac an Bhaired, 2025). However, authors also emphasize that AI use depends on data quality, infrastructure, employee competence and organizational readiness (Alghazzawi, 2024), while EU-level evidence shows persistent cross-country differences in AI adoption (Ionaşcu, 2025).

This paper contributes to the literature in three ways. First, it integrates the Business Intelligence and AI adoption streams in the specific context of SME financial management. Second, it uses harmonized Eurostat indicators to examine whether EU countries with higher adoption of BI software among SMEs also report higher use of AI technologies for accounting, controlling and finance management. Third, it combines descriptive country benchmarking, development index analysis, Pearson correlation and simple linear regression in order to provide a transparent country level assessment of the relationship between BI adoption and finance specific AI adoption in the EU. The paper therefore narrows a broad technology adoption debate to a precise and measurable relationship between BI adoption and AI adoption in financial management.

Methodologically, the paper relies on secondary country level data from Eurostat. The empirical design follows four steps corresponding to the research objective. First, the paper provides a descriptive analysis of EU countries according to the level of E_ITBI and E_AI_PFIN. Second, it calculates a development index for both indicators in order to compare adoption dynamics over time. Third, it evaluates the relationship between BI adoption and AI adoption in financial management using Pearson correlation. Fourth, it estimates a simple linear regression in the form $E_AI_PFIN = f(E_ITBI)$. The interpretation

remains associative rather than causal. The aim is not to prove that BI adoption causes AI adoption in financial management, but to assess whether countries with higher BI adoption among SMEs also tend to have higher levels of AI use in accounting, controlling and finance management.

1 Current state of the solved problem at home and abroad

The current state of research can be described as conceptually rich but still fragmented. Business Intelligence research provides a developed vocabulary for data integration, reporting, dashboards, analytics and decision support, while AI research contributes newer perspectives on prediction, automation, machine learning, generative AI and algorithmic decision support. However, the specific overlap between BI and AI inside SME financial management remains less consolidated than the broader literature on business analytics and technology adoption.

The international literature suggests that BI and AI should be studied together because both technologies are connected by the same managerial problem: how firms transform data into better decisions. BI supports the structuring, reporting and interpretation of data, while AI can automate or augment selected analytical and decision-making tasks. In financial management, this relationship is especially important because financial decisions require reliable data, timely information, interpretability and managerial accountability. For this reason, the following literature review focuses on the conceptual foundations of BI and AI in financial management, their adoption in SMEs, the EU adoption context, drivers and barriers, benefits and remaining research gaps.

1.1 Business intelligence and AI in financial management

Business Intelligence can be understood as a set of technologies, processes and organizational routines through which firms transform data into information and managerial knowledge. Chen, Chiang and Storey (2012) describe Business Intelligence and analytics as a field concerned with turning large and complex data resources into business value. This definition is highly relevant to financial management because financial decisions depend on the availability of timely, accurate and interpretable information. Budgeting, forecasting, liquidity management, cost control and performance evaluation all require the ability to collect, organize, analyze and interpret data.

In the accounting and controlling literature, Rikhardsson and Yigitbasioglu (2018) show that BI and analytics connect most directly with management reporting, performance evaluation and decision support. Their review also suggests that although the relationship between BI and management accounting is theoretically important, it remains underdeveloped in empirical research. This is relevant because financial management is not only about recording past transactions, but also about producing information for planning, monitoring and strategic decisions. BI can therefore be viewed as a bridge between accounting information systems and managerial decision processes.

Santos, Rocha and Silva (2025) move this argument closer to SME practice by conceptualizing management accounting as a Business Intelligence system. In their study of Portuguese SMEs, they show that management accounting intelligence activities can support business strategies and policies and improve both financial and non-financial performance. This strengthens the argument that BI is not merely an IT tool, but part of the information and control logic of SME financial management.

The international BI literature also shows that SMEs do not adopt Business Intelligence under the same conditions as large enterprises. Puklavec, Oliveira and Popovič (2014) argue that SME specific determinants of BI adoption must be studied directly rather than inferred from large firm models. Their research shows that BI adoption in SMEs is shaped by technological, organizational and environmental conditions, including perceived usefulness, compatibility, available resources, management support and external pressure. Popovič, Puklavec and Oliveira (2019) extend this discussion from adoption to value creation and show that BI use can affect firm performance, but that implementation alone is not sufficient. BI creates value only when firms actively use systems to support decisions, improve processes and transform information into managerial action.

For SME financial management, this is crucial because BI software can improve reporting and analysis only if its outputs are incorporated into budgeting, forecasting, liquidity control and performance evaluation. Widhiastuti, Ahmadi and Helmy (2025) provide finance specific evidence by showing a positive relationship between BI and SME financial performance. Their findings indicate that BI may contribute to performance not only by improving reporting accuracy, but also by supporting financial ambidexterity, meaning the ability to balance financial control with strategic flexibility. This is particularly important for SMEs because they often need to preserve liquidity discipline while also responding quickly to market changes.

Artificial intelligence adds a further layer by shifting the focus from descriptive and diagnostic analytics toward prediction, automation and decision augmentation. Kerr (2025) links AI to management accounting tasks such as budgeting, costing, inventory control, receivables management, credit approval and strategic financial planning. Metzger, O'Reilly and Mac an Bhaird (2025) show that generative AI can support SME financial diagnostics by producing accessible and timely interpretations of financial data. Alghazzawi (2024) adds that accounting efficiency gains from AI depend on data quality, employee competence, infrastructure and organizational readiness.

In conceptual terms, AI can be understood as complementary to BI rather than as a substitute for it. BI provides data foundations, reporting structures, dashboards and decision support routines through which financial information becomes available and interpretable. AI extends these capabilities by enabling prediction, anomaly detection, automation, scenario generation and augmented financial decision making. Therefore, the adoption of AI in accounting, controlling and finance management is likely to be more meaningful in SMEs that already use structured analytical tools and have established routines for interpreting financial information.

1.2 EU adoption context

The EU context is characterized by increasing policy support for AI adoption, but also by persistent differences in firm size, system maturity and adoption capacity. The European Commission (2018) framed AI as a strategic technology for European competitiveness and innovation. Regulation (EU) 2024/1689 introduced a comprehensive legal framework for trustworthy and risk-based AI use. In the SME context, this creates a dual challenge. On one hand, BI and AI can improve competitiveness, productivity and financial management. On the other hand, smaller firms often face constraints related to finance, data quality, software integration, managerial expertise and regulatory awareness.

Official Eurostat statistics show that BI adoption remains lower than ERP and CRM adoption. In 2025, 46.45% of EU enterprises used ERP software, 28.51% used CRM software and 16.28% used BI software. Eurostat also reports that BI software was used by 69.24% of large enterprises but only 11.45% of small enterprises. This gap matters because BI represents a more advanced analytical layer of enterprise software use. While ERP integrates internal processes and CRM supports customer related processes, BI directly supports analytical reporting, dashboards and decision making (Eurostat, 2026a).

AI adoption shows a similar size related pattern. In 2025, 19.95% of EU enterprises used AI technologies, but adoption differed strongly by size class: 17% of small enterprises, 30.36% of medium enterprises and 55.03% of large enterprises used AI. Eurostat suggests that this difference may be connected to the complexity of implementation, economies of scale and costs (Eurostat, 2026b). These patterns indicate that SMEs face specific barriers in the adoption of advanced analytical technologies.

The EU policy environment reinforces the importance of this issue. The Digital Decade policy programme identifies the digital transformation of businesses as one of four cardinal points and includes the objective that small businesses and industry should be able to access data and adopt technologies such as cloud, data analytics and AI (European Commission, 2026). At the same time, the AI Act introduces expectations related to risk assessment, data quality, documentation, transparency, human oversight, robustness, cybersecurity and accuracy for high risk AI systems (European Union, 2024). These requirements are particularly relevant for AI used in selected high-impact finance related processes because financial management involves sensitive data, risk assessment, reporting obligations and managerial accountability.

This EU context supports the logic of the present article. If BI represents a measurable form of analytical information systems maturity, and if AI in financial management requires reliable data, reporting routines and decision support processes, then countries with stronger BI adoption among SMEs may also show higher levels of AI use in accounting, controlling and finance management. This relationship cannot be interpreted causally at country level, but it is theoretically plausible and empirically testable using Eurostat indicators.

1.3 Research gaps

The most important gap in the current literature is not the absence of studies on BI or the absence of studies on AI, but the limited integration of both streams in the specific context of SME financial management. Llave (2019) argues that BI and analytics research in SMEs remains limited compared with research on large enterprises. Rikhardsson and Yigitbasioglu (2018) note that the relationship between BI, analytics and management accounting is theoretically important but still underdeveloped. Le Dinh et al. (2025) similarly show that AI applications in SMEs are expanding across business functions, including finance, but more detailed evidence is needed on implementation, performance effects and contextual conditions.

A second gap concerns finance specific processes. Existing studies often discuss BI and AI in broad terms but less is known about how these technologies affect specific financial management practices such as budgeting, forecasting, working capital management, liquidity control, credit decisions, cost management and financial reporting. Widhiastuti, Ahmadi and Helmy (2025) provide useful evidence on BI and SME financial performance, while Metzger, O'Reilly and Mac an Bhaird (2025) provide evidence on generative AI and SME financial diagnostics. Nevertheless, more research is needed to explain how BI and AI jointly produce financial management value.

Third gap concerns comparative EU evidence. Many studies focus on individual firms, case studies or conceptual models, while fewer studies examine whether measurable country level indicators of analytical information systems maturity are associated with finance specific AI adoption across EU member states. The present article addresses this gap by pairing E_ITBI, enterprises using Business Intelligence software, with E_AI_PFIN, enterprises using AI technologies for accounting, controlling and finance management.

The article therefore positions itself at the intersection of SME financial management research, Business Intelligence research and AI adoption research. Its main contribution is to narrow a broad technology adoption debate to a precise and measurable relationship: whether BI adoption, as an indicator of analytical information systems maturity, is associated with the use of AI in accounting, controlling and finance management among SMEs in the EU.

2 Research design and methodology

The aim of this paper is to quantitatively assess the relationship between Business Intelligence adoption and the use of artificial intelligence technologies in financial management among small and medium sized enterprises in EU member states. Business Intelligence adoption is measured by the Eurostat indicator E_ITBI, enterprises using Business Intelligence software. AI adoption in financial management is measured by the Eurostat indicator E_AI_PFIN, enterprises using AI technologies for accounting, controlling or finance management.

The main objective is to identify differences in adoption levels across EU countries, evaluate the development of both indicators between 2023 and 2025, and assess

whether BI adoption is statistically associated with AI adoption in financial management among SMEs.

- RQ1: How do EU member states differ in the adoption of Business Intelligence software and AI technologies for accounting, controlling or finance management among SMEs in 2023 and 2025?
- RQ2: Which EU member states show the highest and lowest short term growth dynamics of E_ITBI and E_AI_PFIN between 2023 and 2025, measured by a development index?
- RQ3: Is there a statistically significant positive correlation between E_ITBI and E_AI_PFIN among SMEs across EU member states?
- RQ4: To what extent is cross country variation in E_AI_PFIN associated with E_ITBI in a simple linear regression model?

The paper uses descriptive analysis, development index analysis, correlation analysis, simple linear regression and synthesis. The descriptive part compares EU member states according to the level of both indicators. The development index captures changes between 2023 and 2025. The correlation and regression analyses are carried out at the level of EU member states. The results are interpreted as associative rather than causal, because the analysis is based on secondary country level data.

2.1 Data collection

The data are drawn from secondary sources, specifically Eurostat databases. The analysis focuses on small and medium sized enterprises, defined as enterprises with 10 to 249 persons employed. The variables used are defined as follows:

- Business Intelligence adoption in SMEs as the share of SMEs using Business Intelligence software, measured by the Eurostat indicator E_ITBI.
- AI adoption in financial management in SMEs as the share of SMEs using AI technologies for accounting, controlling or finance management, measured by the Eurostat indicator E_AI_PFIN.
- Time frame of the analysis is 2023 and 2025. The year 2025 is used as the main analytical year because it is the most recent observation available, while 2023 is used for comparison. If a value is missing for a specific country and year, that observation is excluded from the relevant calculation and no artificial data imputation is applied.

The geographical scope includes EU member states. The EU aggregate is used only for descriptive comparison and is excluded from correlation and regression analysis.

2.2 Data processing and analysis

1. Descriptive analysis of EU member states

For each EU member state, values of E_ITBI and E_AI_PFIN are processed for 2023 and 2025. The output is a comparison of adoption levels, which makes it

possible to identify countries with the highest and lowest use of BI software and AI technologies in financial management among SMEs.

2. Development index of E_ITBI and E_AI_PFIN

To compare adoption dynamics, a development index is calculated for both indicators. The index is defined as the ratio of the value in 2025 to the value in 2023:

Development index = value in 2025 / value in 2023

A value above 1 indicates growth, a value equal to 1 indicates no change and a value below 1 indicates decline. The index provides a simple view of how quickly BI adoption and AI adoption in financial management changed in individual countries.

3. Correlation analysis of E_ITBI and E_AI_PFIN

The correlation analysis is conducted on the set of EU member states. Pearson's correlation coefficient r is computed separately for 2023 and 2025 to express the strength and direction of the relationship between BI adoption and AI adoption in financial management. In addition, the coefficient of determination R^2 is calculated as the square of the correlation coefficient.

4. Regression analysis of E_AI_PFIN and E_ITBI

A simple linear regression model is estimated to quantify the relationship between the two indicators. The dependent variable is E_AI_PFIN and the independent variable is E_ITBI:

$$E_AI_PFIN_i = \beta_0 + \beta_1 E_ITBI_i + \varepsilon_i$$

where $E_AI_PFIN_i$ represents the share of SMEs using AI technologies for accounting, controlling or finance management in country i , E_ITBI_i represents the share of SMEs using Business Intelligence software in country i , β_0 is the intercept, β_1 is the regression coefficient and ε_i is the error term.

The regression is estimated separately for 2023 and 2025. The 2025 model is treated as the main model, while the 2023 model is used as a comparison. The interpretation remains correlational rather than causal.

3 Research results and discussion

In the empirical part, we analyzed the relationship between Business Intelligence adoption and the use of artificial intelligence technologies in financial management among small and medium sized enterprises in EU member states. Business Intelligence adoption is represented by the Eurostat indicator E_ITBI, enterprises using Business Intelligence software. AI adoption in financial management is represented by the Eurostat indicator E_AI_PFIN, enterprises using AI technologies for accounting, controlling or finance management. The analysis covers the years 2023 and 2025 and focuses on SMEs, defined as enterprises with 10 to 249 persons employed. All descriptive

statistics, correlation coefficients and regression models are calculated at the unweighted country level.

Before interpreting the results, two methodological notes are necessary. First, the values reported in the descriptive statistics represent an unweighted country level average of EU member states, not the official EU aggregate. Second, the value of E_AI_PFIN for Germany is missing in 2023. Therefore, the correlation and regression analysis for 2023 is based on 26 countries, while the analysis for 2025 includes all 27 EU member states. The year 2025 is therefore treated as the main analytical year, while 2023 is used as a comparison year.

Table 1 presents the basic descriptive statistics for both indicators. The results show that BI adoption among SMEs is substantially higher than AI adoption in financial management. In 2023, the average share of SMEs using BI software across EU member states was 15.74%, while the average share of SMEs using AI technologies for accounting, controlling or finance management was only 1.82%. By 2025, BI adoption increased to 17.82%, while finance specific AI adoption increased to 4.22%.

Table 1

Descriptive statistics of E_ITBI and E_AI_PFIN in EU member states

Variable	Year	Countries (n)	Mean	Median	Minimum	Maximum	Standard deviation
E_ITBI	2023	27	15.74	12.48	3.50	38.69	9.03
E_ITBI	2025	27	17.82	15.21	6.12	41.69	9.73
E_AI_PFIN	2023	26	1.82	1.57	0.19	5.30	1.25
E_AI_PFIN	2025	27	4.22	3.79	0.70	11.16	2.94

Source: own processing based on statistical data from database EUROSTAT (2026)

The comparison shows that Business Intelligence is already a more established technology among SMEs than AI in financial management. This is expected because BI is usually linked to reporting, dashboards, data analysis and decision support, while AI in accounting, controlling and finance management represents a more advanced and still emerging application. At the same time, AI adoption in financial management increased faster than BI adoption between 2023 and 2025. The mean value of E_ITBI increased by 2.08 percentage points, while the mean value of E_AI_PFIN increased by 2.40 percentage points, despite starting from a much lower baseline.

The increase in standard deviation is also important. For E_AI_PFIN, the standard deviation increased from 1.25 in 2023 to 2.94 in 2025. This means that finance specific AI adoption is growing, but the differences between countries are also becoming more visible. Some countries are moving quickly toward AI use in financial management, while others remain at very low levels. This finding is consistent with the theoretical assumption that AI in financial management depends not only on the availability of AI tools, but also on the maturity of data, information systems, managerial routines and analytical decision making.

Table 2 shows the five countries with the highest and lowest values for each indicator. The same group of leading countries appears repeatedly. Denmark, Finland, Belgium and

the Netherlands belong among the strongest performers in both BI adoption and AI adoption in financial management. On the other hand, Romania, Bulgaria, Greece and Hungary repeatedly appear among the lowest ranked countries.

Table 2

Top and bottom EU member states according to E_ITBI and E_AI_PFIN

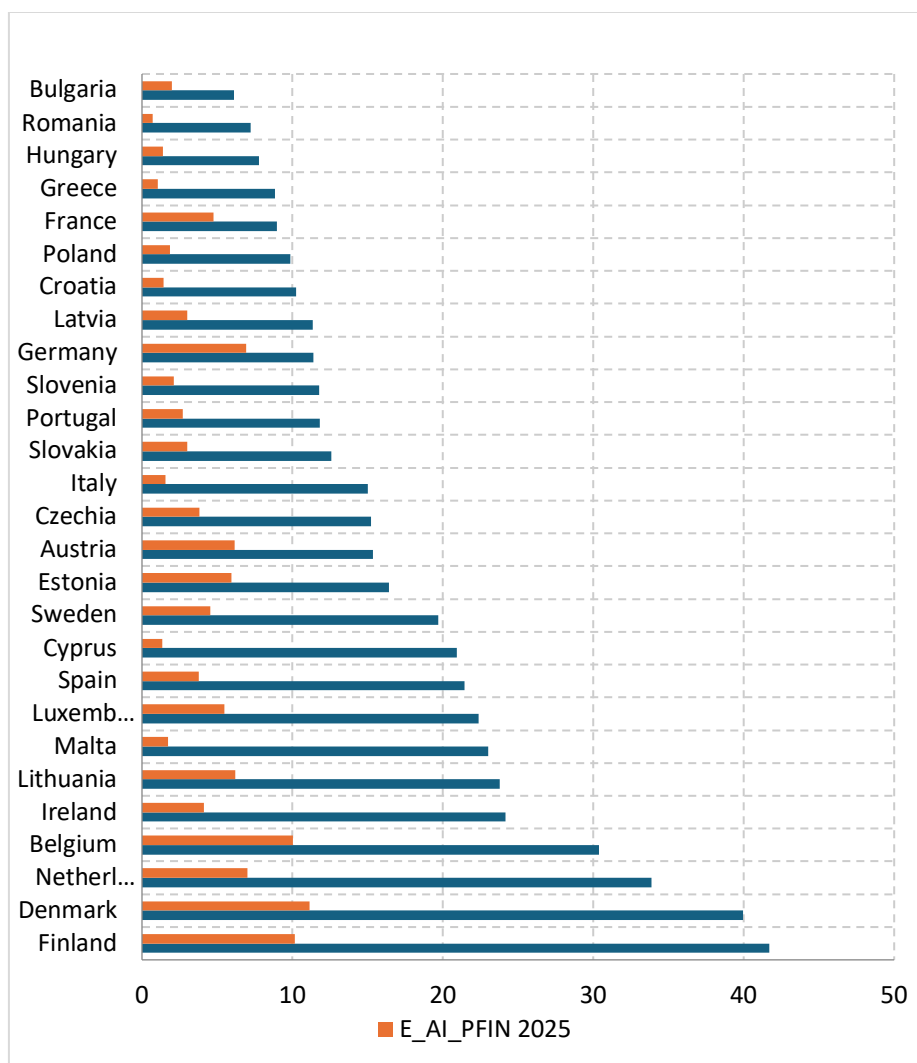
Variable	Year	Top 5 countries	Bottom 5 countries
E_ITBI	2023	Denmark 38.69, Finland 37.06, Netherlands 29.20, Belgium 29.18, Malta 20.98	Greece 8.18, Latvia 8.14, Hungary 6.77, Romania 6.55, Bulgaria 3.50
E_ITBI	2025	Finland 41.69, Denmark 39.96, Netherlands 33.85, Belgium 30.38, Ireland 24.15	France 8.96, Greece 8.83, Hungary 7.77, Romania 7.21, Bulgaria 6.12
E_AI_PFIN	2023	Denmark 5.30, Finland 4.18, Belgium 3.76, Netherlands 3.50, Austria 3.32	Cyprus 0.76, Malta 0.75, Bulgaria 0.67, Greece 0.39, Romania 0.19
E_AI_PFIN	2025	Denmark 11.16, Finland 10.16, Belgium 10.03, Netherlands 7.00, Germany 6.93	Croatia 1.45, Hungary 1.40, Cyprus 1.33, Greece 1.04, Romania 0.70

Source: own processing based on statistical data from database EUROSTAT (2026)

Figure 1 visualizes the 2025 values of E_ITBI and E_AI_PFIN across EU member states. The figure confirms that BI adoption is considerably higher than finance specific AI adoption in most countries. At the same time, countries with high BI adoption, especially Finland, Denmark, Belgium and the Netherlands, also tend to report higher values of AI adoption in financial management.

Figure 1

Adoption of BI software and AI technologies in financial management among SMEs in EU member states in 2025



Source: own processing based on statistical data from database EUROSTAT (2026)

3.1 Development index of E_ITBI and E_AI_PFIN

To compare the dynamics of both indicators, we calculated a development index defined as the ratio of the value in 2025 to the value in 2023. The index provides a simple view of how quickly Business Intelligence adoption and AI adoption in financial management changed during the observed period.

Table 3 presents the development index for both indicators. The average development index of E_ITBI reached 1.18, which means that BI adoption increased moderately between 2023 and 2025. In contrast, the average development index of E_AI_PFIN reached 2.39, which indicates that AI adoption in financial management more than doubled on average. This difference confirms that BI is a more established technology

with slower growth, while AI in financial management is still at an earlier diffusion stage and therefore grows more dynamically from a lower initial base.

Table 3

Development index of E_ITBI and E_AI_PFIN between 2023 and 2025

Country	BI Change (percentage points)	BI index 2025/2023	AI Change (percentage points)	AI index 2025/2023
Belgium	1.20	1.04	6.27	2.67
Bulgaria	2.62	1.75	1.32	2.97
Czechia	5.99	1.65	2.06	2.17
Denmark	1.27	1.03	5.86	2.11
Germany	-1.07	0.91	N/A	N/A
Estonia	1.84	1.13	4.54	4.27
Ireland	4.33	1.22	2.31	2.28
Greece	0.65	1.08	0.65	2.67
Spain	4.93	1.30	2.13	2.28
France	-0.50	0.95	3.08	2.82
Croatia	-0.52	0.95	0.33	1.29
Italy	-1.65	0.90	0.74	1.91
Cyprus	0.81	1.04	0.57	1.75
Latvia	3.22	1.40	1.72	2.33
Lithuania	13.54	2.32	5.24	6.52
Luxembourg	4.02	1.22	2.97	2.19
Hungary	1.00	1.15	0.32	1.30
Malta	2.03	1.10	1.00	2.33
Netherlands	4.65	1.16	3.50	2.00
Austria	-0.71	0.96	2.86	1.86
Poland	0.95	1.11	0.69	1.58
Portugal	0.99	1.09	1.15	1.73
Romania	0.66	1.10	0.51	3.68
Slovenia	0.32	1.03	0.55	1.35
Slovakia	1.40	1.13	1.10	1.57
Finland	4.63	1.12	5.98	2.43
Sweden	-0.38	0.98	2.36	2.08

Source: own processing based on statistical data from database EUROSTAT (2026)

The highest growth of BI adoption was recorded in Lithuania, where the E_ITBI index reached 2.32. Strong growth was also visible in Bulgaria and Czechia. In several countries, however, BI adoption slightly declined, including Italy, Germany, France, Croatia, Austria and Sweden. These changes should be interpreted carefully because the observed period is short and may be influenced by changes in survey implementation, reporting structure or business cycle conditions.

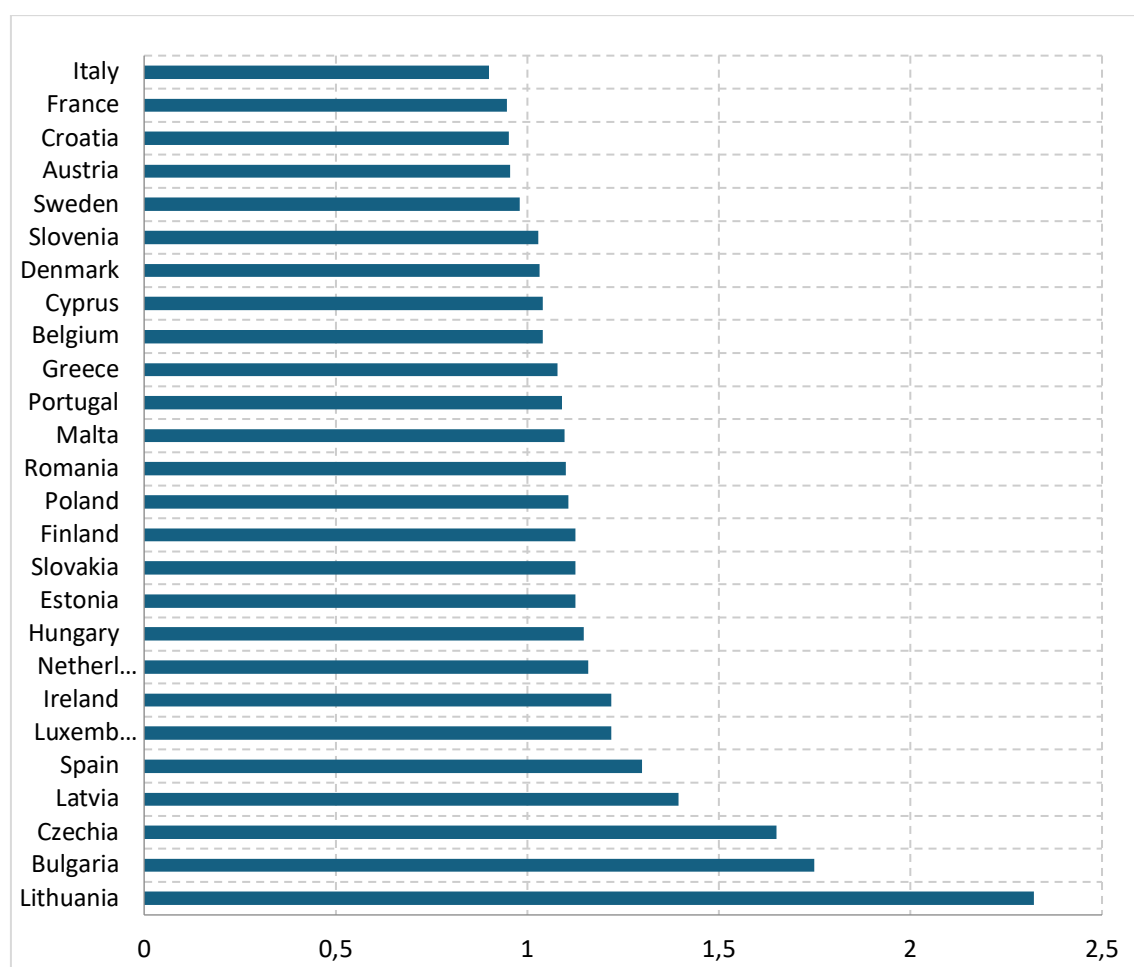
The highest growth of AI adoption in financial management was also recorded in Lithuania, where the E_AI_PFIN index reached 6.52. Estonia and Romania also recorded strong relative growth. However, these high values partly reflect low starting levels in 2023. Therefore, the development index should not be interpreted as evidence of long-

term convergence, but as a short-term indicator of diffusion dynamics between 2023 and 2025.

The development index adds an important dynamic perspective to the descriptive results. It shows that BI adoption is growing more gradually, while AI adoption in financial management is growing more rapidly but from a low base. This supports the interpretation that BI functions as a more mature analytical layer, while AI represents a newer technological extension. From a managerial perspective, this means that many SMEs may already have some form of analytical software foundation, but the transition from BI based reporting to AI based financial decision support is still at an early stage.

Figure 2

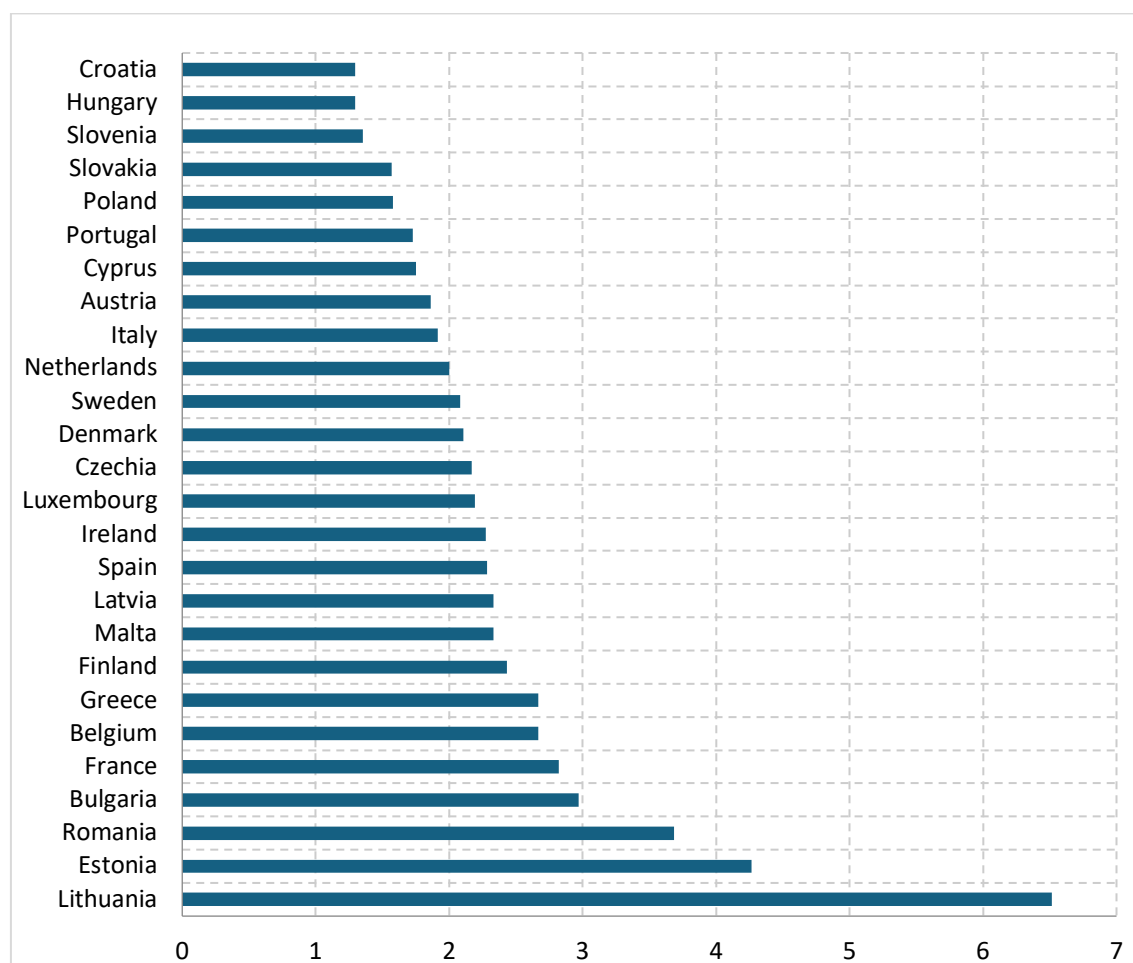
Development index of E_ITBI in EU member states, 2025/2023



Source: own processing based on statistical data from database EUROSTAT (2026)

Figure 3

Development index of E_AI_PFIN in EU member states, 2025/2023



Source: own processing based on statistical data from database EUROSTAT (2026)

Overall, the development index confirms that AI adoption in financial management is growing faster than BI adoption. This finding is consistent with the conceptual distinction between BI as a data reporting and analytical infrastructure and AI as a more advanced application layer. However, because the analysis covers only two years, the results should be understood as short-term development patterns rather than stable long-term trends.

3.2 Correlation analysis of BI adoption and AI adoption in financial management

To examine whether countries with higher Business Intelligence adoption also show higher adoption of AI technologies in financial management, Pearson's correlation coefficient was calculated between E_ITBI and E_AI_PFIN. The analysis was conducted separately for 2023 and 2025. The EU aggregate was excluded, and only EU member states with available values for both variables were included. Because the value of E_AI_PFIN for Germany is missing in 2023, the 2023 analysis is based on 26 countries. The 2025 analysis includes all 27 EU member states.

Table 4

Correlation analysis of E_ITBI and E_AI_PFIN in EU member states

Year	Countries (n)	Pearson r	R squared	p value
2023	26	0.827	0.683	< 0.001
2025	27	0.782	0.612	< 0.001

Source: own processing based on statistical data from database EUROSTAT (2026)

The results show a strong and statistically significant positive relationship in both years. In 2023, the correlation coefficient reached $r = 0.827$, while in 2025 it reached $r = 0.782$. This means that EU countries where SMEs more frequently use Business Intelligence software also tend to report higher use of AI technologies for accounting, controlling and finance management.

The coefficient of determination shows that the linear relationship between the two indicators is substantial. In 2023, 68.3% of the cross-country variation in E_AI_PFIN was associated with variation in E_ITBI. In 2025, the corresponding value was 61.2%. Although the correlation is slightly lower in 2025, it remains strong and statistically significant.

These results support the main assumption of the paper. Business Intelligence adoption can be interpreted as a proxy for analytical information systems maturity among SMEs. Countries with stronger BI adoption appear to have a stronger foundation for more advanced AI use in financial management. However, the results remain correlational. Since the analysis uses aggregated country level data, it cannot prove that the same firms using BI software also use AI in financial management.

This finding is important because it empirically supports the theoretical link developed in the literature review. Rikhardsson and Yigitbasioglu (2018) show that BI and analytics are closely connected with management accounting through reporting, performance evaluation and decision support. Kerr (2025) links AI to budgeting, costing, receivables management, credit approval and strategic financial planning.

From a policy perspective, the correlation results suggest that support for adoption of AI in SMEs should not focus only on AI tools themselves. If AI adoption in financial management is associated with BI maturity, then measures supporting data quality, reporting systems, integration of accounting and operational data, and managerial analytical routines may indirectly support AI adoption in finance related functions.

3.3 Regression analysis of BI adoption and AI adoption in financial management

To quantify the relationship between the two indicators more precisely, a simple linear regression model was estimated. The dependent variable was E_AI_PFIN and the independent variable was E_ITBI. The model was estimated separately for 2023 and 2025.

The regression results are presented in Table 5. In both years, the regression coefficient β_1 is positive and statistically significant. This confirms that higher BI adoption is associated with higher AI adoption in financial management among SMEs.

Table 5

Simple linear regression of BI adoption and AI adoption in financial management

Year	Countries (n)	β_0	β_1	R squared	p value β_1
2023	26	0.032	0.113	0.683	< 0.001
2025	27	0.010	0.236	0.612	< 0.001

Source: own processing based on statistical data from database EUROSTAT (2026)

In 2023, a one percentage point higher share of SMEs using BI software was associated with a 0.113 percentage point higher share of SMEs using AI technologies for accounting, controlling or finance management. In 2025, the corresponding coefficient increased to 0.236. This means that the statistical association between BI adoption and finance specific AI adoption became steeper over time.

This result is important for the interpretation of the relationship. In 2023, AI adoption in financial management was still very low, and even countries with strong BI adoption reported relatively modest levels of finance specific AI use. By 2025, the same difference in BI adoption was associated with a larger difference in AI adoption. This suggests that as AI technologies became more accessible and more widely used, BI adoption may have become a more visible differentiating factor between countries.

The regression results strengthen the main argument of the paper. BI adoption can be understood as a measurable proxy of analytical information systems maturity. Countries where SMEs more frequently use BI software also tend to report higher adoption of AI technologies in accounting, controlling and finance management. This is consistent with the view that AI in financial management requires reliable data, reporting structures, managerial interpretation and decision support routines. It also corresponds with Alghazzawi (2024), who emphasizes the importance of data quality, infrastructure and employee competence for accounting efficiency gains from AI, and with Metzger, O'Reilly and Mac an Bhaird (2025), who argue that generative AI can support SME financial diagnostics but still requires managerial interpretation and readiness.

The regression model accounts for a substantial part of the cross-country variation in E_AI_PFIN, but it should not be interpreted as causal evidence. The model does not control other factors such as sectoral structure, GDP per capita, cloud computing adoption, ERP adoption, innovation environment, managerial skills, availability of finance or national policy support. Therefore, the regression should be understood as a simple linear association model that quantifies the relationship between two theoretically connected indicators.

Conclusion

The aim of the paper was to quantitatively assess whether Business Intelligence adoption is associated with the use of artificial intelligence technologies in financial management among small and medium sized enterprises in EU member states. Business Intelligence adoption was measured by the Eurostat indicator E_ITBI, while AI adoption in financial management was measured by E_AI_PFIN. The analysis used Eurostat data

for 2023 and 2025 and applied descriptive analysis, development index, Pearson correlation and simple linear regression.

RQ1: The results showed substantial differences between EU member states in both indicators. BI adoption was more widespread than AI adoption in financial management. In 2025, the unweighted average share of SMEs using BI software reached 17.82%, while the average share using AI technologies for accounting, controlling or finance management reached 4.22%. Denmark, Finland, Belgium and the Netherlands belonged among the leading countries, while Romania, Greece, Hungary and Bulgaria remained among the weaker performers.

RQ2: The development index showed different growth dynamics across countries. In the case of BI adoption, the highest growth was recorded in Lithuania, Bulgaria and Czechia, while the weakest dynamics were recorded in Italy, Germany, France, Croatia, Austria and Sweden. In the case of AI adoption in financial management, the highest growth was recorded in Lithuania, Estonia and Romania, while the weakest dynamics were recorded in Croatia, Hungary, Slovenia, Slovakia and Poland. Overall, finance specific AI adoption grew faster than BI adoption, but mainly from a very low starting level.

RQ3: The correlation analysis confirmed a strong and statistically significant positive relationship between E_ITBI and E_AI_PFIN. Pearson's correlation coefficient reached $r = 0.827$ in 2023 and $r = 0.782$ in 2025. This means that EU countries where SMEs more frequently use Business Intelligence software also tend to report higher use of AI technologies for accounting, controlling and finance management.

RQ4: The regression analysis confirmed a positive and statistically significant association between the two indicators. In 2023, a one percentage point higher share of SMEs using BI software was associated with a 0.113 percentage point higher share of SMEs using AI technologies in financial management. In 2025, this coefficient increased to 0.236 percentage points. In the simple linear regression model, E_ITBI was associated with 68.3% of the cross-country variation in E_AI_PFIN in 2023 and 61.2% in 2025.

Overall, the findings support the main assumption of the paper. AI adoption in financial management should not be understood as an isolated technological step, but as a more advanced stage of data driven financial management. Countries with higher BI adoption appear to have stronger foundations for finance specific AI use.

For practice, the results suggest that SMEs should first strengthen their BI systems, improve financial and operational data integration, and develop regular reporting and controlling routines before implementing advanced AI tools. From the perspective of financial strategy and financial decision-making, the results suggest that BI and AI should be understood as decision-support infrastructure that can improve budgeting, forecasting, liquidity control, performance evaluation and strategic financial planning in SMEs.

The study has several limitations. It relies on secondary country level data, so it does not capture the behavior of individual firms. The analysis covers only two years, and E_ITBI is not a purely finance specific indicator because BI software can also be used in other business areas. Future research should therefore use firm level data, longer time series

and additional control variables such as ERP adoption, cloud computing use, sectoral structure, innovation capacity and firm size composition.

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References

Alghazzawi, R. (2024), “AI Adoption and Organizational Readiness: Boosting Accounting Efficiency in Jordan”, *Journal of Financial Reporting and Accounting*, doi: 10.1108/JFRA-08-2024-0570.

Chen, H., Chiang, R.H.L. and Storey, V.C. (2012), “Business Intelligence and Analytics: From Big Data to Big Impact”, *MIS Quarterly*, Vol. 36, No. 4, pp. 1165–1188, doi: 10.2307/41703503.

European Commission (2018), “Artificial Intelligence for Europe”, COM(2018) 237 final, available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52018DC0237>. (accessed 25.6.2026)

European Commission (2026), “Europe’s Digital Decade”, *Shaping Europe’s Digital Future*, available at: <https://digital-strategy.ec.europa.eu/en/policies/europes-digital-decade>. (accessed 25.6.2026)

European Union (2024), “Regulation (EU) 2024/1689 Laying Down Harmonised Rules on Artificial Intelligence”, *Official Journal of the European Union*, available at: <https://eur-lex.europa.eu/eli/reg/2024/1689/oj>. (accessed 25.6.2026)

Eurostat (2026a), “E-business Integration”, *Statistics Explained*, data extracted in May 2026, available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=E-business_integration. (accessed 25.6.2026)

Eurostat (2026b), “Use of Artificial Intelligence in Enterprises”, *Statistics Explained*, data extracted in December 2025, available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Use_of_artificial_intelligence_in_enterprises.

Ionaşcu, C.M. (2025), “Artificial Intelligence Adoption in the European Union: A Data Driven Cluster Analysis (2021–2024)”, *Economies*, Vol. 13, No. 5, 145, doi: 10.3390/economies13050145.

Kerr, D. (2025), “A Review of AI and Its Impact on Management Accounting and Society”, *Journal of Risk and Financial Management*, Vol. 18, No. 6, 340, doi: 10.3390/jrfm18060340.

Le Dinh, T. et al. (2025), “Artificial Intelligence in SMEs: Enhancing Business Functions Through Technologies and Applications”, *Information*, Vol. 16, No. 5, 415, doi: 10.3390/info16050415.

Llave, M.R. (2019), "A Review of Business Intelligence and Analytics in Small and Medium Sized Enterprises", *International Journal of Business Intelligence Research*, Vol. 10, No. 1, pp. 19–41, doi: 10.4018/IJBIR.2019010102.

Metzger, M., O'Reilly, S. and Mac an Bhaird, C. (2025), "Generative Artificial Intelligence Augmenting SME Financial Management", *Technovation*, Vol. 147, 103313, doi: 10.1016/j.technovation.2025.103313.

Popovič, A., Puklavec, B. and Oliveira, T. (2019), "Justifying Business Intelligence Systems Adoption in SMEs: Impact of Systems Use on Firm Performance", *Industrial Management and Data Systems*, Vol. 119, No. 1, pp. 210–228, doi: 10.1108/IMDS-02-2018-0085.

Puklavec, B., Oliveira, T. and Popovič, A. (2014), "Unpacking Business Intelligence Systems Adoption Determinants: An Exploratory Study of Small and Medium Enterprises", *Economic and Business Review*, Vol. 16, No. 2, doi: 10.15458/2335-4216.1278.

Rikhardsson, P. and Yigitbasioglu, O. (2018), "Business Intelligence and Analytics in Management Accounting Research: Status and Future Focus", *International Journal of Accounting Information Systems*, Vol. 29, pp. 37–58, doi: 10.1016/j.accinf.2018.03.001.

Santos, C., Rocha, Á. and Silva, A. (2025), "Management Accounting as a Business Intelligence System: Examination in Portuguese Small and Medium Enterprises", *Neural Computing and Applications*, Vol. 37, pp. 25789–25803, doi: 10.1007/s00521-025-11118-4.

Widhiastuti, S., Ahmadi, S. and Helmy, I. (2025), "Exploring the Link Between Business Intelligence and Financial Performance in SMEs", *Investment Management and Financial Innovations*, Vol. 22, No. 2, pp. 36–46, doi: 10.21511/imfi.22(2).2025.04.

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FINANČNÉ ROZHODOVANIE VLASTNÍCKY RIADENEJ MALEJ SPOLOČNOSTI V PODMIENKACH OBMEDZENEJ RACIONALITY: BEHAVIORÁLNY POHĽAD NA INVESTÍCIE, LIKVIDITU A ZADLŽENIE

Miriam Takáčová – Katarína Remeňová

Abstract

Článok sa zameriava na finančné rozhodovanie vlastnícky riadenej malej spoločnosti v podmienkach obmedzenej racionality. V centre pozornosti sú tri oblasti finančnej stratégie: investičné rozhodovanie, rozhodovanie o likviditnej rezerve a rozhodovanie o využití dlhového financovania. Cieľom článku nie je hodnotiť finančnú výkonnosť konkrétneho podniku, ale identifikovať behaviorálne faktory, ktoré môžu ovplyvňovať finančné rozhodovanie vlastníka malej spoločnosti. Teoretická časť vychádza z poznatkov o financovaní malých a stredných podnikov, kapitálovej štruktúre, likvidite, finančných obmedzeniach a behaviorálnych aspektoch rozhodovania. Empirická časť má charakter mini prípadovej štúdie anonymizovanej modelovej spoločnosti s ručením obmedzeným. Výsledky naznačujú, že finančné rozhodovanie v malej spoločnosti nemožno vysvetľovať iba ako technickú prácu s finančnými ukazovateľmi. Významnú úlohu zohráva skúsenosť vlastníka, intuícia, opatrnosť, averzia k riziku, potreba finančnej bezpečnosti a snaha zachovať kontrolu nad podnikom.

JEL classification: G41, G32, D81

Keywords: finančné rozhodovanie, obmedzená racionalita, malé a stredné podniky

Úvod

Finančné rozhodovanie patrí k základným oblastiam riadenia podniku, pretože určuje, akým spôsobom podnik získava, alokuje a využíva svoje finančné zdroje. Výsledkom týchto rozhodnutí je konkrétna finančná stratégia, ktorá ovplyvňuje stabilitu, rozvoj aj schopnosť podniku zvládať riziká. Vo veľkých podnikoch sú finančné rozhodnutia často podporované analytickými oddeleniami, controllingom, rozpočtami, finančnými modelmi a formálnymi schvaľovacími procesmi. V malých podnikoch však býva rozhodovanie sústredené do rúk vlastníka alebo konateľa, ktorý spája ekonomické údaje s vlastnou skúsenosťou, intuíciou, opatrnosťou a subjektívnym vnímaním rizika.

Vlastník sa musí rozhodovať, či investovať do nového vybavenia, technológie alebo softvéru, koľko peňažných prostriedkov ponechať vo firme ako rezervu a či prípadný rast financovať vlastnými zdrojmi alebo úverom. Predmet článku tak tvoria tri navzájom prepojené oblasti: rozhodovanie o investíciách, rozhodovanie o likviditnej rezerve a rozhodovanie o zadlžení. Práve tieto oblasti predstavujú praktické jadro finančnej stratégie vlastnícky riadenej malej spoločnosti.

Finančné rozhodovanie v malej spoločnosti sa nachádza na rozhraní medzi racionalitou finančného riadenia a reálnym manažérskym rozhodovaním. Na jednej strane je

potrebné sledovať náklady, výnosy, cash-flow, návratnosť investícií, úverové podmienky a likviditu. Na druhej strane vlastník nerozhoduje v dokonalej informačnej situácii. Nemusí mať k dispozícii úplné dáta, profesionálny analytický aparát ani dostatok času na porovnávanie všetkých alternatív. V praxi preto často nehľadá dokonale optimálne riešenie, ale riešenie, ktoré je z jeho pohľadu dostatočne bezpečné, uskutočniteľné a zlučiteľné s dlhodobou stabilitou podniku.

Cieľom článku je identifikovať a opísať, ako sa behaviorálne faktory prejavujú vo finančnom rozhodovaní vlastnícky riadenej malej spoločnosti pri rozhodnutiach o investíciách, likvidite a zadlžení. Článok vychádza z literárnej rešerše z databázy Web of Science, z bibliometrickej analýzy tematických väzieb a z mini prípadovej štúdie anonymizovanej modelovej spoločnosti.

1 Súčasný stav riešenej problematiky doma a v zahraničí

Finančné rozhodovanie malých a stredných podnikov (ďalej v texte aj SME) je dlhodobo spájané s obmedzenými zdrojmi, nižšou vyjednávacou silou voči bankám, citlivosťou na výkyvy cash-flow a vyššou závislosťou od externého (Finnegan a Kapoor, 2023; Sommer, 2024). Malé podniky často nemajú samostatné finančné oddelenie, rozvinuté analytické nástroje ani jednoduchý prístup ku kapitálovým trhom. Finančná stratégia preto býva výrazne naviazaná na osobu vlastníka, jeho skúsenosti, finančnú gramotnosť, ochotu riskovať a schopnosť posúdiť únosnosť rozhodnutia (Sulistianingsih a Santi, 2023). Aktuálne údaje Európskej centrálnej banky za prvý štvrtrok 2026 naznačujú (European Central Bank, 2026), že financovanie malých a stredných podnikov zostáva citlivé na vývoj úrokových sadzieb, dodatočných nákladov financovania a celkového ekonomického výhľadu. Podniky v eurozóne vnímali sprísnenie úrokových podmienok bankových úverov a mierny pokles dostupnosti bankového financovania, pričom financovanie využívali najmä na zásoby a pracovný kapitál (European Central Bank, 2026). Podobne aj Organizácia pre hospodársku spoluprácu a rozvoj zdôrazňuje, že hoci sa finančné podmienky po inflačnom období čiastočne zlepšovali, náklady financovania zostali vyššie než pred pandémiou a SME potrebujú diverzifikovanejšie zdroje financovania (OECD, 2026). V slovenskom prostredí je finančné rozhodovanie malých a stredných podnikov potrebné vnímať aj cez štruktúru podnikateľského sektora. Slovenská ekonomika je relatívne silno zastúpená mikropodnikmi a individuálnymi podnikateľmi, zatiaľ čo výzvou zostáva najmä rast produktivity, digitalizácia a inovačná aktivita menších firiem (OECD, 2021). Slovensko zároveň patrí medzi začínajúcich inovátorov a jeho inovačná výkonnosť dosahuje iba 62,6 % priemeru Európskej únie (European Commission, 2025). Nižšie hodnoty dosahuje najmä v oblasti financovania a podpory inovácií, rizikového kapitálu, podnikových investícií a výdavkov podnikov na výskum a vývoj (European Commission, 2025).

Finančné riziko malých a stredných podnikov nesúvisí iba s nedostatkom kapitálu, ale aj s tým, či podnik dokáže rozvíjať nové riešenia, udržať si konkurenčnú pozíciu a reagovať na zmeny trhu. Vyššia inovatívnosť môže znižovať vnímané obavy z bankrotu, nemusí však automaticky znamenať lepšiu aktuálnu finančnú výkonnosť – inovačné aktivity sú totiž často spojené s dodatočnými nákladmi, neistotou a potrebou riadiacej kapacity, čo

môže byť osobitne náročné pre menšie podniky s obmedzenými zdrojmi (Civelek a kol., 2023). V česko-slovensko-maďarskom prostredí sa zároveň ukazuje, že vzťah medzi inovatívnosťou, konkurencieschopnosťou a finančným riadením rizika sa líši podľa veľkosti podniku (Ključnikov a kol., 2022). Výraznejšie sa prejavuje najmä pri mikropodnikoch, pri ktorých môže konkurencieschopnosť podporovať lepšie finančné riadenie rizika, zatiaľ čo inovatívnosť môže byť krátkodobo spojená s vyššou finančnou záťažou (Ključnikov a kol., 2022). Dôležitou súčasťou finančného rozhodovania je aj nastavenie kapitálovej štruktúry. Výskum mladých malých a stredných podnikov ukazuje, že vhodná kombinácia vlastného kapitálu a dlhu môže zlepšovať krátkodobú solventnosť a ukazovateľ pracovného kapitálu, čím sa znižuje riziko finančného zlyhania podniku (Amoa-Gyarteng a Dhliwayo, 2023). Vyššia závislosť od krátkodobého dlhu môže byť v krízových obdobiach riziková, pretože zvyšuje potrebu častejšieho refinancovania a citlivosť podniku na zhoršenie dostupnosti externého financovania. Rozhodnutie o úvere preto nie je iba otázkou ceny kapitálu, ale aj otázkou finančnej bezpečnosti, flexibility, splatnosti záväzkov a schopnosti podniku preklenúť obdobie znížených príjmov (Bvirindi a Inalegwu, 2024).

Malé podniky často prirodzene preferujú interné zdroje financovania, nerozdelený zisk alebo zdroje kapitálu, ktoré sú im známe a dôveryhodné. Takéto rozhodovanie však nemusí vždy zodpovedať čisto racionálnemu modelu. Výber zdrojov financovania môže byť ovplyvnený dôverou v známe možnosti, predchádzajúcou skúsenosťou podnikateľa a mierou ochoty prijať neistotu spojenú s externým financovaním. Finančná gramotnosť môže tento proces korigovať, pretože pomáha podnikateľovi lepšie porovnať dostupné alternatívy, posúdiť ich riziká a obmedziť jednostranné spoliehanie sa na známe riešenia (Sulistianingsih a Santi, 2023). Voľba medzi vlastnými a cudzími zdrojmi preto nie je iba technickou finančnou otázkou, ale aj behaviorálne podmieneným rozhodnutím. Toto rozhodovanie je zároveň ovplyvnené tým, aké možnosti externého financovania sú pre podnik reálne dostupné. Dostupnosť externého financovania malých a stredných podnikov totiž nezávisí iba od ich vlastnej finančnej situácie, ale aj od kvality finančného systému, fungovania bánk, právneho prostredia a dostupnosti dôveryhodných informácií o podniku. V rozvinutejšom finančnom prostredí majú podniky väčšiu šancu využívať formálne externé zdroje financovania, napríklad bankové alebo nebankové inštitúcie, a to pri financovaní pracovného kapitálu aj dlhodobějších investícií (Wang a kol., 2023). Ani priaznivejšie menové alebo úverové podmienky však nemusia automaticky odstrániť úverové obmedzenia všetkých podnikov. Menšie, mladšie a viac zadlžené podniky môžu zostať citlivejšie na obmedzený prístup k úverom aj v období uvoľnenejšej menovej politiky (Finnegan a Kapoor, 2023). Dostupnosť úveru preto nie je vhodné vnímať iba ako výsledok individuálnej finančnej výkonnosti podniku, ale aj ako výsledok širších podmienok finančného trhu a inštitucionálneho prostredia.

Finančné rozhodovanie v malých a stredných podnikoch tak nemožno vysvetliť iba racionálnymi ekonomickými modelmi, pretože rozhodovatelia nepracujú vždy s úplnými informáciami a ich úsudok môže byť ovplyvnený skúsenosťou, emóciami, zjednodušenými pravidlami rozhodovania a obmedzenou racionalitou. V profesionálnom rozhodovaní sa často prejavuje nadmerná sebadôvera, hľadanie informácií potvrdzujúcich vlastný názor, spätný pocit, že výsledok bol „jasný od začiatku“, alebo

silnejšia citlivosť na stratu než na možný zisk (Berthet, 2022). Pri finančných a investičných rozhodnutiach môžu takéto zjednodušené postupy pomáhať znižovať zložitosť rozhodovania, najmä v podmienkach neistoty a nedostatku času. Zároveň však môžu viesť k chybným záverom, ak rozhodovateľ preceňuje vlastnú skúsenosť, podceňuje riziká alebo sa príliš opiera o informácie, ktoré sú mu práve najľahšie dostupné (Ahmad, 2024). Pre malé podniky je tento pohľad významný najmä preto, že finančné rozhodnutia často prijíma konkrétny vlastník alebo manažér, ktorý nesie ich priame dôsledky. Rozhodnutie o úvere, investícii alebo väčšom výdavku preto nemusí byť ovplyvnené iba objektívnym porovnaním nákladov a výnosov, ale aj aktuálnym stavom hotovosti, predchádzajúcou skúsenosťou, obavou zo zadlženia alebo pocitom, že známy spôsob financovania je bezpečnejší. Finančná gramotnosť v tomto kontexte pomáha vlastníkovi lepšie porozumieť finančným možnostiam, posudzovať ich riziká a prijímať informovanejšie rozhodnutia (Frimpong a kol., 2022).

Významnú úlohu zároveň zohráva digitalizácia podnikania, pretože digitálne nástroje a aplikácie umelej inteligencie môžu malým a stredným podnikom pomáhať pri práci so zákazníkmi, predikcii cash-flow, cenotvorbe, riadení prevádzky alebo hodnotení rizík. Tým môžu znižovať podnikateľské riziká, podporovať efektívnejšie rozhodovanie a zvyšovať schopnosť podniku rýchlejšie reagovať na zmeny prostredia (Drydakis, 2022). Digitálne prepojenie podniku so zákazníkmi, dodávateľmi a obchodnými partnermi môže podporovať aj inovácie, pretože podniku umožňuje rýchlejšie získavať a využívať informácie z trhu. Malý podnik tak môže lepšie zachytiť, čo zákazníci potrebujú, aké zmeny nastávajú v dopyte, kde vznikajú problémy v dodávkach alebo ktoré časti výrobu, služby či vnútorného procesu je možné zlepšiť. Digitalizácia preto nemusí znamenať iba používanie nových technológií, ale aj lepšie prepájanie informácií medzi podnikom a jeho okolím. Takto získané informácie môžu byť základom pre úpravu procesov, tvorbu nových produktov alebo vznik novej podnikateľskej príležitosti. Ich skutočný prínos však závisí od toho, či ich podnikateľ dokáže prepojiť s vlastnou skúsenosťou a praktickými potrebami podniku (Marín a kol., 2023; Kastelli a kol., 2024).

Finančné rozhodovanie v malých a stredných podnikoch je tak výsledkom kombinácie ekonomických, behaviorálnych, technologických a inštitucionálnych faktorov. Objektívne ho ovplyvňujú likvidita, zadlženosť, kapitálová štruktúra, úrokové sadzby, cash-flow, dostupnosť úverov a kvalita finančného systému (Wang a kol., 2023; Qerimi a kol., 2024). Subjektívne doň vstupujú skúsenosť vlastníka, finančná gramotnosť, dôvera voči poskytovateľom kapitálu, vnímanie rizika, emócie a schopnosť pracovať s informáciami (Sulistianingsih a Santi, 2023; Ahmad, 2024). Práve táto kombinácia robí finančné rozhodovanie malých spoločností špecifickým a odlišným od rozhodovania veľkých podnikov.

2.1 Tematické zmapovanie výskumnej oblasti pomocou VOSviewer

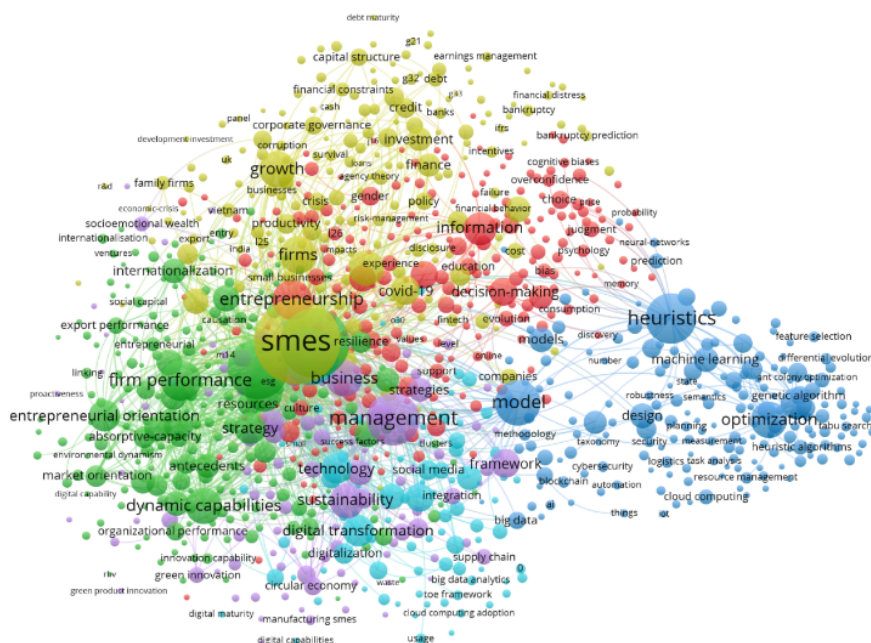
Bibliometrická mapa bola vytvorená v programe VOSviewer na základe exportu z databázy Web of Science za roky 2021 až 2026. Analyzovaný súbor obsahoval 7 614 záznamov, z toho 6 739 vedeckých článkov, 585 konferenčných príspevkov a 287

prehľadových štúdií. Najviac záznamov pochádzalo z rokov 2025, 2024 a 2023, čo naznačuje rastúci výskumný záujem o danú problematiku v poslednom období.

Bibliometrická mapa viewer ukazuje, že výskum malých a stredných podnikov je tematicky sústredený okolo pojmov SMEs, entrepreneurship, firm performance, management, finance, investment, debt, credit, financial constraints, decision-making, information, heuristics a bias. Najvýraznejším uzlom je pojem SMEs, ktorý je prepojený s výkonnosťou podnikov, podnikateľskou orientáciou, stratégiou, zdrojmi a rastom. Významný žltý klaster združuje pojmy súvisiace s finančným rozhodovaním, najmä investment, finance, credit, debt, capital structure a financial constraints. Červený klaster je orientovaný na rozhodovanie, informácie, kognitívne skreslenia, úsudok, riziko a finančné správanie. Modrý klaster reprezentuje modelovanie, optimalizáciu, heuristiky, strojové učenie a predikciu.

Obrázok 1

Bibliometrická mapa kľúčových slov súvisiacich s finančným rozhodovaním SME



Zdroj: vlastné spracovanie

Z mapy vyplýva, že finančné rozhodovanie SME sa nachádza na prieniku finančnej stratégie, manažérskeho rozhodovania a behaviorálnych faktorov. Táto štruktúra podporuje zameranie článku na investície, likviditu a zadlženie ako tri oblasti, v ktorých sa stretávajú finančné obmedzenia, subjektívne vnímanie rizika a rozhodovanie vlastníka malej spoločnosti. Uvedené poznatky vedú k záveru, že finančné rozhodovanie v malej spoločnosti je vhodné skúmať ako kombináciu finančno-ekonomických a behaviorálnych faktorov. Vlastník malej spoločnosti síce pracuje s číslami, no ich interpretácia je ovplyvnená osobnou skúsenosťou, očakávaniami, opatrnosťou, vnímaním rizika a preferenciou bezpečnosti.

2 Cieľ a metodika práce a metódy skúmania

Cieľom článku je identifikovať a opísať behaviorálne faktory, ktoré ovplyvňujú finančné rozhodovanie vlastnícky riadenej malej spoločnosti pri rozhodnutiach o investíciách, likvidite a zadlžení. Formulácia cieľa a výskumných otázok vychádza zo všeobecných metodologických odporúčaní pre tvorbu výskumného problému a jeho operacionalizáciu vo výskume (Ferjenčík, 2010; Bačíková a Janovská, 2018).

Metodicky článok vychádza z kvalitatívneho prístupu, ktorý je vhodný najmä vtedy, keď cieľom výskumu nie je štatistické zovšeobecnenie výsledkov, ale hlbšie porozumenie skúmanému javu v konkrétnom kontexte (Creswell a Creswell, 2018). Použitá bola literárna rešerš z databázy Web of Science, obsahová analýza vybraných odborných zdrojov, interpretácia bibliometrickej mapy vytvorenej vo VOSviewer a mini prípadová štúdia anonymizovanej modelovej spoločnosti.

Na základe výsledkov bibliometrickej analýzy sme sformulovali základnú výskumnú otázku: *Aké behaviorálne faktory ovplyvňujú finančné rozhodovanie vlastníka malej s.r.o. pri rozhodnutiach o investíciách, likvidite a zadlžení?*

Z hlavnej výskumnej otázky vyplývajú tri čiastkové otázky:

- **ČO1:** Ako vlastník malej spoločnosti posudzuje investičné rozhodnutia a akú úlohu pri nich zohráva intuícia, skúsenosť a vnímanie rizika?
- **ČO2:** Ako vlastník určuje primeranú likviditnú rezervu a akú úlohu pri tom zohráva potreba bezpečnosti?
- **ČO3:** Ako vlastník vníma dlhové financovanie a aké behaviorálne faktory vstupujú do rozhodnutia medzi vlastnými zdrojmi a úverom?

2.1 Výskumný nástroj – pološtruktúrovaný rozhovor

Pološtruktúrovaný rozhovor bol realizovaný s jedným respondentom, v jednom modelovom podniku a koncipovaný ako prípadová štúdia. Na zodpovedanie čiastkových výskumných otázok boli pripravené konkrétne otázky pološtruktúrovaného rozhovoru. Ich úlohou bolo zachytiť, ako vlastník modelovej spoločnosti uvažuje o investíciách, likviditnej rezerve a zadlžení, ako aj to, akým spôsobom do jeho rozhodovania vstupuje skúsenosť, intuícia, pocit bezpečnosti a vnímanie rizika. Otázky boli rozdelené do troch hlavných oblastí finančného rozhodovania a doplnené o prierezové otázky zamerané na celkový spôsob rozhodovania vlastníka. Nasledujúca tabuľka uvádza prehľad otázok použitých v rozhovore.

Tabuľka 1

Prehľad otázok pološtruktúrovaného rozhovoru

Oblasť	Otázka
Investície	Ako sa rozhodujete, či investovať do nového vybavenia, auta, technológie alebo softvéru?
Investície	Čo je pre Vás dôležitejšie – rýchla návratnosť alebo dlhodobý úžitok?
Investície	Stalo sa, že ste investíciu odložili, aj keď dávala ekonomický zmysel?
Likvidita	Koľko peňazí považujete za bezpečné ponechať vo firme?
Likvidita	Čo by sa muselo stať, aby ste rezervu znížili?
Likvidita	Uprednostnili by ste vyššiu rezervu alebo rýchlejší rast?
Zadlženie	Ako vnímate podnikateľský úver?
Zadlženie	Kedy by ste boli ochotný financovať rast úverom?
Zadlženie	Uprednostňujete vlastné zdroje alebo úver?
Celkové rozhodovanie	Akú úlohu zohráva Vaša skúsenosť z minulosti?
Celkové rozhodovanie	Rozhodujete sa skôr podľa čísel alebo podľa pocitu?
Celkové rozhodovanie	Čo by Vám pomohlo robiť finančné rozhodnutia istejšie?

Zdroj: vlastné spracovanie

Modelová spoločnosť je malá spoločnosť s ručením obmedzeným pôsobiaca v oblasti služieb. Vlastnícke a riadiace rozhodnutia sú koncentrované na úrovni konateľa, ktorý zároveň zodpovedá za obchodné, prevádzkové a finančné rozhodnutia. Spoločnosť nemá samostatné finančné oddelenie, preto sú finančné rozhodnutia realizované na základe kombinácie účtovných údajov, očakávaného cash-flow, skúseností z minulosti, znalosti zákazníkov a subjektívneho posúdenia rizika.

Ako výskumná metóda bol použitý pološtruktúrovaný rozhovor s vlastníkom modelovej spoločnosti. Tento typ rozhovoru umožňuje zachovať základnú tematickú štruktúru výskumu, no zároveň ponecháva priestor na zachytenie individuálnych skúseností, postojov a subjektívnych interpretácií respondenta (Flick, 2014). Rozhovor bol tematicky rozdelený do troch oblastí: investície, likvidita a zadlženie. Otázky boli zostavené na základe teoretických východísk, cieľa článku a výskumných otázok, v súlade s princípom prepojenia výskumného cieľa, výskumného nástroja a spôsobu vyhodnocovania údajov (Creswell a Creswell, 2018).

Keďže cieľom článku je zachytiť prejavy behaviorálnych faktorov vo finančnom rozhodovaní v praxi, odpovede vlastníka modelovej spoločnosti boli spracované na základe realizovaného rozhovoru a následne obsahovo autorizované respondentom. Pri ich vyhodnocovaní bol použitý obsahovo-tematický prístup, v rámci ktorého boli odpovede vlastníka najskôr priradené k trom oblastiam finančného rozhodovania – investíciám, likvidite a zadlženiu – a následne interpretované z hľadiska prejavov behaviorálnych faktorov (Braun a Clarke, 2022). V tomto článku boli základnými tematickými kategóriami investície, likvidita a zadlženie, pričom v rámci nich boli

sledované faktory, ako sú intuícia, skúsenosť, vnímanie rizika, potreba bezpečnosti, opatrnosť, averzia k strate a potreba zachovania kontroly nad podnikom.

Interpretácia týchto faktorov vychádzala z poznatkov deskriptívnych prístupov k rozhodovaniu, ktoré zdôrazňujú, že reálne rozhodovanie manažérov sa neodohráva v podmienkach úplnej racionality, ale je ovplyvňované obmedzenými informáciami, rozhodovacím štýlom, skúsenosťou, emóciami a subjektívnym hodnotením situácie (Remeňová a Jankelová, 2019). Pri kategorizácii odpovedí sa preto sledovalo, či vlastníci spoločnosti opisuje rozhodovanie ako analytické porovnávanie finančných alternatív, alebo skôr ako kombináciu finančných údajov, osobnej skúsenosti, intuície, opatrnosti a potreby kontroly. Takýto postup je v súlade s behaviorálnym pohľadom na manažérsky úsudok, podľa ktorého môžu rozhodnutia ovplyvňovať kognitívne skreslenia, predchádzajúce skúsenosti, nadmerná sebadôvera, ukotvenie v známych riešeniach alebo subjektívne vnímanie rizika (Bazerman a Moore, 2013).

Pri finančných rozhodnutiach vlastníka malej spoločnosti bola osobitná pozornosť venovaná aj tomu, ako respondent hodnotí riziko, neistotu a možné dôsledky rozhodnutia. V tejto súvislosti boli odpovede interpretované aj s prihliadnutím na poznatky o posudzovaní rizika pri osobných financiách a podnikateľských príležitostiach, kde významnú úlohu zohráva nielen racionálne zhodnotenie možného výnosu, ale aj subjektívny pocit bezpečia, obava zo straty a ochota niesť dôsledky rozhodnutia (Bačová a kol., 2019). Pri rozhodnutiach o investíciách, likviditnej rezerve a zadlžení sa preto sledovalo, či vlastníci spoločnosti uvažuje predovšetkým v kategóriách rastu a návratnosti, alebo skôr v kategóriách stability, ochrany pred stratou, udržania kontroly a zníženia neistoty.

Zároveň boli zohľadnené aj novšie poznatky o variabilite ľudského úsudku a rozhodovacích odchýlkach, ktoré upozorňujú, že rozdiely v rozhodovaní nemusia byť spôsobené iba systematickými skresleniami, ale aj rozdielnou interpretáciou podobných situácií, momentálnym kontextom a subjektívnym nastavením rozhodovateľa (Kahneman a kol., 2021; Gigerenzer, 2023). V podmienkach malej spoločnosti je tento aspekt významný najmä preto, že finančné rozhodnutia sú sústredené do rúk jedného vlastníka, ktorý zároveň nesie ekonomické aj osobné dôsledky svojich rozhodnutí. Zachytenie behaviorálnych faktorov preto umožňuje lepšie porozumieť tomu, prečo vlastníci nemusia vždy preferovať finančne najvýnosnejšiu alternatívu, ale môže uprednostniť riešenie, ktoré vníma ako bezpečnejšie, kontrolovateľnejšie a dlhodobo udržateľné.

2.2 Analýza údajov

Cieľom štúdie bolo preskúmať pohľad na finančné rozhodovanie vlastnícky riadenej malej spoločnosti v podmienkach obmedzenej racionality. Údaje získané prostredníctvom štruktúrovaného rozhovoru s konateľom spoločnosti boli analyzované tematickou analýzou.

Tematická analýza, ako nástroj na identifikáciu vzorov v dátových súboroch, sa uplatňuje v rozhovoroch s jednotlivými respondentmi. Avšak predstavuje výraznú výzvu pri

zachytávaní individuálnych, osobitých významov (Yi a kol., 2025). V tomto kontexte sa uplatnená metodika posúva od hľadania agregovaných trendov k zdôrazňovaniu hĺbky reflexivity a nuansovanej konštrukcie reality, ktorá je vlastná špecifickému naratívu účastníka (Lee a kol., 2024; Naeem a kol., 2023). V prípadovej štúdií sme identifikovali latentné významy a prepojenosť výpovedí vyplývajúcich zo skúseností tak, aby zachovali metodologickú integritu (Braun a Clarke, 2021; Polat, 2025). Konkrétne bola v práci uplatnená reflexívna tematická analýza (Perry a kol., 2022; Braun et al., 2019; Braun & Clarke, 2019).

Odpovede boli analyzované v softvéri maxqda. Takto zvolený metodický postup umožňuje prepojiť finančno-ekonomický obsah rozhodnutí s behaviorálnou interpretáciou rozhodovacieho procesu (Braun a Clarke, 2019; Naeem a kol., 2023). Výsledkom preto nie je hodnotenie finančnej výkonnosti modelovej spoločnosti, ale kvalitatívne zachytenie spôsobu, akým vlastník malej spoločnosti interpretuje finančné rozhodnutia v podmienkach obmedzenej racionality.

3 Výsledky výskumu

3.1 Investičné rozhodovanie

Prvá skúmaná oblasť sa týkala rozhodovania o investíciách. V malej spoločnosti môže ísť napríklad o nákup pracovného vybavenia, vozidla, softvéru, technológie alebo iného nástroja, ktorý má zvýšiť efektívnosť podnikania. Vlastník modelovej spoločnosti pri tejto otázke neuvažoval iba v kategóriách formálnej návratnosti investície, ale aj v kategóriách prevádzkovej potreby, bezpečnosti a očakávaného využitia.

Otázka 1: Ako sa rozhodujete, či investovať do nového vybavenia, auta, technológie alebo softvéru?

Odpoveď vlastníka: „Najprv sa pozerám na to, či tú vec naozaj potrebujem pre výkon práce alebo pre získanie ďalších zákaziek. Ak ide len o niečo, čo by bolo dobré mať, ale nie je to nevyhnutné, skôr to odložím. Pozerám sa aj na to, či mám na to dostatok peňazí bez toho, aby som ohrozil bežnú prevádzku firmy. Nechcem investovať tak, že potom budem nervózny z každej faktúry, ktorá príde neskoro.“

Otázka 2: Čo je pre Vás dôležitejšie – rýchla návratnosť alebo dlhodobý úžitok?

Odpoveď vlastníka: „Najlepšie je, keď sa to vráti rýchlo, ale pri niektorých veciach viem akceptovať aj dlhší horizont. Musím však vidieť, že to má praktický význam. Nepotrebujem mať najmodernejšie riešenie len preto, že je moderné. Dôležité je, aby mi to šetrilo čas, znižovalo chyby alebo pomohlo lepšie obslúžiť zákazníka.“

Otázka 3: Stalo sa, že ste investíciu odložili, aj keď dávala ekonomický zmysel?

Odpoveď vlastníka: „Áno, stalo sa. Niekedy čísla vyzerajú dobre, ale človek má pocit, že teraz nie je správny čas. Napríklad keď sú neisté zákazky alebo keď neviem, či budú platby chodiť načas. Vtedy radšej počkám, aj keď viem, že investícia by mi možno pomohla.“

3.2 Likviditné rozhodovanie

Druhou skúmanou oblasťou bolo rozhodovanie o likviditnej rezerve. V malých spoločnostiach má likvidita často väčší význam než formálna ziskovosť. Podnik môže byť účtovne ziskový, ale ak nemá k dispozícii hotovosť na úhradu záväzkov, dostáva sa do finančného napätia. Krátkodobá solventnosť a pracovný kapitál sú významné pre prežitie najmä mladších SME, pričom likvidita chráni podnik pred neočakávanými udalosťami.

Otázka 4: Koľko peňazí považujete za bezpečné ponechať vo firme?

Odpoveď vlastníka: „Potrebujem mať pocit, že aj keby dva alebo tri mesiace neprišli očakávané príjmy, firma vie fungovať. Nejde len o presné číslo. Je to skôr hranica, pri ktorej viem pokojne spať. Keď rezerva klesne pod túto hranicu, prestávam rozmýšľať o investíciách a sústredím sa na to, aby sa najprv doplnila hotovosť.“

Otázka 5: Čo by sa muselo stať, aby ste rezervu znížili?

Odpoveď vlastníka: „Rezervu by som znížil len vtedy, keby išlo o veľmi dobrú príležitosť a zároveň by som mal istotu, že prídu ďalšie príjmy. Napríklad keby bola podpísaná zákazka, dobrá platobná disciplína zákazníka a investícia by bola priamo potrebná na jej realizáciu. Bez toho by som do rezervy siahla nerád.“

Otázka 6: Uprednostnili by ste vyššiu rezervu alebo rýchlejšiu rast?

Odpoveď vlastníka: „Skôr vyššiu rezervu. Rast je dobrý, ale nie za cenu toho, že firma stratí stabilitu. Malá firma si nemôže dovoliť veľké výkyvy. Radšej rásť pomalšie, ale mať veci pod kontrolou.“

3.3 Rozhodovanie o zadlžení

Treťou skúmanou oblasťou bolo rozhodovanie o zadlžení. V klasickej finančnej teórii sa dlh posudzuje najmä podľa ceny kapitálu, daňového efektu, rizika a vplyvu na kapitálovú štruktúru. V malej spoločnosti však úver často nadobúda aj psychologický význam. Vlastník ho môže vnímať ako záväzok, zdroj tlaku alebo obmedzenie slobody rozhodovania.

Otázka 7: Ako vnímate podnikateľský úver?

Odpoveď vlastníka: „Úver nevnímam ako niečo zlé, ale mám pred ním rešpekt. Je rozdiel investovať vlastné zarobené peniaze a zaviazať sa banke. Úver znamená, že splátka príde každý mesiac bez ohľadu na to, či zákazník zaplatil načas. Preto by som ho bral len vtedy, keby som mal veľmi jasný dôvod.“

Otázka 8: Kedy by ste boli ochotný financovať rast úverom?

Odpoveď vlastníka: „Vtedy, keby bola investícia priamo naviazaná na zákazku alebo na niečo, čo viem reálne využiť. Nešiel by som do úveru len preto, že chcem pôsobiť väčší alebo rýchlejšie rásť. Musel by som mať prepočítané, že splátky zvládnem aj v horšom mesiaci.“

Otázka 9: Uprednostňujete vlastné zdroje alebo úver?

Odpoveď vlastníka: „Ak sa dá, radšej vlastné zdroje. Mám väčší pocit kontroly. Úver by som využil len vtedy, ak by vlastné zdroje nestačili a príležitosť by bola dostatočne silná. Nechcem, aby firma žila len na splátkach.“

3.4 Celkové rozhodovanie

Štvrtá skúmaná oblasť mala prierezový charakter a zameriavala sa na celkový spôsob finančného rozhodovania vlastníka modelovej spoločnosti. Cieľom nebolo sledovať samostatnú finančnú oblasť, ale zachytiť, akým spôsobom vlastníci prepájajú finančné údaje, skúsenosť, intuíciu a subjektívne vnímanie neistoty naprieč investičnými, likviditnými a dlhovými rozhodnutiami. Táto časť rozhovoru umožňuje lepšie porozumieť tomu, či sa vlastník pri rozhodovaní opiera najmä o čísla, alebo či do rozhodnutí vstupuje aj osobná skúsenosť, pocit bezpečia a spätná väzba z minulých rozhodnutí.

Otázka 10: Akú úlohu zohráva Vaša skúsenosť z minulosti?

Odpoveď vlastníka: „Veľkú. Keď človek už zažil, že zákazník zaplatil neskoro alebo že nejaký výdavok prišiel v najhoršom možnom čase, začne sa na rozhodnutia pozeráť opatrnejšie. Nejde len o to, čo ukazujú čísla dnes, ale aj o to, čo sa môže stať, keď sa situácia zhorší. Skúsenosť mi pomáha odhadnúť, kedy je rozhodnutie ešte bezpečné a kedy už je lepšie počkať.“

Otázka 11: Rozhodujete sa skôr podľa čísel alebo podľa pocitu?

Odpoveď vlastníka: „Snažím sa pozeráť najprv na čísla, teda na cash-flow, náklady, očakávané príjmy a to, či si firma môže dané rozhodnutie dovoliť. Ale samotné čísla mi nestačia. Dôležitý je aj pocit, či je správny čas, či zákazky vyzerajú stabilne a či ma dané rozhodnutie nebude príliš tlačiť. Najčastejšie je to teda kombinácia čísel, skúsenosti a pocitu.“

Otázka 12: Čo by Vám pomohlo robiť finančné rozhodnutia istejšie?

Odpoveď vlastníka: „Pomohlo by mi mať lepší prehľad o budúcich príjmoch, spoľahlivejšie plánovanie cash-flow a viac informácií o tom, ako sa podobné rozhodnutia osvedčili v minulosti. Užitočné by bolo aj spätne si vyhodnocovať väčšie rozhodnutia – či investícia naozaj priniesla očakávaný úžitok, či bola rezerva nastavená správne alebo či by úver nebol zbytočne veľké riziko. Väčšia istota by prišla hlavne z lepších informácií a zo spätnej väzby.“

3.5 Súhrn identifikovaných behaviorálnych faktorov

Na základe výsledkov tematickej analýzy odpovedí vlastníka možno identifikovať viacero behaviorálnych faktorov, ktoré vstupujú do finančného rozhodovania vlastníka malej spoločnosti.

Najčastejšie používané slová vo vyjadrení respondenta



Na základe poskytnutého textu sme vypracovali reflexívnu tematickú analýzu (RTA) investičného rozhodovania vlastníka malého podniku (SME). Táto analýza sa neorientuje len na povrchné frekvencie slov, ale snaží sa zachytiť latentné významy a nuansovanú konštrukciu reality účastníka výskumu.

1. Psychologický pokoj ako hranica finančnej únosnosti - pre vlastníka nie je finančná rezerva len účtovnou položkou, ale kľúčovým faktorom pre jeho mentálne zdravie a schopnosť rozhodovať sa.

2. Pragmatickosť a funkčnosť nad estetickou modernosťou - investície nie sú vnímané ako nástroj na budovanie imidžu, ale ako čisto funkčné prostriedky na riešenie konkrétnych prevádzkových potrieb. Kľúčový prístup vlastníka je, že rozlišuje medzi tým, čo je „nevyhnutné“, a tým, čo by bolo „dobré mať“.

3. Intuitívna obozretnosť formovaná minulosťou - rozhodovací proces je hybridom ekonomickej racionality a subjektívneho „pocitu“, ktorý je hlboko ukotvený v predchádzajúcich negatívnych skúsenostiach.

Rola skúsenosti: Minulé zlyhania (napr. neskoré platby od zákazníkov) slúžia ako varovný mechanizmus, ktorý vlastníka učí odhadnúť, kedy je rozhodnutie „ešte bezpečné“. Vzniká

tu napätie medzi číslami a intuíciou. Aj keď čísla (cash-flow) dávajú ekonomický zmysel, vlastník je ochotný investíciu odložiť, ak „pocit“ hovorí, že nie je správny čas. To potvrdzuje tézu, že metodika SME rozhodovania zahŕňa hĺbkovú reflexivitu a individuálne významy.

4. Autonómia a kontrola cez odpor k externému dlhu - vlastník vníma bankový úver ako potenciálnu stratu kontroly a zdroj neustáleho tlaku. Vnímanie rizika - úver je vnímaný ako záväzok, ktorý nerešpektuje realitu podnikania (splátka musí odísť bez ohľadu na to, či zákazník zaplatil).

Preferenčný rámec: Vlastné zdroje sú synonymom pre „pocit kontroly“. Úver je akceptovateľný len vtedy, ak je priamo a bezpečne naviazaný na konkrétnu, už podpísanú zákazku.

Tabuľka 2

Sumarizácia behaviorálnych faktorov

Otázka	Prejav v odpovediach	Identifikovaný behaviorálny faktor
1	Rozhodovanie podľa potreby investície a jej vplyvu na bežnú prevádzku.	Opatrnosť, averzia k strate, vnímanie rizika.
2	Rozhodovanie podľa praktického využitia a skúsenosti.	Učenie založené na predchádzajúcej skúsenosti, subjektívne hodnotenie úžitku.
3	Odklad investície napriek ekonomickému zmyslu.	Averzia k strate, status quo bias.
4	Potreba rezervy, pri ktorej vlastník „pokojne spí“.	Potreba bezpečnosti, opatrnosť.
5	Zníženie rezervy len pri dôvere v budúce príjmy.	Dôvera, vnímanie rizika, neistota.
6	Uprednostnenie stability pred rýchlym rastom.	Averzia k riziku, preferencia stability.
7	Rešpekt pred úverom a mesačnými splátkami.	Averzia k záväzku, vnímanie straty flexibility.
8	Využitie úveru len pri jasnom účele a zvládnutí horšieho scenára.	Opatrnosť, vnímanie rizika.
9	Preferencia vlastných zdrojov.	Potreba kontroly, averzia k zadĺženiu.
10	Rozhodovanie ovplyvnené skúsenosťou z minulosti.	Heuristika dostupnosti, učenie založené na predchádzajúcej skúsenosti.
11	Kombinácia čísel, skúsenosti a pocitu.	Obmedzená racionalita.
12	Potreba lepších informácií a spätnej väzby.	Potreba informácií, znižovanie neistoty.

Zdroj: vlastné spracovanie

Na základe realizovaného rozhovoru, interpretácie odpovedí vlastníka a súhrnu identifikovaných behaviorálnych faktorov možno formulovať odpoveď na hlavnú výskumnú otázku aj tri čiastkové výskumné otázky.

ČO1: Ako vlastník malej spoločnosti posudzuje investičné rozhodnutia a akú úlohu pri nich zohráva intuícia, skúsenosť a vnímanie rizika?

Z odpovedí vyplýva, že vlastník malej spoločnosti posudzuje investičné rozhodnutia predovšetkým cez ich praktickú potrebu, využiteľnosť a vplyv na bežnú prevádzku firmy.

Investícia nie je hodnotená iba podľa formálnej návratnosti alebo očakávaného ekonomického prínosu, ale aj podľa toho, či je skutočne potrebná, či pomôže pri výkone práce, získaní zákaziek, úspore času alebo znížení chybovosti. Skúsenosť vlastníka zohráva významnú úlohu pri rozlišovaní medzi investíciou, ktorá je nevyhnutná, a investíciou, ktorá by bola iba vhodná alebo príjemná. Vnímanie rizika sa prejavuje najmä v opatrnosti a averzii k strate. Vlastník je ochotný investíciu odložiť aj vtedy, keď dáva ekonomický zmysel, ak má pocit, že by mohla ohroziť hotovosť, stabilitu firmy alebo prísť v nevhodnom čase. Investičné rozhodovanie je preto výsledkom kombinácie finančnej racionality, praktickej skúsenosti, subjektívneho hodnotenia úžitku a opatrnosti pri neistom vývoji.

ČO2: Ako vlastník určuje primeranú likviditnú rezervu a akú úlohu pri tom zohráva potreba bezpečnosti?

Primeranú likviditnú rezervu vlastník neurčuje výlučne ako presný finančný ukazovateľ, ale skôr ako hranicu finančnej istoty, pri ktorej má pocit, že firma dokáže bezpečne fungovať aj pri dočasnom výpadku príjmov. Likviditná rezerva má preto nielen ekonomickú, ale aj psychologickú funkciu. Predstavuje nástroj ochrany pred neistotou, oneskorenými platbami a neočakávanými výdavkami. Potreba bezpečnosti sa prejavuje v tom, že vlastník uprednostňuje stabilitu pred rýchlym rastom a rezervu by znížil iba vtedy, ak by mal dostatočnú dôveru v budúce príjmy, podpísanú zákazku a dobrú platobnú disciplínu zákazníka. Pri likviditnom rozhodovaní sa preto prejavuje opatrnosť, potreba bezpečnosti, vnímanie rizika, neistota, dôvera v budúce príjmy a preferencia stability. Likvidita je v tomto prípade chápaná nielen ako finančný zdroj, ale aj ako predpoklad pokoja, kontroly a schopnosti firmy prežiť nepriaznivé obdobie.

ČO3: Ako vlastník vníma dlhové financovanie a aké behaviorálne faktory vstupujú do rozhodnutia medzi vlastnými zdrojmi a úverom?

Vlastník nevníma dlhové financovanie ako principiálne nevhodné, ale pristupuje k nemu s výraznou mierou opatrnosti. Úver pre neho nepredstavuje iba finančný nástroj, ale aj záväzok, ktorý prináša pravidelné mesačné splátky, tlak na cash-flow a možnú stratu flexibility. Pri rozhodovaní o úvere je preto dôležité, či má financovanie jasný účel, či je naviazané na konkrétnu zákazku alebo reálne využiteľnú investíciu a či by firma zvládla splátky aj v horšom období. Pri voľbe medzi vlastnými zdrojmi a úverom vlastník preferuje vlastné zdroje, pretože mu poskytujú väčší pocit kontroly, nezávislosti a finančnej voľnosti. Do rozhodovania o zadlžení vstupuje najmä averzia k záväzku, vnímanie straty flexibility, opatrnosť, potreba kontroly, vnímanie rizika a averzia k zadlženiu. Úver je teda prijateľný iba vtedy, ak je jeho účel dostatočne jasný a riziko splácania vnímané ako zvládnuteľné.

Hlavná výskumná otázka: Aké behaviorálne faktory ovplyvňujú finančné rozhodovanie vlastníka malej s.r.o. pri rozhodnutiach o investíciách, likvidite a zadlžení?

Výsledky mini prípadovej štúdie naznačujú, že finančné rozhodovanie vlastníka malej s.r.o. ovplyvňuje viacero vzájomne prepojených behaviorálnych faktorov. Najvýraznejšie sa prejavuje opatrnosť, averzia k strate, averzia k riziku, potreba bezpečnosti, potreba kontroly, vnímanie neistoty, dôvera v budúce príjmy, skúsenostné učenie a heuristika

dostupnosti. Tieto faktory sa neprejavujú izolovane, ale vstupujú do rozhodovania naprieč všetkými sledovanými oblasťami. Pri investíciách sa prejavujú najmä v posudzovaní praktického úžitku a v odkladaní rozhodnutí pri neistote. Pri likvidite sa prejavujú v potrebe udržať bezpečnú rezervu a uprednostniť stabilitu pred rýchlym rastom. Pri zadlžení sa prejavujú v rešpekte pred úverom, obave zo straty flexibility a preferencii vlastných zdrojov.

Finančné rozhodovanie vlastníka preto nemožno vysvetliť iba ako formálne porovnávanie finančných ukazovateľov, ale ani označiť za iracionálne. Ide skôr o rozhodovanie v podmienkach obmedzenej racionality, pri ktorom sú čísla, cash-flow, náklady a očakávané príjmy dopĺňané skúsenosťou, intuíciou, pocitom bezpečia a subjektívnym hodnotením rizika. Rozhodovateľ v takomto kontexte nehľadá nevyhnutne optimálne riešenie, ale riešenie, ktoré považuje za dostatočne bezpečné, kontrolovateľné a udržateľné. Behaviorálne faktory preto nemožno chápať iba ako izolované rozhodovacie chyby, ale aj ako súčasť praktického spôsobu uvažovania, ktorý pomáha vlastníkovi chrániť podnik pred stratou likvidity, nadmerným zadlžením a neuváženým rastom.

Záver

Článok sa venoval finančnému rozhodovaniu vlastnícky riadenej malej spoločnosti v podmienkach obmedzenej racionality. Jeho cieľom bolo identifikovať a opísať behaviorálne faktory, ktoré vstupujú do rozhodovania vlastníka pri tvorbe finančnej stratégie, najmä v oblastiach investícií, likvidity a zadlżenia. Výskum mal charakter mini prípadovej štúdie anonymizovanej modelovej spoločnosti a vychádzal z kvalitatívneho spracovania pološtruktúrovaného rozhovoru.

Hlavným poznatkom článku je, že finančná stratégia malej spoločnosti nevzniká iba na základe finančných ukazovateľov, ale aj prostredníctvom subjektívnej interpretácie rizika, istoty a prijateľnosti rozhodnutia. Vlastník v tomto procese nehodnotí iba ekonomickú výhodnosť jednotlivých možností, ale aj ich vplyv na stabilitu, kontrolu nad podnikom a schopnosť zvládnuť nepriaznivý vývoj. Tento pohľad umožňuje lepšie porozumieť tomu, prečo sa vlastník malej spoločnosti nemusí vždy rozhodnúť pre finančne najvýnosnejšiu alternatívu, ale uprednostní riešenie, ktoré považuje za bezpečné, zvládnutelné a dlhodobo udržateľné.

Prínos článku spočíva v prepojení finančno-ekonomického a behaviorálneho pohľadu na rozhodovanie vlastníka malej spoločnosti. Identifikované behaviorálne faktory nie sú interpretované iba ako možné rozhodovacie skreslenia, ale aj ako súčasť praktického spôsobu uvažovania v prostredí neistoty. V kontexte malej spoločnosti môžu tieto faktory podporovať finančnú stabilitu a opatrnosť, zároveň však môžu brzdiť rýchlejšie využívanie rastových príležitostí. Ich význam je preto potrebné vnímať vyvážené, nielen ako riziko, ale aj ako prirodzenú súčasť rozhodovania v podmienkach obmedzených informácií a priamej zodpovednosti vlastníka za dôsledky rozhodnutí.

Z praktického hľadiska článok poukazuje na potrebu jednoduchého rozhodovacieho rámca, ktorý by pri väčších finančných rozhodnutiach prepájal ekonomické ukazovatele

s posúdením likvidity, zadlženia, schopnosti zvládnuť nepriaznivý scenár a subjektívne vnímaného rizika. Takýto rámec by mohol vlastníkovi pomôcť zachovať výhodu praktickej skúsenosti, ale zároveň podporiť systematickejšie a disciplinovanejšie finančné rozhodovanie.

Obmedzením článku je jeho zameranie na jednu anonymizovanú modelovú spoločnosť, preto výsledky nemožno zovšeobecňovať na všetky malé a stredné podniky. Možno ich však chápať ako ilustráciu toho, ako sa behaviorálne faktory môžu prejavovať v konkrétnom prostredí vlastnícky riadenej malej spoločnosti. Budúci výskum by sa mohol zamerať na porovnanie viacerých malých podnikov z rôznych odvetví a veľkostných kategórií, prípadne prepojiť kvalitatívne rozhovory s vybranými finančnými ukazovateľmi, ako sú likvidita, zadlženosť, investičná aktivita alebo stabilita cash-flow

Poznámka o riešenom projekte

Tento príspevok je čiastkovým výstupom riešenia projektu VEGA 1/0775/25 Na dátach založená zelená transformácia: strategické cesty k udržateľným modelom a zeleným inováciám.

Použitá literatúra (References)

Ahmad, M. (2024). The role of cognitive heuristic-driven biases in investment management activities and market efficiency: A research synthesis. *International Journal of Emerging Markets*, 19(2), 273–321. <https://doi.org/10.1108/IJOEM-07-2020-0749>

Amoa-Gyarteng, K., a Dhliwayo, S. (2023). Capital structure, profitability, and short-term solvency of nascent SMEs in Ghana: An empirical study. *Journal of Entrepreneurship Management and Innovation*, 19(4), 83–110. <https://doi.org/10.7341/20231943>

Bačíková, M., a Janovská, A. (2018). *Základy metodológie pedagogicko-psychologického výskumu. Sprievodca pre študentov učiteľstva*. Košice: ŠafárikPress. 154 s. ISBN: 978-80-8152-695-4

Bačová, V., Fedáková, D., Hanák, R., Kožárová, Z. a Nemcová, E. (2019). *Posudzovanie rizika v rozhodovaní jednotlivcov o osobných financiách a podnikateľských príležitostiach*. Bratislava: Ústav experimentálnej psychológie, Centrum spoločenských a psychologických vied SAV. 113 s. ISBN: 978-80-98524-43-3

Bazerman, M. H. a Moore, D. A. (2013). *Judgment in Managerial Decision Making*. 8th ed. Hoboken: Wiley. 277 s. ISBN: 978-1118065709.

Berthet, V. (2022). The impact of cognitive biases on professionals' decision-making: A review of four occupational areas. *Frontiers in Psychology*, 12, Article 802439. <https://doi.org/10.3389/fpsyg.2021.802439>

Braun, V., a Clarke, V. (2019). Reflecting on Reflexive Thematic Analysis. *Qualitative Research in Sport, Exercise and Health*, 11, 589-597. <https://doi.org/10.1080/2159676X.2019.1628806>

Braun, V., a Clarke, V. (2022). *Thematic Analysis. A Practical Guide*. Sage Publications. 376 s. ISBN: 9781473953246

Braun, V., Clarke, V., Hayfield, N., a Terry, G. (2019). Thematic Analysis. In: Liamputtong, P. (eds) *Handbook of Research Methods in Health Social Sciences*. Springer, Singapore. https://doi.org/10.1007/978-981-10-5251-4_103

Bvirindi, T. C., a Inalegwu, O.-I. (2024). The impact of the global financial crisis and the European sovereign debt crisis on the capital structure of firms in Europe: Do SMEs, and listed firms respond the same? *The European Journal of Finance*, 30(8), 889–913. <https://doi.org/10.1080/1351847X.2023.2244553>

Civelek, M., Krajčík, V., a Fialová, V. (2023). The impacts of innovative and competitive abilities of SMEs on their different financial risk concerns: System approach. *Oeconomia Copernicana*, 14(1), 327–354. <https://doi.org/10.24136/oc.2023.009>

Creswell, J. W., a Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). SAGE Publications. 304 s. ISBN: 978-1-5063-8670-6

Drydakakis, N. (2022). Artificial intelligence and reduced SMEs' business risks: A dynamic capabilities analysis during the COVID-19 pandemic. *Information Systems Frontiers*, 24(4), 1223–1247. <https://doi.org/10.1007/s10796-022-10249-6>

European Central Bank. (2026). *Survey on the access to finance of enterprises in the euro area – First quarter of 2026*. Online: https://www.ecb.europa.eu/stats/ecb_surveys/safe/html/ecb.safe202604.en.html

European Commission. (2025). *European Innovation Scoreboard 2025: Slovakia country profile*. Online: https://ec.europa.eu/assets/rtd/eis/2025/ec_rtd_eis-country-profile-sk.pdf

Ferjenčík, J. (2010). *Úvod do metodologie psychologického výzkumu*. Vyd. 2. Praha: Portál. 255 s. ISBN: 978-80-7367-815-9

Finnegan, M., a Kapoor, S. (2023). ECB unconventional monetary policy and SME access to finance. *Small Business Economics*, 61(3), 1253–1288. <https://doi.org/10.1007/s11187-023-00730-0>

Flick, U. (2014). *An Introduction to Qualitative Research*. Sage. 616 s. ISBN 978-1-4462-6779-0

Frimpong, S. E., Agyapong, G., a Agyapong, D. (2022). Financial literacy, access to digital finance and performance of SMEs: Evidence from Central region of Ghana. *Cogent Economics & Finance*, 10(1), Article 2121356. <https://doi.org/10.1080/23322039.2022.2121356>

Gigerenzer G. (2023). *The Intelligence of Intuition*. Cambridge University Press. 176 s. ISBN: 9781009304887

Kahneman, D., Sibony, O. & Sunstein, C. (2021). *Šum. O chybách v ľudskom úsudku*. Bratislava: Aktuell. 399s. ISBN: 978-0-3164-5138-3.

- Kastelli, I., Siokas, G., a Tsakanikas, A. (2024). Entrepreneurial absorptive capacity as enabler of knowledge intensive entrepreneurship: An empirical investigation. *Journal of the Knowledge Economy*, 15(2), 9667–9698. <https://doi.org/10.1007/s13132-023-01465-9>
- Kljucnikov, A., Civelek, M., Cervinka, M., Voznáková, I., a Vincúrová, Z. (2022). The role of SMEs' innovativeness and competitiveness in their financial risk management concerns. *Journal of Competitiveness*, 14(4), 97–116. <https://doi.org/10.7441/joc.2022.04.06>
- Lee, V. V., van der Lubbe, S. C. C., Goh, L. H., a Valderas, J. M. (2024). Harnessing ChatGPT for Thematic Analysis: Are We Ready?. *Journal of medical Internet research*, 26, e54974. <https://doi.org/10.2196/54974>
- Marín, R., Santos-Arteaga, F. J., Tavana, M., a Di Caprio, D. (2023). Value chain digitalization and technological development as innovation catalysts in small and medium-sized enterprises. *Journal of Innovation & Knowledge*, 8(4), Article 100454. <https://doi.org/10.1016/j.jik.2023.100454>
- Naeem, M., Ozuem, W., Howell, K., & Ranfagni, S. (2023). A step-by-step process of thematic analysis to develop a conceptual model in qualitative research. *International Journal of Qualitative Methods*, 22, 1–18. <https://doi.org/10.1177/16094069231205789>
- OECD (2021), SME Entrepreneurship Policy in Slovak Republic, OECD Studies on SMEs and Entrepreneurship, OECD Publishing, Paris, <https://doi.org/10.1787/9097a251-en>
- OECD (2026), Slovak Republic: Financing SMEs and entrepreneurs 2026. In *Financing SMEs and Entrepreneurs 2026: An OECD Scoreboard*, OECD Publishing, Paris, <https://doi.org/10.1787/075d8058-en>
- Perry, K., Meissel, K., a Hill, M. F. (2022). Rebooting assessment. Exploring the challenges and benefits of shifting from pen-and-paper to computer in summative assessment. *Educational Research Review*, Vol 36, <https://doi.org/10.1016/j.edurev.2022.100451>.
- Polat, A. (2025). Thematic Analysis in Qualitative Research: Common Pitfalls and Practical Insights for Academic Writing. *International Journal of Qualitative Methods*, 24. <https://doi.org/10.1177/16094069251372835>
- Qerimi, A., Balaj, D., & Krasniqi, B. A. (2024). The capital structure dynamics of SMEs in Kosovo: Evidence using panel data. *South East European Journal of Economics and Business*, 19(2), 82–102. <https://doi.org/10.2478/jeb-2024-0017>
- Remeňová, K. a Jankelová, N. (2019). *A descriptive approach to decision making and decision-making style*. Hamburg: Verlag Dr. Kovač. 137 s. ISBN: 978-3-339-11218-7
- Sommer, C. (2024). The role of capital markets for small and medium-sized enterprise (SME) finance. *Journal of Development Studies*, 60(11), 1812–1831. <https://doi.org/10.1080/00220388.2024.2377299>
- Sulistianingsih, H. a Santi, F. (2023) Does SME's financing decisions follow pecking order pattern? The role of financial literacy, risk preference, and home bias in SME financing decisions, *Cogent Business & Management*, 10:1, 2174477, <https://doi.org/10.1080/23311975.2023.2174477>

Wang, H., Xiang, X., a Han, L. (2023). Financial development, legal systems and SME finance: Cross-country evidence. *International Review of Economics & Finance*, 88, 981–1002. <https://doi.org/10.1016/j.iref.2023.07.021>

Yi, S., Nguyen, J., Xu, H., Lim, T., Skrovan, J., Beri, M., Mehak, M., Modi, H., Well, A., Leqi, L., Markey, M. a Ding, Y. (2025). SFT-TA: Supervised Fine-Tuned Agents in Multi-Agent LLMs for Automated Inductive Thematic Analysis. <https://doi.org/10.48550/arXiv.2509.17167>

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TECHNICKÁ EFEKTÍVNOSŤ A REGIONÁLNE ROZDIELY V KVALITE OVZDUŠIA A RESPIRAČNÝCH HOSPITALIZÁCIÁCH NA SLOVENSKU

Roman Tranžík

Abstract

Článok sa zameriava na hodnotenie finančnej stability vybraných verejných zdravotníckych zariadení v Slovenskej republike v období rokov 2020 až 2024. Cieľom článku je posúdiť finančnú stabilitu nemocníc prostredníctvom ukazovateľov likvidity, zadlženosti, čistého pracovného kapitálu, vlastného imania a výsledku hospodárenia. Analýza vychádza z verejne dostupných účtovných údajov z Registra účtovných závierok. Výskumnú vzorku tvorí päť zdravotníckych zariadení: Univerzitná nemocnica Bratislava, Univerzitná nemocnica L. Pasteura Košice, Univerzitná nemocnica Martin, Fakultná nemocnica s poliklinikou F. D. Roosevelta Banská Bystrica a Fakultná nemocnica Trnava. V článku boli použité metódy analýzy, komparácie, deskriptívnej štatistiky, poradového bodového hodnotenia a Spearmanovej korelačnej analýzy. Výsledky ukázali, že finančná stabilita sledovaných nemocníc bola vo väčšine prípadov oslabená, najmä v dôsledku nízkej likvidity, záporného čistého pracovného kapitálu, vysokej zadlženosti a záporného vlastného imania. Najnepriaznivejšiu finančnú pozíciu vykazovali Univerzitná nemocnica Bratislava a Univerzitná nemocnica L. Pasteura Košice. Relatívne priaznivejšie postavenie dosiahla Fakultná nemocnica s poliklinikou F. D. Roosevelta Banská Bystrica a v niektorých ukazovateľoch aj Fakultná nemocnica Trnava. Spearmanova korelačná analýza potvrdila štatisticky významné monotónne vzťahy medzi ukazovateľmi likvidity, celkovou zadlženosťou, mierou samofinancovania a čistým pracovným kapitálom. Na základe výsledkov bola nulová hypotéza zamietnutá. Zistenia poukazujú na potrebu hodnotiť finančnú stabilitu verejných nemocníc viacrozmerne, nie iba prostredníctvom výsledku hospodárenia alebo jedného izolovaného ukazovateľa.

JEL classification: C10, I12, Q53

Keywords: znečistenie ovzdušia; respiračné hospitalizácie; Slovensko

Úvod

Zdravotnícke zariadenia patria medzi kľúčové subjekty verejného záujmu, pretože ich fungovanie priamo súvisí s dostupnosťou a kontinuitou zdravotnej starostlivosti. Stabilné financovanie nemocníc je dôležité nielen z pohľadu ich vnútorného hospodárenia, ale aj z hľadiska schopnosti zabezpečovať každodennú prevádzku, reagovať na rastúce náklady a udržiavať rozsah a kvalitu poskytovaných služieb. Finančné problémy nemocníc sa preto neprejavujú iba v účtovných výkazoch, ale môžu vytvárať tlak na riadenie prevádzky, investičné rozhodnutia a celkovú udržateľnosť poskytovania zdravotnej starostlivosti. Odborná literatúra poukazuje na to, že finančné zdravie zdravotníckych organizácií nemožno hodnotiť iba prostredníctvom výsledku hospodárenia, ale je potrebné sledovať viacero ukazovateľov súčasne, najmä likviditu, zadlženosť, pracovný kapitál a kapitálovú štruktúru. Tento prístup je významný aj pri hodnotení verejných

nemocníc v Slovenskej republike, kde sa dlhodobo diskutuje o zadlžovaní zdravotníckych zariadení, potrebe stabilizačných opatrení a efektívnosti ich riadenia. Pri hodnotení finančnej stability je preto potrebné prepájať krátkodobú platobnú schopnosť s dlhodobejšou kapitálovou pozíciou nemocníc.

Tento článok prispieva k skúmanej problematike tromi spôsobmi. Po prvé, poskytuje aktuálny deskriptívno-analytický pohľad na finančnú stabilitu vybraných verejných zdravotníckych zariadení v Slovenskej republike v období rokov 2020 až 2024. Po druhé, prepája hodnotenie krátkodobej finančnej pozície prostredníctvom ukazovateľov likvidity a čistého pracovného kapitálu s hodnotením dlhodobejšej kapitálovej štruktúry prostredníctvom zadlženosti a miery samofinancovania. Po tretie, dopĺňa deskriptívne porovnanie o Spearmanovu korelačnú analýzu, ktorá umožňuje posúdiť, či medzi ukazovateľmi likvidity a ukazovateľmi zadlženosti a kapitálovej stability existuje štatisticky významný monotónny vzťah.

V nadväznosti na uvedené je hlavným cieľom článku zhodnotiť finančnú stabilitu vybraných zdravotníckych zariadení v Slovenskej republike prostredníctvom ukazovateľov likvidity, zadlženosti, čistého pracovného kapitálu a vlastného imania v období rokov 2020 až 2024. S ohľadom na tento cieľ bola formulovaná výskumná otázka: Akú finančnú stabilitu vykazovali vybrané zdravotnícke zariadenia v Slovenskej republike z hľadiska likvidity a zadlženosti v rokoch 2020 až 2024?

Článok metodicky vychádza z verejne dostupných účtovných údajov z Registra účtovných závierok. Výskumnú vzorku tvorí päť verejných zdravotníckych zariadení: Univerzitná nemocnica Bratislava, Univerzitná nemocnica L. Pasteura Košice, Univerzitná nemocnica Martin, Fakultná nemocnica s poliklinikou F. D. Roosevelta Banská Bystrica a Fakultná nemocnica Trnava. Na základe údajov zo súvahy a výkazu ziskov a strát boli vypočítané ukazovatele likvidity, čistého pracovného kapitálu, celkovej zadlženosti, miery samofinancovania a výsledku hospodárenia. Výsledky sú porovnávané medzi nemocnicami aj v čase a následne doplnené o Spearmanovu korelačnú analýzu, ktorá posudzuje vzťah medzi ukazovateľmi likvidity, zadlženosti a kapitálovej stability.

1 Súčasný stav riešenej problematiky

Finančná stabilita zdravotníckych zariadení predstavuje jeden z dôležitých predpokladov udržateľného fungovania zdravotníckeho systému. Nemocnice nemožno hodnotiť výlučne ako klasické podnikateľské subjekty, pretože ich hlavnou úlohou nie je maximalizácia zisku, ale zabezpečenie dostupnej a kontinuálnej zdravotnej starostlivosti. Gapenski a Pink (2015) v tejto súvislosti zdôrazňujú, že finančné riadenie v zdravotníctve musí byť prepojené s prevádzkovými potrebami zdravotníckych organizácií, keďže nedostatok finančných zdrojov sa môže premietiť do ich schopnosti zabezpečovať služby v požadovanom rozsahu. Podobne Finkler, Calabrese a Smith (2022) upozorňujú, že pri verejných a neziskových organizáciách nemožno finančné rozhodovanie vnímať izolovane od ich verejného poslania a zodpovednosti voči používateľom služieb. Finančná nestabilita nemocníc preto nepredstavuje iba účtovný problém, ale môže ovplyvňovať aj ich schopnosť uhrádzať záväzky, financovať bežnú prevádzku, vyplácať mzdy, zabezpečovať lieky, zdravotnícky materiál a obnovovať technické vybavenie.

Nemocnice sú vo všeobecnosti špecifické organizácie s vysokým podielom fixných nákladov, nepretržitou prevádzkou, regulovanými úhradovými mechanizmami a výraznou závislosťou od verejných zdrojov financovania. Cleverley, Cleverley a Parks (2023) poukazujú na to, že hodnotenie finančného zdravia zdravotníckych organizácií si vyžaduje sledovanie viacerých finančných ukazovateľov, keďže samotný výsledok hospodárenia neposkytuje dostatočný obraz o ich celkovej finančnej kondícii. Tento pohľad rozširujú Zelman et al. (2020), podľa ktorých je pri hodnotení zdravotníckych organizácií potrebné pracovať nielen s výsledkom hospodárenia, ale aj s ukazovateľmi likvidity, zadlženosti, cash flow, pracovného kapitálu a kapitálovej štruktúry. Milbank Memorial Fund a Bailit Health (2024) zároveň upozorňujú, že finančné údaje nemocníc je potrebné interpretovať prostredníctvom viacerých finančných ukazovateľov a v kontexte dostupných zdrojov údajov, keďže samotné účtovné výkazy nemusia poskytovať úplný obraz o finančnej situácii zdravotníckych zariadení. Podobne Dubas-Jakóbczyk et al. (2022) zdôrazňujú, že finančná výkonnosť nemocníc je prepojená nielen s hospodárením, ale aj s kvalitou starostlivosti, manažérskym riadením a dlhodobou udržateľnosťou poskytovania služieb.

Likvidita vyjadruje schopnosť organizácie uhrádzať krátkodobé záväzky v čase ich splatnosti. V nemocničnom sektore má osobitný význam, pretože zdravotnícke zariadenia musia zabezpečovať plynulú prevádzku aj v situáciách, keď dochádza k časovým nesúladam medzi poskytovaním zdravotnej starostlivosti a prijímaním úhrad. Upadhyay, Sen a Smith (2015) zdôrazňujú, že likvidita nemocníc úzko súvisí s riadením pracovného kapitálu a cash conversion cycle, teda s tým, ako rýchlo sa finančné prostriedky viazané v prevádzke opäť premieňajú na dostupné peňažné zdroje. Tento pohľad dopĺňajú Singh a Wheeler (2012), podľa ktorých schopnosť nemocníc riadiť príjmový cyklus, pohľadávky a finančné toky ovplyvňuje ich schopnosť vytvárať vlastné zdroje a udržiavať finančnú stabilitu. S likviditou úzko súvisí čistý pracovný kapitál. V zdravotníctve je tento ukazovateľ dôležitý najmä preto, že nemocnice nemôžu jednoducho obmedziť svoju činnosť podľa aktuálne dostupných finančných prostriedkov. Musia zabezpečovať starostlivosť kontinuálne. Dalci a Ozyapici (2018) v tejto súvislosti upozorňujú, že politika riadenia pracovného kapitálu v zdravotníctve súvisí s mierou zadlženosti a celkovou finančnou výkonnosťou organizácie. Kim, McCullough a Lee (2022) zároveň ukazujú, že obmedzenia čistého pracovného kapitálu môže ovplyvňovať aj investičné rozhodnutia nemocníc na úvod v krátkodobom finančnom ponímaní pričom pozícia sa môže postupne prenášať aj do dlhodobej rozvojovej schopnosti zariadenia.

Druhým kľúčovým faktorom finančnej stability podľa nájdenej literatúry je zadlženosť. Vysoká zadlženosť nemocníc môže byť dôsledkom dlhodobého nesúladu medzi príjmami a nákladmi, kumulovaných strát, investičných potrieb alebo opakovaného hromadenia záväzkov voči dodávateľom. Cleverley, Cleverley a Parks (2023) zdôrazňujú, že pri hodnotení finančného zdravia zdravotníckych organizácií je potrebné sledovať nielen výnosy a náklady, ale aj štruktúru financovania a schopnosť organizácie dlhodobo kryť svoje záväzky. Blavin et al. (2023) na tento pohľad nadväzujú tým, že pri hodnotení finančnej výkonnosti zdravotníckych systémov pracujú s finančnými ukazovateľmi vychádzajúcimi z účtovných výkazov, vrátane tých, ktoré zachytávajú zadlženosť a

kapitálovú pozíciu. Pri verejných nemocniciach je však potrebné zadlženosť interpretovať opatrnejšie než pri bežných podnikateľských subjektoch, pretože ich fungovanie je viazané na verejný záujem a dostupnosť zdravotnej starostlivosti. Napriek tomu vysoký podiel záväzkov, záporné vlastné imanie a nízka schopnosť samofinancovania predstavujú významné signály dlhodobej finančnej nerovnováhy.

Vzťah medzi finančnou stabilitou a výkonnosťou nemocníc nie je v literatúre interpretovaný iba jedným smerom, a to smerom finančná stabilita rovná sa lepšie služby a perspektíva zdravotníckeho zariadenia. Niektoré štúdie poukazujú na to, že lepšia finančná pozícia môže vytvárať priestor na investície, technologickú obnovu a zlepšovanie procesov. Choi (2017) napríklad ukazuje, že kapitálové investície nemocníc sú citlivé na ekonomické podmienky a finančné možnosti organizácie. Podobne Kim a McCue (2008) spájajú investičnú aktivitu neziskových nemocníc s finančnými a organizačnými faktormi. Na druhej strane Dong (2015) a Akinleye et al. (2019) upozorňujú, že vzťah medzi finančnými ukazovateľmi a kvalitou starostlivosti nie je jednoduchý a nemožno ho vysvetliť iba tým, že finančne silnejšia nemocnica automaticky poskytuje kvalitnejšiu starostlivosť. Finančná stabilita je nevyhnutným predpokladom fungovania, ale sama osebe ešte nezaručuje efektívnosť, kvalitu ani správne manažérske rozhodnutia v danej zdravotníckej organizácii.

Literatúra ďalej hovorí, že verejné nemocnice sú často spájané s konceptom mäkkého rozpočtového obmedzenia. Tento výraz alebo označenie vzniká vtedy, keď organizácia očakáva, že jej straty alebo dlhy budú v konečnom dôsledku pokryté štátom alebo lokálnym zriaďovateľom. Wright (2016) upozorňuje, že mäkké rozpočtové obmedzenia vo verejných nemocniciach vznikajú najmä vtedy, keď vláda nedokáže dôveryhodne garantovať, že nemocnicu v prípade vyčerpania rozpočtu nezachráni. Berger, Sommersguter-Reichmann a Cypionka (2020) dopĺňajú, že takéto nastavenie môže znižovať účinnosť reforiem zameraných na zvyšovanie efektívnosti nemocníc. Podobne Babczuk a Kachniarz (2012) poukazujú na to, že pri verejných zdravotníckych zariadeniach môžu byť zdroje finančných problémov spojené nielen s objemom financií, ale aj s nastavením zodpovednosti, vlastníctva a očakávanej podpory zo strany verejných autorít. V slovenskom kontexte je táto problematika veľmi aktuálna vzhľadom na dlhodobé zadlžovanie verejných nemocníc a opakovanú potrebu ich finančnej stabilizácie a nepravidelného predlžovania zmlúv s poisťovňami. Ministerstvo zdravotníctva SR (2025) pravidelne sleduje vývoj dlhu v rezorte zdravotníctva, pričom významnú časť záväzkov tvoria práve zdravotnícke zariadenia v pôsobnosti štátu. Národný kontrolný úrad SR (2024) zároveň upozorňuje, že problémy slovenského zdravotníctva nemožno vysvetľovať výlučne nedostatkom finančných zdrojov, ale aj otázkami riadenia, efektívnosti a systémového nastavenia jednotlivých zdravotníckych zariadení. Tento pohľad je v súlade aj s medzinárodnými hodnoteniami, podľa ktorých je pri posudzovaní zdravotníckych systémov potrebné sledovať nielen objem verejných výdavkov, ale aj spôsob ich využívania, riadenia a dopad na stabilitu poskytovateľov zdravotnej starostlivosti (European Observatory on Health Systems and Policies, 2025; European Observatory on Health Systems and Policies a OECD, 2025). V podobnom duchu Duran et al. (2019) zdôrazňujú význam správy a riadenia verejných nemocníc, pričom vyzdvihujú, že finančné výsledky sú úzko previazané s nastavením kompetencií,

zodpovednosti a manažérskych mechanizmov organizácie. Na záver myšlienku správneho pohľadu na financovanie verejných zdravotníckych organizácií dotvára Pourmohammadi et al. (2018), ktorý zdôrazňuje, že pri hodnotení verejných nemocníc majú finančné indikátory význam najmä vtedy, keď pomáhajú identifikovať rizikové oblasti a podporujú manažérske rozhodovanie.

2 Výskumný dizajn a metodológia

Článok je spracovaný ako deskriptívno-analytická štúdia založená na analýze verejne dostupných účtovných údajov vybraných zdravotníckych zariadení. Empirická časť nadväzuje na formulovaný cieľ článku a zameriava sa na vyhodnotenie finančnej stability nemocníc prostredníctvom ukazovateľov likvidity, zadlženosti, čistého pracovného kapitálu, vlastného imania a výsledku hospodárenia. V nadväznosti na tento cieľ bola formulovaná výskumná otázka: Akú finančnú stabilitu vykazovali vybrané zdravotnícke zariadenia v Slovenskej republike z hľadiska likvidity a zadlženosti v rokoch 2020 až 2024? Na základe formulovanej výskumnej otázky boli stanovené nasledujúce hypotézy: H_0 : Medzi úrovňou likvidity a mierou zadlženosti vybraných zdravotníckych zariadení neexistuje štatisticky významný monotónny vzťah. H_1 : Vyššia úroveň likvidity vybraných zdravotníckych zariadení je spojená s nižšou mierou zadlženosti, teda medzi likviditou a zadlženosťou existuje štatisticky významný negatívny monotónny vzťah.

Výskumnú vzorku tvorilo päť verejných zdravotníckych zariadení. Do vzorky nemocníc boli zaradené významné verejné nemocnice poskytujúce ústavnú zdravotnú starostlivosť v rôznych regiónoch Slovenskej republiky. Detailnejšie informácie sú uvedené v tabuľke 1. Objektom skúmania sú vybrané verejné zdravotnícke zariadenia v Slovenskej republike, konkrétne Univerzitná nemocnica Bratislava, Univerzitná nemocnica L. Pasteura Košice, Univerzitná nemocnica Martin, Fakultná nemocnica s poliklinikou F. D. Roosevelta Banská Bystrica a Fakultná nemocnica Trnava. Detailnejšie vymedzenie výskumnej vzorky a vstupných údajov uvádza tabuľka 1.

Tabuľka 1

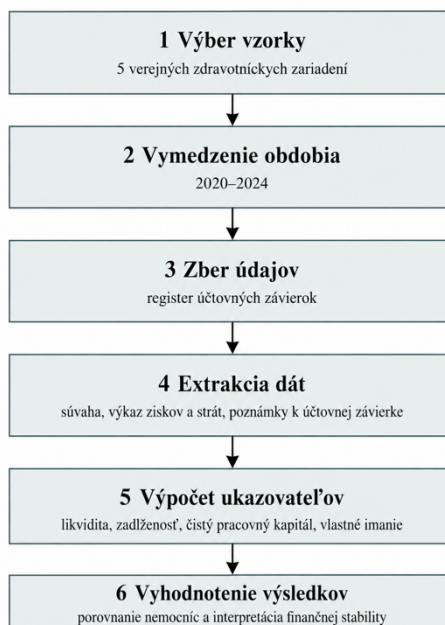
Výskumná vzorka a vstupné údaje analýzy

Časť analýzy	Špecifikácia
Výskumná vzorka	Univerzitná nemocnica Bratislava; Univerzitná nemocnica L. Pasteura Košice; Univerzitná nemocnica Martin; Fakultná nemocnica s poliklinikou F. D. Roosevelta Banská Bystrica; Fakultná nemocnica Trnava
Sledované obdobie	2020 – 2024
Počet pozorovaní	25 - (5 nemocníc × 5 rokov)
Zdroj údajov	Register účtovných závierok
Použité účtovné výkazy	súvaha; výkaz ziskov a strát, poznámky
Zahrnuté účtovné položky	aktíva spolu; obežný majetok; zásoby; krátkodobý finančný majetok; vlastné imanie; záväzky spolu; krátkodobé záväzky; výsledok hospodárenia; náklady; výnosy
Vypočítané ukazovatele	bežná likvidita; pohotovú likviditu; okamžitá likvidita; čistý pracovný kapitál; celková zadlženosť; miera samofinancovania; debt-to-equity; VH/výnosy

Zdroj: vlastné spracovanie

Obrázok 1

Postup spracovania údajov pri hodnotení finančnej stability zdravotníckych zariadení



Zdroj: vlastné spracovanie

Obrázok 1 znázorňuje základný metodický postup spracovania údajov. V prvej fáze bola vymedzená výskumná vzorka piatich zdravotníckych zariadení a sledované obdobie rokov 2020 až 2024. Následne boli z Registra účtovných záznamov získané individuálne účtovné závierky, konkrétne údaje zo súvahy a výkazu ziskov a strát. Z týchto výkazov boli extrahované položky potrebné na výpočet ukazovateľov likvidity, zadlženosti, čistého pracovného kapitálu, vlastného imania a výsledku hospodárenia. V záverečnej fáze boli vypočítané hodnoty ukazovateľov porovnané medzi nemocnicami a interpretované z hľadiska ich krátkodobej a dlhodobej finančnej stability. Výsledok hospodárenia bol použitý ako doplnkový ukazovateľ finančnej výkonnosti. Pri jeho interpretácii sa prihliadalo na skutočnosť, že kladný výsledok hospodárenia v jednom roku nemusí automaticky znamenať celkovú finančnú stabilitu nemocnice, ak súčasne pretrváva nízka likvidita, vysoká zadlženosť alebo záporné vlastné imanie.

V článku boli použité metódy analýzy, syntézy, komparácie a deskriptívnej štatistiky. Metóda analýzy bola využitá pri spracovaní účtovných údajov a výpočte jednotlivých finančných ukazovateľov. Komparácia bola použitá pri porovnávaní nemocníc medzi sebou a pri sledovaní vývoja ukazovateľov v čase. Deskriptívna štatistika bola využitá pri sumarizácii hodnôt, vyhodnotení počtu pozorovaní, priemerných hodnôt a rozpätí ukazovateľov. Súčasťou analytického postupu bolo aj poradové bodové hodnotenie, ktoré umožnilo porovnať relatívne postavenie nemocníc v rámci sledovanej vzorky. Syntéza bola použitá pri záverečnom zhodnotení finančnej stability a pri formulovaní interpretačných záverov. Na posúdenie vzťahu medzi ukazovateľmi krátkodobej finančnej stability a ukazovateľmi dlhodobej finančnej pozície bol použitý Spearmanov poradový korelačný koeficient. Tento neparametrický štatistický nástroj bol zvolený

vzhľadom na malý rozsah výskumnej vzorky, nízky počet pozorovaní a predpoklad, že analyzované finančné ukazovatele nemusia spĺňať podmienku normálneho rozdelenia. Spearmanov koeficient je zároveň vhodný pri hodnotení monotónnych vzťahov medzi premennými, aj v prípadoch, keď tieto vzťahy nie sú striktne lineárne.

Tabuľka 2

Použité finančné ukazovatele

Ukazovateľ	Výpočet	Význam
Bežná likvidita	obežný majetok / krátkodobé záväzky	schopnosť kryť krátkodobé záväzky obežným majetkom
Pohotovú likviditu	(obežný majetok – zásoby) / krátkodobé záväzky	schopnosť kryť záväzky likvidnejšími krátkodobými aktívami
Okamžitá likvidita	krátkodobý finančný majetok / krátkodobé záväzky	schopnosť okamžitej úhrady krátkodobých záväzkov
Čistý pracovný kapitál	obežný majetok – krátkodobé záväzky	prevádzková finančná rezerva
Celková zadlženosť	záväzky spolu / aktíva spolu	miera financovania aktív cudzími zdrojmi
Miera samofinancovania	vlastné imanie / aktíva spolu	podiel vlastných zdrojov na financovaní aktív
Debt-to-equity	záväzky spolu / vlastné imanie	pomer cudzích zdrojov k vlastnému imaniu
VH/výnosy	výsledok hospodárenia / výnosy	relatívny výsledok hospodárenia vo vzťahu k výnosom

Zdroj: vlastné spracovanie

Korelačná analýza bola zameraná na vzťahy medzi ukazovateľmi likvidity, konkrétne bežnou likviditou, pohotovú likviditou a okamžitou likviditou, a ukazovateľmi zadlženosti a finančnej stability, reprezentovanými celkovou zadlženosťou, mierou samofinancovania a čistým pracovným kapitálom. Štatistická významnosť bola posudzovaná na hladine významnosti $\alpha = 0,05$. Sila korelačného vzťahu bola interpretovaná podľa absolútnej hodnoty Spearmanovho koeficientu ρ , pričom hodnoty do 0,10 boli považované za zanedbateľné, hodnoty 0,10 – 0,29 za slabé, 0,30 – 0,49 za stredne silné, 0,50 – 0,69 za silné a hodnoty 0,70 a viac za veľmi silné vzťahy. Pri interpretácii výsledkov sa zohľadňovala nielen štatistická významnosť, ale aj ich ekonomická relevantnosť. Na overenie vzťahu medzi likviditou a zadlženosťou vybraných zdravotníckych zariadení bol použitý Spearmanov poradový korelačný koeficient.

Metodické obmedzenia článku vyplývajú najmä zo skutočnosti, že analýza je založená na verejne dostupných účtovných údajoch. Tieto údaje umožňujú posúdiť finančnú stabilitu nemocníc z pohľadu účtovných výkazov, neumožňujú však plne zachytiť všetky prevádzkové, medicínske a organizačné faktory, ktoré môžu ovplyvňovať ich hospodárenie. Analýza sa zároveň zameriava iba na vybranú vzorku piatich nemocníc, preto jej výsledky nemožno automaticky zovšeobecniť na celý nemocničný sektor. Napriek týmto obmedzeniam poskytuje zvolený postup relevantný pohľad na finančnú stabilitu významných verejných zdravotníckych zariadení v Slovenskej republike.

3 Výsledky práce

V prvej fáze boli vyhodnotené ukazovatele likvidity v nemocniciach.

Tabuľka 3

Hodnoty ukazovateľov likvidity zdravotníckych zariadení v rokoch 2020-2024

Zdravotnícke zariadenie	Rok	Bežná likvidita	Pohotovú likvidita	Okamžitá likvidita
UN Bratislava	2020	0,27	0,23	0,10
UN Bratislava	2021	0,28	0,24	0,10
UN Bratislava	2022	0,29	0,24	0,09
UN Bratislava	2023	0,30	0,25	0,05
UN Bratislava	2024	0,32	0,28	0,07
UN L. Pasteura Košice	2020	0,24	0,21	0,09
UN L. Pasteura Košice	2021	0,37	0,33	0,18
UN L. Pasteura Košice	2022	0,36	0,30	0,18
UN L. Pasteura Košice	2023	0,28	0,23	0,07
UN L. Pasteura Košice	2024	0,32	0,26	0,10
UN Martin	2020	0,30	0,23	0,05
UN Martin	2021	0,45	0,22	0,07
UN Martin	2022	0,26	0,21	0,07
UN Martin	2023	0,32	0,28	0,09
UN Martin	2024	1,05	1,01	0,84
FNsP F. D. Roosevelta BB	2020	0,45	0,39	0,15
FNsP F. D. Roosevelta BB	2021	0,54	0,45	0,23
FNsP F. D. Roosevelta BB	2022	0,47	0,38	0,19
FNsP F. D. Roosevelta BB	2023	0,53	0,44	0,14
FNsP F. D. Roosevelta BB	2024	1,14	1,07	0,79
FN Trnava	2020	0,48	0,42	0,15
FN Trnava	2021	0,49	0,43	0,17
FN Trnava	2022	0,40	0,33	0,11
FN Trnava	2023	0,37	0,32	0,05
FN Trnava	2024	0,45	0,40	0,16
zlepšenie oproti predchádzajúcemu roku				
zhoršenie oproti predchádzajúcemu roku				
bez zmeny / prvý rok sledovania				

Zdroj: vlastné spracovanie

Z tabuľky 3 vyplýva, že likvidita sledovaných zdravotníckych zariadení bola vo väčšine rokov nízka. Bežná likvidita bola pod hodnotou 1 v 23 z 25 pozorovaní. Najnižšie hodnoty bežnej likvidity vykazovali Univerzitná nemocnica Bratislava a Univerzitná nemocnica L. Pasteura Košice. Pri oboch zariadeniach sa bežná likvidita počas celého sledovaného obdobia pohybovala výrazne pod hranicou 1. Relatívne priaznivejší vývoj bol zaznamenaný pri Univerzitnej nemocnici Martin a Fakultnej nemocnici s poliklinikou F. D. Roosevelta Banská Bystrica. Tieto dve nemocnice ako jediné v roku 2024 prekročili hranicu bežnej likvidity 1. Zlepšenie sa prejavilo aj pri pohotovej a okamžitej likvidite.

Zaujímavý trend bol však pri Univerzitnej nemocnici Bratislava, kde bežná likvidita bola ďaleko od hranice 1, avšak každý rok jej hodnota pozitívne rástla.

Ďalšej fáze boli hodnotené ukazovatele čistého pracovného kapitálu, zadlženosti, miery samofinancovania, debt-to-equity a výsledku hospodárenia. Výsledok hospodárenia bol sledovaný ako doplnkový ukazovateľ finančnej výkonnosti v nadväznosti na prístup autorov Berger, Sommersguter-Reichmann a Cypionka (2020).

Tabuľka 4

Hodnoty ukazovateľov pracovného kapitálu, zadlženosti, miery samofinancovania a výsledku hospodárenia vybraných zdravotníckych zariadení v rokoch 2020 – 2024

Zdravotnícke zariadenie	Rok	Čistý pracovný kapitál v mil. €	Celková zadlženosť v %	Miera samofinancovania v %	Debt-to-equity	Výsledok hospodárenia a v mil. €
UN Bratislava	2020	-180,1	194,0	-94,1	-2,06	-8,5
UN Bratislava	2021	-204,4	205,2	-105,3	-1,95	-47,7
UN Bratislava	2022	-224,2	207,6	-108,8	-1,91	-16,3
UN Bratislava	2023	-184,8	198,4	-98,7	-2,01	37,8
UN Bratislava	2024	-189,4	205,3	-105,4	-1,95	-10,5
UN L. Pasteura Košice	2020	-96,0	198,6	-99,1	-2,01	-25,1
UN L. Pasteura Košice	2021	-97,5	193,1	-94,3	-2,05	-19,4
UN L. Pasteura Košice	2022	-105,0	187,1	-90,8	-2,06	-3,3
UN L. Pasteura Košice	2023	-109,6	206,3	-107,7	-1,92	-4,1
UN L. Pasteura Košice	2024	-110,7	198,4	-99,3	-2,00	0,8
UN Martin	2020	-54,6	150,6	-51,9	-2,90	-22,2
UN Martin	2021	-54,7	142,1	-60,2	-2,36	-20,5
UN Martin	2022	-89,1	170,1	-74,2	-2,29	-8,9
UN Martin	2023	-77,3	156,1	-58,9	-2,65	10,8
UN Martin	2024	6,1	123,6	-24,9	-4,96	6,4
FNsP F. D. Roosevelta BB	2020	-32,9	131,6	-32,5	-4,05	-2,5
FNsP F. D. Roosevelta BB	2021	-34,3	127,3	-28,7	-4,44	-2,8
FNsP F. D. Roosevelta BB	2022	-52,3	141,8	-44,5	-3,18	-16,0
FNsP F. D. Roosevelta BB	2023	-36,5	119,8	-21,9	-5,47	21,8
FNsP F. D. Roosevelta BB	2024	13,0	109,2	-9,9	-11,07	2,1
FN Trnava	2020	-13,2	91,9	-19,7	-4,67	0,7
FN Trnava	2021	-15,3	94,1	-17,7	-5,33	-0,7
FN Trnava	2022	-25,4	108,4	-29,7	-3,65	-8,9
FN Trnava	2023	-28,5	104,5	-22,1	-4,74	3,6
FN Trnava	2024	-30,0	103,5	-18,1	-5,72	1,1
	najpriaznivejšia hodnota v kategórii					
	najnepriaznivejšia hodnota v kategórii					

Zdroj: vlastné spracovanie podľa údajov z Registra účtovných závierok

Tabuľka 4 nadväzuje na hodnotenie likvidity a rozširuje pohľad na finančnú pozíciu nemocníc. Z hľadiska čistého pracovného kapitálu sa ukazuje, že vo väčšine sledovaných

případov boli krátkodobé záväzky vyššie ako obežný majetok. Záporný čistý pracovný kapitál bol zaznamenaný v 23 z 25 pozorovaní. Najnižšia hodnota bola dosiahnutá pri Univerzitnej nemocnici Bratislava v roku 2022, keď čistý pracovný kapitál predstavoval -224,2 mil. eur. Podobný vývoj bol zaznamenaný aj pri Univerzitnej nemocnici L. Pasteura Košice, kde sa hodnoty pohybovali od -96,0 mil. eur v roku 2020 po -110,7 mil. eur v roku 2024. Odlišný vývoj sa objavil pri Univerzitnej nemocnici Martin a Fakultnej nemocnici s poliklinikou F. D. Roosevelta Banská Bystrica v roku 2024. Ide o jediné dve kladné hodnoty v celom sledovanom súbore. Tento výsledok sa zároveň zhoduje s vývojom likvidity, keďže práve tieto dve nemocnice dosiahli v roku 2024 aj najvyššie hodnoty bežnej a pohotovej likvidity.

Pri celkovej zadlženosti sa ukazuje výrazný rozdiel medzi nemocnicami, ale zároveň aj spoločný znak viacerých pozorovaní. Celková zadlženosť presiahla hranicu 100 % v 23 z 25 pozorovaní. Najvyššie hodnoty boli zaznamenané pri Univerzitnej nemocnici Bratislava, kde sa zadlženosť pohybovala od 194,0 % v roku 2020 a 205,3 % v roku 2024. Podobne vysoké hodnoty vykazovala opäť aj Univerzitná nemocnica L. Pasteura Košice. Nižšie hodnoty celkovej zadlženosti dosahovali najmä Fakultná nemocnica Trnava a Rooseveltova nemocnica. Fakultná nemocnica Trnava mala v roku 2020 zadlženosť 91,9 %, čo bola najnižšia hodnota v celej tabuľke. V ďalších rokoch sa však zadlženosť tejto nemocnice pohybovala už nad hranicou 100 %, pričom v roku 2024 dosiahla 103,5 %. Rooseveltova nemocnica zaznamenala prekvapivo opačný posun a to postupný pokles zadlženosti zo 141,8 % v roku 2022 na 119,8 % v roku 2023 a 109,2 % v roku 2024. Tento vývoj môže súvisieť s priaznivejším pomerom medzi záväzkami a aktívami v posledných sledovaných rokoch a taktiež možno vďaka koordinovanému prístupu a fokusu na zlepšenie hodnoty zadlženia na úrovni manažmentu nemocnice.

Miera samofinancovania bola vo všetkých sledovaných prípadoch záporná. Keďže tento ukazovateľ vychádza z pomeru vlastného imania a aktív, záporné hodnoty súvisia so záporným vlastným imaním nemocníc. Najnižšia hodnota bola zaznamenaná pri Univerzitnej nemocnici Bratislava v roku 2022, a to -108,8 %. Naopak, najvyššia, hoci stále záporná hodnota, bola pri Rooseveltovej nemocnici v roku 2024, keď dosiahla -9,9 %. Tento rozdiel naznačuje, že pri Rooseveltovej nemocnici sa v závere sledovaného obdobia podarilo aspoň čiastočne zmierniť nepomer medzi vlastným imaním, záväzkami a aktívami, zatiaľ čo pri Univerzitnej nemocnici Bratislava zostával záporný kapitálový základ výrazne prehĺbený.

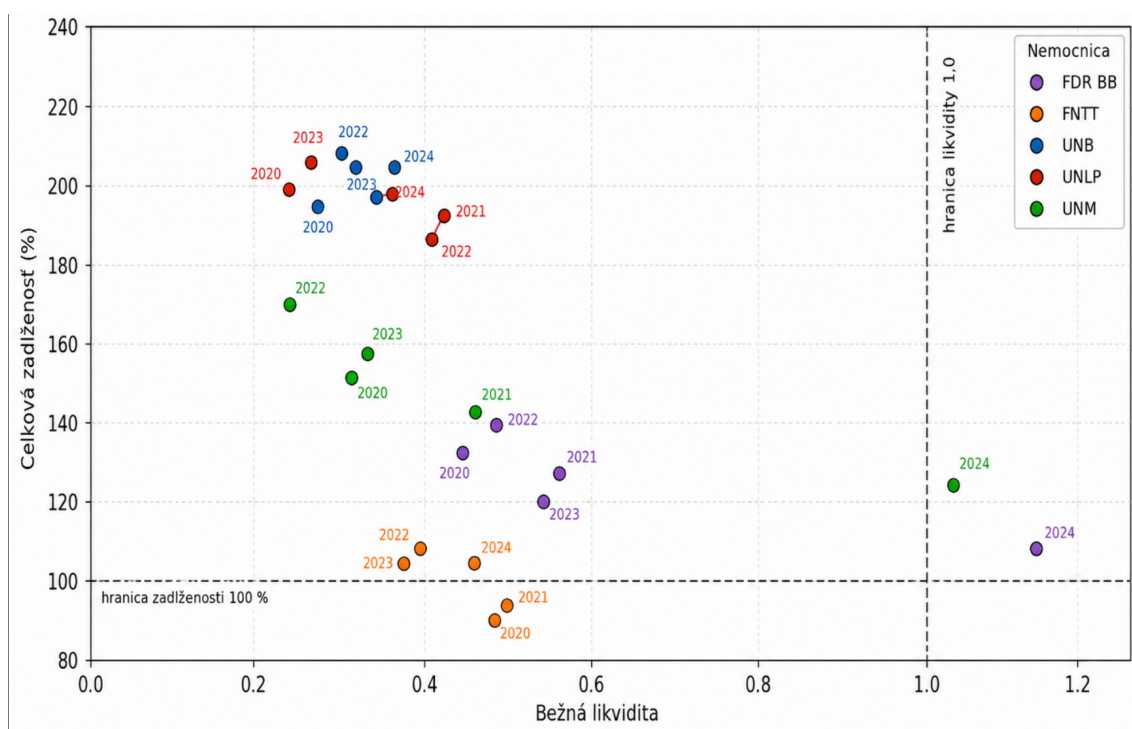
Ukazovateľ debt-to-equity bol ponechaný ako doplnkový údaj, avšak nebol už ďalej používaný, keďže sme zistili, že všetky nemocnice majú záporné vlastné imanie a jeho interpretácia je obmedzená. Záporné hodnoty debt-to-equity v tejto tabuľke nie sú znakom nižšej zadlženosti, ale dôsledkom toho, že vlastné imanie bolo záporné.

Výrazný rozdiel bol zaznamenaný pri Univerzitnej nemocnici Bratislava, ktorá v roku 2021 dosiahla najvyššiu stratu, no v roku 2023 zároveň najvyšší kladný výsledok hospodárenia. Výraznejší kladný výsledok bol v roku 2023 zaznamenaný aj pri Rooseveltovej nemocnici, a to 21,8 mil. eur. V sledovanom období bol výsledok hospodárenia záporný v 16 z 25 pozorovaní. Stratu zaznamenala taktiež aj Univerzitná nemocnica Martin v roku 2020, keď výsledok hospodárenia dosiahol -22,2 mil. eur. Zaujímavým rokom bol 2023 kedy 4

z 5 nemocníc vykázali kladný výsledok hospodárenia. Rok 2023 sa tak v rámci sledovaného obdobia javí ako rok s najpriaznivejším súhrnným výsledkom hospodárenia vo vzorke nemocníc. Pri porovnaní rokov možno vidieť výrazné medziročné výkyvy. Rok 2021 bol z hľadiska výsledku hospodárenia najmenej priaznivý, keďže všetkých päť sledovaných nemocníc dosiahlo záporný výsledok hospodárenia. Z hľadiska kumulovaného výsledku hospodárenia za celé obdobie 2020 až 2024 boli najvyššie záporné hodnoty zaznamenané pri Univerzitnej nemocnici L. Pasteura Košice kumulovaný výsledok bol -51,1 mil. eur, naopak, Rooseveltova nemocnica dosiahla za celé obdobie mierne kladný kumulovaný výsledok hospodárenia približne 2,6 mil. eur.

Obrázok 2

Postavenie vybraných zdravotníckych zariadení z hľadiska likvidity a priemernej celkovej zadlženosti v rokoch 2020 – 2024



Zdroj: vlastné spracovanie

Na súhrnné porovnanie sledovaných nemocníc nadväzuje obrázok č. 2, ktorý znázorňuje postavenie vybraných zdravotníckych zariadení graficky z hľadiska bežnej likvidity a celkovej zadlženosti v jednotlivých rokoch obdobia 2020 až 2024. Z grafu vyplýva, že väčšina bodov sa nachádza pod hranicou bežnej likvidity 1,0 a súčasne nad hranicou celkovej zadlženosti 100 %. Najviac bodov v ľavej hornej časti grafu predstavujú Univerzitnej nemocnice Bratislava a Univerzitnej nemocnice L. Pasteura Košice.

Na doplnenie hodnotenia finančnej stability bola použitá Spearmanova korelačná analýza, ktorej cieľom bolo posúdiť vzťah medzi ukazovateľmi likvidity, zadlženosti a kapitálovej stability. Výsledky tejto analýzy sú uvedené v tabuľke č. 5.

Tabuľka 5

Výsledky Spearmanovej korelačnej analýzy vzťahu medzi likviditou, zadlženosťou a kapitálovou stabilitou zdravotníckych zariadení

Porovnávané premenné	Spearmanovo ρ	p-hodnota	Interpretácia
Bežná likvidita × Celková zadlženosť	-0,8529	< 0,001	veľmi silný negatívny vzťah
Pohotovú likviditu × Celková zadlženosť	-0,7790	< 0,001	veľmi silný negatívny vzťah
Okamžitá likvidita × Celková zadlženosť	-0,5998	0,0015	silný negatívny vzťah
Bežná likvidita × Miera samofinancovania	0,8241	< 0,001	veľmi silný pozitívny vzťah
Pohotovú likviditu × Miera samofinancovania	0,7720	< 0,001	veľmi silný pozitívny vzťah
Okamžitá likvidita × Miera samofinancovania	0,5869	0,0020	silný pozitívny vzťah
Čistý pracovný kapitál × Celková zadlženosť	-0,9671	< 0,001	veľmi silný negatívny vzťah
Čistý pracovný kapitál × Miera samofinancovania	0,9662	< 0,001	veľmi silný pozitívny vzťah

Zdroj: vlastné spracovanie

Výsledky potvrdili existenciu štatisticky významných monotónnych vzťahov medzi analyzovanými premennými.

Medzi bežnou likviditou a celkovou zadlženosťou bol zistený veľmi silný negatívny vzťah ($\rho = -0,8529$, $p < 0,001$). Podobne aj medzi pohotovú likviditou a celkovou zadlženosťou bol identifikovaný veľmi silný negatívny vzťah ($\rho = -0,7790$, $p < 0,001$).

Pri okamžitej likvidite bol vzťah s celkovou zadlženosťou taktiež negatívny a štatisticky významný, avšak s nižšou intenzitou ($\rho = -0,5998$, $p = 0,0015$).

Vo vzťahu k miere samofinancovania sa preukázal veľmi silný pozitívny vzťah pri bežnej likvidite ($\rho = 0,8241$, $p < 0,001$) aj pri pohotovej likvidite ($\rho = 0,7720$, $p < 0,001$). Aj okamžitá likvidita vykázala štatisticky významný pozitívny vzťah s mierou samofinancovania ($\rho = 0,5869$, $p = 0,0020$).

Osobitne výrazné výsledky boli zistené pri čistom pracovnom kapitál, ktorý vykázal veľmi silný negatívny vzťah s celkovou zadlženosťou ($\rho = -0,9671$, $p < 0,001$) a súčasne veľmi silný pozitívny vzťah s mierou samofinancovania ($\rho = 0,9662$, $p < 0,001$).

Tieto výsledky naznačujú, že priaznivejšia krátkodobá finančná pozícia nemocníc bola úzko spojená s nižšou mierou zadlženosti a priaznivejšou kapitálovou štruktúrou. Na základe získaných výsledkov bola nulová hypotéza zamietnutá.

Napriek štatistickej významnosti zistených korelačných vzťahov je potrebné výsledky interpretovať opatrne, keďže ide o malú účelovo vybranú vzorku piatich verejných zdravotníckych zariadení a korelačná analýza sama osebe neumožňuje vyvodzovať kauzálne závery. Korelácia dokazuje súvislosť, nie príčinný účinok. Nemožno tvrdiť, že

vyššia likvidita spôsobuje nižšiu zadlženosť; oba ukazovatele môžu byť ovplyvnené veľkosťou nemocnice, financovaním, oddĺžením alebo jednorazovými účtovnými zmenami.

Na záverečné porovnanie sledovaných zdravotníckych zariadení bolo zostavené poradové bodové hodnotenie. Jeho cieľom je doplniť predchádzajúcu analýzu o súhrnný pohľad na to, ako sa jednotlivé nemocnice umiestňovali voči ostatným nemocniciam v sledovanom súbore pri vybraných finančných ukazovateľoch počas rokov 2020 až 2024.

Tabuľka 6

Poradové bodové hodnotenie finančnej pozície zdravotníckych zariadení v rokoch 2020 – 2024

Zdravotnícke zariadenie	Bežná likvidita	Pohotovú likvidita	Okamžitá likvidita	Čistý pracovný kapitál	Celková zadlženosť	Miera samofinancovania	Výsledok hospodárenia	Spolu body
FNsP F. D. Roosevelta BB	24	24	24	21	20	22	18	153
FN Trnava	20	20	16	23	25	23	19	146
UN Martin	14	12	12	16	15	15	16	100
UN L. Pasteura Košice	9	9	15	10	8	8	12	71
UN Bratislava	9	11	10	5	7	7	11	60

Zdroj: vlastné spracovanie podľa údajov z Registra účtovných závierok

Pri každom ukazovateli a v každom roku boli nemocnice zoradené podľa dosiahnutej hodnoty. Nemocnica s najpriaznivejšou hodnotou získala 5 bodov, druhá nemocnica 4 body, tretia 3 body, štvrtá 2 body a nemocnica s najmenej priaznivou hodnotou 1 bod. Pri ukazovateľoch likvidity, čistého pracovného kapitálu, miery samofinancovania a výsledku hospodárenia bola za priaznivejšiu považovaná vyššia hodnota. Pri celkovej zadlženosti bola za priaznivejšiu považovaná nižšia hodnota. Ukazovateľ debt-to-equity nebol do bodového hodnotenia zahrnutý, keďže pri zápornom vlastnom imaní má obmedzenú interpretačnú hodnotu a nie je vhodný.

Najvyššie celkové bodové hodnotenie dosiahla Fakultná nemocnica s poliklinikou F. D. Roosevelta Banská Bystrica, a to 153 bodov. Táto nemocnica dosahovala najlepšie umiestnenia najmä pri ukazovateľoch likvidity, čistého pracovného kapitálu a miery samofinancovania. Druhé najvyššie skóre dosiahla Fakultná nemocnica Trnava so 146 bodmi. Jej výsledok bol podporený najmä priaznivejším postavením pri celkovej zadlženosti a čistom pracovnom kapitáli. Nižšie bodové hodnotenie dosiahli Univerzitná nemocnica L. Pasteura Košice so 71 bodmi a Univerzitná nemocnica Bratislava so 60 bodmi. Tieto nemocnice sa pri viacerých ukazovateľoch a vo viacerých rokoch umiestňovali v porovnaní s ostatnými sledovanými nemocnicami na menej priaznivých pozíciách a zároveň medziročne nezaznamenali postupné zlepšenie v sledovaných údajoch.

4 Diskusia

Výsledky analýzy umožnili odpovedať na výskumnú otázku článku. Vybrané zdravotnícke zariadenia v rokoch 2020 až 2024 nevykazovali jednotnú úroveň finančnej stability.

Najslabšia finančná pozícia bola identifikovaná pri Univerzitetnej nemocnici Bratislava a Univerzitetnej nemocnici L. Pasteura Košice, kde sa počas celého sledovaného obdobia opakovane spájali nízka likvidita, záporný čistý pracovný kapitál, vysoká celková zadlženosť a záporné vlastné imanie. Naopak, relatívne priaznivejšie postavenie dosiahla Fakultná nemocnica s poliklinikou F. D. Roosevelta Banská Bystrica a v niektorých ukazovateľoch aj Fakultná nemocnica Trnava. Spoločným znakom väčšiny sledovaných nemocníc bola oslabená krátkodobá platobná schopnosť. Bežná likvidita bola vo väčšine pozorovaní pod hodnotou 1 a záporný čistý pracovný kapitál bol zaznamenaný v 23 z 25 pozorovaní. To poukazuje na to, že obežný majetok nemocníc často nepostačoval na krytie krátkodobých záväzkov. Výnimkou bol rok 2024 pri Univerzitetnej nemocnici Martin a Rooseveltovej nemocnici, ktoré ako jediné prekročili hodnotu bežnej likvidity 1 a zároveň dosiahli kladný čistý pracovný kapitál.

Druhou významnou oblasťou rizika bola zadlženosť. Celková zadlženosť presiahla hranicu 100 % vo väčšine sledovaných pozorovaní, pričom najnepriaznivejšie hodnoty dosahovali Univerzitná nemocnica Bratislava a Univerzitná nemocnica L. Pasteura Košice. Pri týchto nemocniciach sa zadlženosť pohybovala približne na úrovni dvojnásobku aktív, čo poukazuje na výraznú kapitálovú nerovnováhu. Priaznivejšie hodnoty zadlženosti dosahovala najmä Fakultná nemocnica Trnava, zatiaľ čo Rooseveltova nemocnica zaznamenala v závere sledovaného obdobia postupné zníženie zadlženosti.

Výsledky Spearmanovej korelačnej analýzy podporili záver, že krátkodobá platobná schopnosť a dlhodobější kapitálová stabilita nemocníc boli vzájomne prepojené. Negatívny vzťah medzi ukazovateľmi likvidity a celkovou zadlženosťou naznačuje, že nemocnice s priaznivejšou likviditou vykazovali spravidla nižšiu mieru zadlženosti. Osobitne významný bol čistý pracovný kapitál, ktorý veľmi silno negatívne koreloval s celkovou zadlženosťou a veľmi silno pozitívne s mierou samofinancovania. Na základe týchto výsledkov bola nulová hypotéza zamietnutá a možno konštatovať, že medzi likviditou a zadlženosťou existovala v sledovanej vzorke štatisticky významná monotónna závislosť.

Rozdiely medzi nemocnicami potvrdilo aj poradové bodové hodnotenie. Najvyššie skóre dosiahla Rooseveltova nemocnica, ktorá mala v rámci sledovanej vzorky najpriaznivejšie relatívne postavenie najmä pri ukazovateľoch likvidity, čistého pracovného kapitálu a miery samofinancovania. Druhé najvyššie skóre dosiahla Fakultná nemocnica Trnava, najmä vďaka priaznivejším hodnotám zadlženosti a čistého pracovného kapitálu. Naopak, Univerzitná nemocnica Bratislava a Univerzitná nemocnica L. Pasteura Košice dosiahli najnižšie bodové hodnotenie, čo potvrdzuje, že ich nepriaznivá finančná pozícia sa prejavovala vo viacerých ukazovateľoch súčasne.

Záver

Predkladaný článok sa zameriaval na hodnotenie finančnej stability 5 zdravotníckych zariadení v Slovenskej republike v období rokov 2020 až 2024. Na základe účtovných údajov z Registra účtovných závierok boli analyzované ukazovatele likvidity, zadlženosti, čistého pracovného kapitálu, vlastného imania a výsledku hospodárenia. Cieľom bolo posúdiť, do akej miery tieto ukazovatele poukazujú na finančnú stabilitu sledovaných

nemocníc. Na základe vykonanej analýzy možno konštatovať, že finančná stabilita sledovaných zdravotníckych zariadení bola vo väčšine prípadov oslabená. Najvýraznejšie problémy sa prejavili v nízkej likvidite, zápornom čistom pracovnom kapitáli, vysokej zadlženosti a zápornom vlastnom imaní. Výskumná otázka bola zodpovedaná tým, že vybrané zdravotnícke zariadenia nevykazovali jednotnú úroveň finančnej stability. Najnepriaznivejšiu pozíciu vykazovali Univerzitná nemocnica Bratislava a Univerzitná nemocnica L. Pasteura Košice, zatiaľ čo relatívne priaznivejšie postavenie dosiahla Fakultná nemocnica s poliklinikou F. D. Roosevelta Banská Bystrica a v niektorých ukazovateľoch aj Fakultná nemocnica Trnava či Martin. Výsledky zároveň potvrdili, že likvidita a zadlženosť sú v sledovanej vzorke vzájomne prepojené. Spearmanova korelačná analýza preukázala štatisticky významné monotónne vzťahy medzi ukazovateľmi likvidity, celkovou zadlženosťou, mierou samofinancovania a čistým pracovným kapitálom. Na základe týchto výsledkov bola nulová hypotéza zamietnutá. Možno teda konštatovať, že vyššia úroveň likvidity bola v sledovanej vzorke spojená s nižšou mierou zadlženosti a priaznivejšou kapitálovou pozíciou nemocníc.

Záverom možno uviesť, že finančnú stabilitu verejných zdravotníckych zariadení nemožno hodnotiť prostredníctvom jedného ukazovateľa ako uvádza literatúra, zároveň sme potvrdili, že nemocnice sa od seba odlišujú aj na takej malej vzorke ako je Slovensko. Prínos článku spočíva v prepojení hodnotenia krátkodobej finančnej pozície nemocníc s hodnotením ich kapitálovej štruktúry a v doplnení deskriptívnej analýzy o korelačné overenie vzťahu medzi likviditou a zadlženosťou. Pre prax výsledky naznačujú, že hodnotenie verejných nemocníc by nemalo byť založené iba na všeobecnom konštatovaní o nepriaznivom finančnom stave celého zdravotného sektora, ale na konkrétnych ukazovateľoch a ich vývoji v čase. Pri Rooseveltovej nemocnici a čiastočne pri Univerzitnej nemocnici Martin bolo v závere sledovaného obdobia zaznamenané zlepšenie vybraných ukazovateľov, zatiaľ čo pri Univerzitnej nemocnici Bratislava a Univerzitnej nemocnici L. Pasteura Košice pretrvávala výraznejšia finančná nerovnováha a zhoršenie.

Použitá literatúra (References)

- Akinleye, D. D., McNutt, L. A., Lazariu, V., & McLaughlin, C. C. (2019). Correlation between hospital finances and quality and safety of patient care. *PLOS ONE*, 14(8), e0219124. <https://doi.org/10.1371/journal.pone.0219124>
- Babczuk, A., & Kachniarz, M. (2012). Sources of soft budget constraints in the structure of autonomous public healthcare centres. *Argumenta Oeconomica*, 28(1), 181–214.
- Berger, M., Sommersguter-Reichmann, M., & Czipionka, T. (2020). Determinants of soft budget constraints: How public debt affects hospital performance in Austria. *Social Science & Medicine*, 249, 112855. <https://doi.org/10.1016/j.socscimed.2020.112855>
- Blavin, F., Kane, N., Arnos, D., & Zuckerman, S. (2023). Association of commercial-to-Medicare relative prices with health system financial performance. *JAMA Health Forum*, 4(2), e225401. <https://doi.org/10.1001/jamahealthforum.2022.5401>

Choi, S. (2017). Hospital capital investment during the Great Recession. *Inquiry: The Journal of Health Care Organization, Provision, and Financing*, 54, 1–12. <https://doi.org/10.1177/0046958017715158>

Cleverley, W. O., Cleverley, J. O., & Parks, A. V. (2023). *Essentials of Health Care Finance*. Jones & Bartlett Learning.

Dalci, I., & Ozyapici, H. (2018). Working capital management policy in health care: The effect of leverage. *Health Policy*, 122(11), 1266–1272.

Dong, G. N. (2015). Performing well in financial management and quality of care: Evidence from hospital process measures for treatment of cardiovascular disease. *BMC Health Services Research*, 15, 45. <https://doi.org/10.1186/s12913-015-0690-x>

Dubas-Jakóbczyk, K., Albrecht, T., Behmane, D., Bryndová, L., Dimova, A., Džakula, A., Habicht, T., Murauskienė, L., Scîntee, S. G., Smatana, M., Velkey, Z., & Quentin, W. (2022). The association between hospital financial performance and the quality of care: A scoping literature review. *Health Policy*, 126(12), 1141–1150.

Duran, A., Chanturidze, T., Moreno, A., & Gheorghe, A. (2019). Assessment of public hospital governance in Romania: Lessons from 10 case studies. *International Journal of Health Policy and Management*, 8(4), 199–210. <https://doi.org/10.15171/ijhpm.2018.119>

European Observatory on Health Systems and Policies. (2025). Slovakia: Health System Review 2025. *Health Systems in Transition*. European Observatory on Health Systems and Policies.

European Observatory on Health Systems and Policies, & OECD. (2025). Slovakia: Country Health Profile 2025. *State of Health in the EU*. OECD Publishing / European Observatory on Health Systems and Policies.

Finkler, S. A., Calabrese, T. D., & Smith, D. L. (2022). *Financial Management for Public, Health, and Not-for-Profit Organizations*. Pearson.

Gapenski, L. C., & Pink, G. H. (2015). *Understanding Healthcare Financial Management*. Health Administration Press.

Kim, T. H., & McCue, M. J. (2008). Association of market, operational, and financial factors with nonprofit hospitals' capital investment. *Inquiry: The Journal of Health Care Organization, Provision, and Financing*, 45(2), 215–231.

Kim, T. H., McCullough, J. S., & Lee, C. (2022). Do liquidity constraints affect the investment decisions of California hospitals? *Economic Modelling*, 114, 105935.

Milbank Memorial Fund, & Bailit Health. (2024). *A Guide to Understanding Hospital Spending through Financial Analysis*. Milbank Memorial Fund.

Ministerstvo zdravotníctva Slovenskej republiky. (2025). Informácia o vývoji dlhu v rezorte zdravotníctva za rok 2024. Ministerstvo zdravotníctva Slovenskej republiky.

Národný kontrolný úrad Slovenskej republiky. (2024). Nespravodlivý systém a záujmové skupiny urobili z pacienta rukojemníka. Národný kontrolný úrad Slovenskej republiky.

Pourmohammadi, K., Hatam, N., Shojaei, P., & Bastani, P. (2018). A comprehensive map of the evidence on the performance evaluation indicators of public hospitals: A scoping study and best fit framework synthesis. *Cost Effectiveness and Resource Allocation*, 16, 64. <https://doi.org/10.1186/s12962-018-0166-z>

Register účtovných závierok. (2025). Register účtovných závierok – verejné účtovné závierky zdravotníckych zariadení. Ministerstvo financií Slovenskej republiky. <https://www.registeruz.sk>

Singh, S. R., & Wheeler, J. (2012). Hospital financial management: What is the link between revenue cycle management, profitability, and not-for-profit hospitals' ability to grow equity? *Journal of Healthcare Management*, 57(5), 325–339.

Upadhyay, S., Sen, B., & Smith, D. G. (2015). Hospital liquidity and cash conversion cycle. *Journal of Health Care Finance*, 41(3), 1–15.

Wright, D. J. (2016). Soft budget constraints in public hospitals. *Health Economics*, 25(5), 578–590. <https://doi.org/10.1002/hec.3164>

Zelman, W. N., McCue, M. J., Glick, N. D., & Thomas, M. S. (2020). *Financial Management of Health Care Organizations: An Introduction to Fundamental Tools, Concepts and Applications*. Jossey-Bass.

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THE INFLUENCE OF FINANCIAL DECISION-MAKING ON THE INTRODUCTION OF INNOVATIONS IN RURAL ENTERPRISES

Veronika Volfová

Abstract

This thematic synthesis summarizes relevant professional literature published in the last 10 years in the Web of Science database. The aim is to map the current state of knowledge on the influence of financial decision-making in connection with the implementation of innovations in rural enterprises. The analysis identifies three main thematic areas: factors that influence rural entrepreneurs in their financial decision-making regarding innovation activities, forms of financing that rural enterprises use to finance innovation activities, and barriers that make it difficult for rural enterprises to draw funds for the implementation of innovations. Key findings indicate that the most significant factor influencing financial decision-making in rural enterprises is the human factor, that rural enterprises use bank loans most of all from formal forms of foreign capital, and that the greatest barriers for rural enterprises are poorly allocated or insufficient government support, the marginalization of specific groups, etc.

JEL classification: G32, O31, Q14

Keywords: financial decision-making, rural enterprises, innovations

Introduction

Financial decision-making in rural enterprises is one of the important determinants that influence the implementation of innovations. Innovation represents a key factor in achieving their financial sustainability and competitiveness. This is confirmed by Kaur (2026), who found that capital investments determine the financial success of innovations. The following literature review therefore focuses on the influence of financial decision-making on the implementation of innovations in rural enterprises, with the most frequent subjects of research being rural enterprises operating in the agricultural sector. The main subject of the literature review was rural enterprises, as they are still receiving little attention in scientific research. At the same time, the literature review was not focused on a specific area, but examined the issue from a global perspective, therefore the text summarizes articles focusing on the area of Great Britain, China, Canada, the USA, Africa and Europe. The aim is to provide an overview of the knowledge that has been researched and published on this issue and to identify the main areas that have an impact on the financial decision-making of rural enterprises.

1 Current state of the solved problem at home and abroad

In connection with the topic, it is also necessary to define the basic concepts that were used during the literature search. These are primarily rural enterprises, innovation and financial decision-making. Rural enterprises are considered business groups that

significantly contribute to the national economy (Kamar and Ali, 2023). A typical feature of rural enterprises is not only their geographical location but also their connection to the local environment, which involves the use of local resources and an irreplaceable contribution to the local community (Rachwał, 2022). As mentioned by Beckmann et al. (2023), rural enterprises also play an important role in the sustainable development of rural areas, in supporting innovation, and they contribute to preventing rural depopulation by creating new jobs.

Innovations provide businesses with the opportunity to grow faster and be more competitive. Therefore, it is important to focus research on the factors that determine these innovative activities in rural enterprises (Gamito et al., 2021). Generally, rural enterprises are not perceived as significantly innovative. They are characterized by limited availability of resources and labor, poorer infrastructure, and also a limited customer base (Steinerowska-Streb et al., 2019). Gamito et al. (2021) defined categories of resources that generally shape the dynamics of rural innovation. These are natural resources, cultural amenities, traditions, the rural population, and the territory. According to the OECD (2025), innovations in rural areas have a positive impact on society in adapting to global changes. Innovations in rural areas are not built on general research and development but are specific, influenced, and driven by people and creativity in a given place. Thanks to digitalization, automation, and AI, new business models are emerging through which distance and resource unavailability can be overcome.

Financial decision-making is a key process that an entrepreneur or business manager deals with. This process consists of systematic consideration, analysis and selection of the most appropriate options for the movement of cash in the company. The goal of financial decision-making is to maximize the value of the company and minimize risks (Míková, 2008).

2 Research design and methodology

The main research method used for writing this article was thematic synthesis. This method is characterized by formulating conclusions based on emerging findings. The procedure for applying this method is as follows: first, the subject of the study is defined, research objectives are set, and relevant basic information essential for formulating synthetic conclusions is selected (MUNI, 2019). A literature search was conducted to obtain data that was processed through thematic synthesis. The subject of the literature search was rural enterprises. The aim was to find professional articles dealing with the topic of the influence of financial decision-making on the implementation of innovations in rural enterprises and to identify the main areas that the authors dealt with in this context. The Web of Science database was used as a data source for the literature search. The exact procedure for selecting articles included in the literature search was as follows:

- Data was selected specifically on 12. 6. 2026.
- Within the Web of Science Core Collection, the search term: the influence of financial decision-making on the introduction of innovations in rural enterprises, was used and the search was performed in the Topic field.

- 100 results were found. These 100 results were further filtered by entering the time range in which the articles were published. Specifically, these were articles between 2016-2026.
- The type of searched contributions was also set to “articles” and “review articles”.
- After including these criteria, 44 articles were found, which were subsequently individually evaluated for their relevance to the research topic.
- In the final total, 22 articles were used in the literature search.

The articles were grouped into thematic areas in the context of writing a literature review to determine what directions the authors are dealing with in relation to the issue and in what areas there are research gaps. To achieve the research objective, the following research questions were set: RQ1: What are the main areas that the authors dealt with in relation to financing decisions on the introduction of innovations in a rural enterprise? And 3 sub-research questions were set: SRQ1: What key factors influence the financial decisions themselves in rural enterprises on innovations? SRQ2: What forms of financing do rural enterprises most often use to implement innovation plans? SRQ3: What main barriers do rural enterprises face when trying to draw on funds?

The limits of the research are primarily in the narrowly specific query when searching for relevant literary sources and also in the use of only one citation database. Future research could focus on a broader literature search with multidimensional queries and on exploring other recognized citation databases.

3 Result of the paper

3.1 Factors influencing financial decisions in rural enterprises

Innovation is one of the key factors helping rural enterprises achieve financial sustainability. Rural enterprises usually use available resources, which are physical, financial and human (Patoju and Swain, 2023). These resources further influence the implementation of innovations in enterprises. It is financial resources and financial decision-making that most influence the implementation of innovations. At the same time, correctly allocated capital investments determine the future financial success of innovations (Kaur, 2026). The positive impact of implemented innovations on the profitability of a rural enterprise was also written about by Fanelli (2021), who examined the impact of new technologies on small and medium-sized enterprises in Bulgaria, the Czech Republic, Greece, Hungary, Italy, Latvia, Slovenia and the United Kingdom. His results showed, among other things, that approximately 56% of rural small and medium-sized enterprises that introduced new technology experienced a positive impact on their profitability. If we return to the resources that enterprises use, it is necessary to stop not only at financial resources. Human resources determine how financial resources are strategically managed and allocated in a rural enterprise. As Obi-Anike et al. (2023) emphasize, the financial information literacy of entrepreneurs or managers plays a role here, which also affects the sustainability, performance and effectiveness of strategic decision-making on innovations. Rural entrepreneurs are influenced in this decision-

making by local media such as radio broadcasting, advertisements, etc. The financial capabilities of rural entrepreneurs directly determine the success of the business. Yi et al (2023) found that higher financial capabilities are positively correlated with the scale, profitability and sustainability of rural businesses. In addition to the above-mentioned financial capabilities and financial information literacy, it is important for rural enterprises to correctly set the structure of their liabilities and the way in which they cover their assets. This issue is examined in more detail by Bondina et al (2022), who propose the optimal ratio of equity and debt capital. As they state, this optimization is necessary to maximize profitability and minimize risk, which is to ensure the successful implementation of the company's financial strategy.

3.2 Forms of financing innovation plans

Rural enterprises can use their own resources to finance innovation projects or use foreign capital from so-called external sources of financing. In their articles, the authors focus on both traditional and alternative forms of foreign capital used by rural enterprises. Since micro, small and medium-sized enterprises may have a more limited amount of financial resources that they could allocate to innovation activities, they most often resort to traditional forms of financing. One of the most common forms of traditional financing is bank loans. As Chen et al (2025) found, bank loans have a positive impact on SMEs, as they help them alleviate the problem of limited financing for innovation, in this case in the agri-food industry. At the same time, they provide them with financial support for their innovation activities in connection with trade openness. Research conducted by Khafagy et al (2024) also demonstrated that external financing has a greater positive effect on rural enterprises. They also found that the lack of competitors in the rural environment positively mitigates the impact of external financing on business growth. Formal financing also has a positive effect, as it significantly contributes to the growth of business performance, while informal financing does not (Xiang et al, 2026). In addition to traditional forms, the development of digital inclusive financing has also come to the fore in recent years, which, according to Li et al (2025), significantly supports the innovation of agricultural enterprises, as it alleviates financial constraints and strengthens the investment security of enterprises for long-term research and development. This is also confirmed by Jiang et al. (2019) by finding that improving the level of development of inclusive financing can better support farmers' entrepreneurship. On the other hand, Yang and Li (2025) draw attention to the fact that human capital and certain forms of digital inclusive financing can act as negative moderators in certain cases. Another form of foreign capital are alternative sources of financing, the use and greater acceptance of which would ensure better availability of capital for agricultural enterprises and would support entrepreneurial and innovative activities Njegomir et al (2017). Alternative forms of financing also have the ability to mitigate the shortcomings resulting from the use of venture capital. (Fernandez-Vidal and Alarcon, 2025) In connection with the use of external resources, businesses can use forms of government support, or use the support of government support agencies or community organizations that can help in the use of financial information, financing, planning, etc. However, as Jagoda et al (2016) found in the Alberta region of Canada,

rural entrepreneurs are more likely to not use these services, despite the fact that they have noted the need for help in this area. The use of external forms of financing could significantly help create stronger rural businesses. Several authors have also emphasized in their articles the need to focus more financial support on supporting innovation in rural businesses. For example, Kaur (2026) mentions that policymakers should prioritize financing start-ups, which would help them accelerate the introduction of innovations. Xiang et al (2026) emphasize the need to strengthen formal finance, adopt regionally differentiated support strategies, and develop informal finance to support sustainable rural entrepreneurship growth. Yi et al (2023) recommend providing financial education to entrepreneurs, improving the financial environment, and trying to better link financial services with factors such as technology, land, and labour. Fernandez-Vidal and Alarcon (2025) also emphasize the importance of developing an innovation ecosystem and designing the right financial structures.

3.3 Barriers to accessing innovation funding

As already mentioned, the introduction of innovations in rural enterprises carries a motivation in the form of increasing the profitability of the enterprise (Fanelli, 2021). In addition to the positive impact of innovations on rural enterprises, innovations have the ability to help revitalize the countryside (del Olmo-García et al, 2023). However, in connection with the use of foreign capital, certain barriers have emerged for enterprises that they face and that make access more difficult. For example, Eschker et al (2017) found that some groups are disadvantaged when applying for financial support. These are mainly female-owned enterprises, family businesses and businesses with Hispanic owners, which face difficulties in obtaining funds to support innovations. Another barrier to drawing funds for the introduction of innovations is also the different availability of government support within localities. Therefore, the authors Ogujiuba et al (2022) emphasize the need for a more equitable distribution of support in favour of rural areas. It is the exclusion of some areas that significantly reduces business plans and innovation activity in rural areas Wang and Wang (2025). Kucher (2020) even points out the often-missing state support for innovative entrepreneurship, finding this fact to be one of the most significant obstacles. In addition to the above, another barrier is the fact that some rural companies do not want to invest in innovation due to the unpredictability of future product prices, monopolization of markets, control of power or justice (Malysh et al (2022).

4 Discussion

Through the thematic synthesis of current professional literature, the set research questions were answered. In connection with answering the main research question (RQ1), three main areas were identified that the authors addressed in their articles. The first area is the factors that influence rural entrepreneurs in making financial decisions regarding innovation activities. The second area is the forms of financing that rural enterprises use to finance their innovation activities. The third area is the barriers that

make it difficult for rural enterprises to draw funds for the implementation of innovations.

Through sub-question number 1 (SRQ1), it was found that the way in which rural enterprises decide on the financing of innovation projects is influenced by several factors. These factors are financial, human and physical, with human factors being considered the most important (Patoju and Swain, 2023). These mainly stem from the person of the entrepreneur or manager himself, who is responsible for the strategic management of financial resources in the enterprise and decides on their allocation (Obi-Anike et al., 2023). In addition to factors, the availability of financial resources in a rural enterprise also influences financial decisions, and the importance of paying attention to the correct ratio of equity and debt capital emerged (Bondina et al., 2022).

The literature search also provided an answer to sub-question number 2 (SRQ2) examining what forms of financing rural enterprises most often use to implement innovation plans. It was found that rural enterprises most often use formal forms of financing to finance innovation activities from external sources, namely in the form of a bank loan (Chen et al., 2025). This will be due primarily to the fact that in economic theory, foreign capital, for example in the form of a bank loan, which is most available to small and medium-sized enterprises, is cheaper than equity capital. It is cheaper mainly due to tax savings on interest and lower risk for creditors. Other forms of financing showed that rural enterprises can use alternative forms of financing or draw, for example, subsidies from government support (Njegomir et al., 2017; Jagoda et al., 2016). However, it is precisely with these forms of financial support that several authors have identified barriers that rural enterprises encounter. This leads us to the third sub-question (SRQ3), which aimed to identify the barriers that rural businesses face when trying to draw on funds. These barriers include, for example, insufficient or poorly allocated government support, disadvantage of certain minorities in approving applications for any form of financial support, market uncertainties or unequal access to resources (Kucher, 2020; Eschker et al., 2017; Malysh et al., 2022; Wang and Wang, 2025). The literature review showed that rural businesses are given little attention in the area of supporting the financing of innovation activities not in the context of a local scale, but on a global scale. Given the fact that there is an outflow of population from rural areas, targeted support for rural businesses could, as already mentioned, support the revitalization of these areas (del Olmo-García et al., 2023) and at the same time help to kick-start their better economic performance and mitigate the outflow of population, which would also have a positive impact on the local community.

Conclusion

The article provided an overview of the main areas covered by the authors in their articles over the past 10 years related to the topic of the influence of financial decision-making on the implementation of innovations in rural enterprises. A total of 22 relevant professional articles from the Web of Science database were summarized as part of the literature search. The limits of the research are primarily in the narrowly specific query when searching for relevant literary sources and also in the use of only one citation

database. Future research could focus on a broader literature search with multidimensional queries and on exploring other recognized citation databases.

References

- Beckmann, M., Garkisch, M., Zeyenová, A. (2021). Together we are strong? A systematic literature review on how SMEs use relation-based collaboration to operate in rural areas. *Journal of Small Business & Entrepreneurship*, 35 (4), pp. 515-549. <https://doi.org/10.1080/08276331.2021.1874605>.
- Bondina, N., Bondin, I., Pavlova, I., & Gulina, A. (2022). Methodological approaches to optimizing the structure of owned and loan capital of agricultural enterprises. *Scientific Papers-Series Management Economic Engineering in Agriculture and Rural Development*, 22(2), 129–136.
- del Olmo-García, F., Domínguez-Fabián, I., Crecente-Romero, F. J., & del Val-Núñez, M. T. (2023). Determinant factors for the development of rural entrepreneurship. *Technological Forecasting and Social Change*, 191, Článek 122487. DOI 10.1016/j.techfore.2023.122487.
- Eschker, E., Gold, G., & Lane, M. D. (2017). Rural entrepreneurs: what are the best indicators of their success? *Journal of Small Business and Enterprise Development*, 24(2), 278–296. DOI 10.1108/JSBED-07-2016-0112.
- Fanelli, R. M. (2021). Barriers to adopting new technologies within rural small and medium enterprises (SMEs). *Social Sciences*, 10(11), Článek 430. DOI 10.7341/20221811.
- Fernandez-Vidal, J., & Alarcon, S. (2025). Financing agricultural innovation: Challenges and alternatives to venture capital in the AgTech sector. *Food Policy*, 136, Článek 102967. DOI 10.1016/j.foodpol.2025.102967.
- Gamito, T., M., Madureira, L., Santos, J., M., L. (2021). Unveiling and typifying rural resources underpinned by innovation dynamics in rural areas. *Regional Science Policy & Practice*, 13 (3), pp. 457-478. <https://doi.org/10.1111/rsp3.12228>.
- Chen, X., Wang, K., Xing, L. R., & Lli, J. (2025). Nonlinear effects of bank loans on county agrifood SMEs innovation: Empirical evidence from China. *Agricultural Economics-Zemědělská Ekonomika*, 71(11), 604–617. DOI 10.17221/324/2024-AGRICECON.
- Jagoda, K., Lin, X. H., Calvert, V., & Tao, S. (2016). Accountability of venture support agencies: Do they really help? *Entrepreneurship Research Journal*, 6(2), 175–206. DOI 10.1515/erj-2014-0038
- Jiang, L. L., Tong, A. H., Hu, Z. F., & Wang, Y. F. (2019). The impact of the inclusive financial development index on farmer entrepreneurship. *PLOS ONE*, 14(5), Článek e0216466. DOI 10.1371/journal.pone.0216466.
- Kamar, M.,A.,A., Ali, M.,A.,F. (2023). The impacts of the COVID 19 pandemic crisis on rural entrepreneurs. *Malaysian Journal of Society and Space*, 19 (1), PP. 109-118. <https://doi.org/10.17576/geo-2023-1901-08>.

- Kaur, S. (2026). Analyzing business model innovation and market entry strategies for agri-based enterprises: a financial perspective. *Frontiers in Sustainable Food Systems*, 9, Článek 1719231. DOI 10.3389/fsufs.2025.1719231.
- Khafagy, A., Nguyen, T., Gorton, M., & Phillipson, J. (2025). External finance and the growth of rural and urban SMEs in England. *Journal of Small Business Management*, 63(5), 2455–2483. DOI 10.1080/00472778.2024.2436985.
- Kucher, L. (2020). Opportunities and barriers on the way of introducing innovations in agricultural enterprises. *Scientific Papers-Series Management Economic Engineering in Agriculture and Rural Development*, 20(3), 343–351.
- Malysh, I. A., Bukhalo, E. V., Prozorova, N. V., & Bilokin, O. P. (2022). Studying the factors that influence the innovation and investment development of agricultural enterprises by the expert survey method. *Science and Innovation*, 18(3), 74–86. DOI 10.15407/scine18.03.074.
- Míková, M. (2008). Tři hlavní druhy finančního rozhodování podniku. *Český finanční a účetní časopis*, 2008, roč. 3, č. 2, s. 42-46. <https://cfuc.vse.cz/pdfs/cfu/2008/02/05.pdf>
- MUNI. (2019). Metodologie II. Srovnání kvantitativních a kvalitativních metod. Dostupné 12.6. 2026 z: https://is.muni.cz/el/fsps/jaro2013/np2019/um/srovnani_kvant-kval.pdf
- Njegomir, V., Tepavac, R., & Ivanisevic, N. (2017). Alternative sources of financing entrepreneurial undertakings in agriculture. *Ekonomika Poljoprivrede-Economics of Agriculture*, 64(1), 295–306. DOI 10.5937/ekoPolj1701295N.
- Li, Q., Li, X. N., Zhai, QQ., Li, W., & Wagan, S. A. (2025). Impact of digital financial inclusion on agricultural enterprise innovation. *Transformations in Business & Economics*, 24(1), 102–122.
- Obi-Anike, H. O., Daniel, O. C., Onodugo, I. J., Attamah, I. J., & Imhanrenialena, B. O. (2023). The role of financial information literacy in strategic decision-making effectiveness and sustainable performance among agribusiness entrepreneurs in Nigeria. *Sustainability*, 15(13), Článek 10416. DOI 10.3390/su151310416.
- OECD. (2025). *Rural innovation pathways: Shaping the future of rural areas*. OECD Publishing. https://www.oecd.org/content/dam/oecd/en/publications/reports/2025/11/rural-innovation-pathways_2336e9dd/c86de0f4-en.pdf
- Ogujiuba, K. K., Olamide, E., Agholor, A. I., Boshoff, E., & Semosa, P. (2022). Impact of government support, business style, and entrepreneurial sustainability on business location of SMEs in South Africa's Mpumalanga Province. *Administrative Sciences*, 12(3), Článek 117. DOI 10.3390/admsci12030117.
- Patoju, S. K. S., & Swain, S. (2023). Entrepreneurial value creation by rural enterprises: A process model. *Journal of Entrepreneurship*, 32(3), 590–617. DOI 10.1177/09713557231210683.

Rachwał, T., Kulawiak, A., Suliborski, A. (2022). Research on Rural Entrepreneurship in Terms of the Literature: Definition Problems and Selected Research Issues. *Quaestiones Geographicae*, 41 (2), pp. 7-19. <https://doi.org/10.2478/quageo-2022-0020>.

Steinerowska-Streb, I., Peterková, J., Steiner, A. (2019). Innovation and rural context: An exploratory case study of a small rural enterprise from the Czech Republic. *International Journal of Entrepreneurship and Innovation*, 25 (2), pp. 116-127. <https://doi.org/10.1177/14657503241241415>

Sus, T., Yemets, O., & Tsiupa, O. (2020). Financial policy of stimulating innovative development of the agricultural sector and mechanism of its implementation: foreign experience. *Financial and Credit Activity-Problems of Theory and Practice*, 4(35), 347–355.

Wang, B., & Wang, W. Q. (2025). Breaking barriers to rural entrepreneurship: How productive credit mitigates financial exclusion. *Finance Research Letters*, 86, Article 108568. DOI 10.1016/j.frl.2025.108568.

Xiang, Z. L., Yin, Q. Y., Xue, X. Z., Zhang, W. T., & Wang, X. (2026). What affects rural households' entrepreneurial performance: Formal or informal finance availability? *PLOS ONE*, 21(2), Článek e0343040. DOI 10.1371/journal.pone.0343040.

Yang, L. L., & Li, M. Q. (2025). Rural financial services and agricultural technological innovation. *Finance Research Letters*, 86, Article 108478. DOI 10.1016/j.frl.2025.108478.

Yi, H., Meng, X., Linghu, Y. T., & Zhang, Z. Y. (2023). Can financial capability improve entrepreneurial performance? Evidence from rural China. *Economic Research-Ekonomska Istraživanja*, 36(1), 1631–1650. DOI 10.1080/1331677X.2022.2091631.

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FINANCIAL AND COST BARRIERS TO DIGITAL TRANSFORMATION IN HEALTHCARE FACILITIES: A SYSTEMATIC LITERATURE REVIEW BASED ON THE PRISMA METHODOLOGY

Sofia Zavacká – Nadežda Jankelová

Abstract

Digital transformation has become one of the key priorities in the development of modern healthcare systems. Despite its expected benefits, the implementation of digital technologies is often limited by financial and cost-related barriers that influence investment decisions and the long-term sustainability of digital transformation. The aim of this study is to systematically identify and synthesize the financial and cost-related barriers to digital transformation in healthcare organizations through a systematic literature review based on the PRISMA methodology, using studies retrieved from the Web of Science database. The review included 24 studies published between 2022 and 2026 that met the predefined inclusion criteria. The findings identified five major financial barriers related primarily to healthcare financing and reimbursement mechanisms, as well as five recurrent cost-related barriers associated with the implementation and operation of digital technologies. The results indicate that digital transformation is constrained not only by high implementation costs but also by systemic shortcomings in financing and reimbursement models. These findings provide an overview of the main economic challenges associated with digital transformation and may support healthcare managers and policymakers in financial planning, investment decision-making, and the development of more sustainable financing mechanisms for digital health technologies.

JEL classification: H51, I18, O33

Keywords: digital transformation; healthcare; financial barriers

Introduction

Digital transformation in healthcare represents an important component of the modernization of healthcare systems and is closely associated with the development of digital technologies that are changing the organization, management, and delivery of healthcare services (Bocean & Vărzaru, 2025; Kludacz-Alessandri et al., 2025). The implementation of solutions such as electronic health records, telemedicine, artificial intelligence, and the Internet of Things requires not only technological readiness but also appropriate economic conditions to support their adoption and long-term operation (Duncan et al., 2022).

The existing literature on digital transformation has focused primarily on the clinical benefits of digital technologies, technological innovation, and organizational change. Considerably less attention has been paid to the economic aspects of implementation, although financial resources and implementation costs are among the key factors

influencing the adoption and long-term sustainability of digital technologies in healthcare organizations.

The aim of this study is to identify and synthesize the financial and cost-related barriers to digital transformation in healthcare organizations through a systematic literature review based on the PRISMA methodology. To achieve this aim, the following research question was formulated: "What are the main financial and cost-related barriers hindering digital transformation in healthcare organizations?" The review seeks to identify the most frequently reported financial and cost-related barriers and synthesize the available evidence to provide a comprehensive overview of the economic challenges associated with the implementation of digital technologies in healthcare organizations.

1 Current state of the solved problem at home and abroad

The COVID-19 pandemic significantly accelerated the digital transformation of healthcare, as digital technologies ensured the continuity of healthcare delivery during periods when in-person visits to healthcare organizations were restricted (Mauro et al., 2024). Healthcare digitalization has also been promoted by European Union initiatives, particularly the Digital Decade 2030 strategy, which sets the direction for the further development of digital public services, including healthcare. One of its objectives is to ensure that all European Union citizens have access to electronic health records by 2030 (European Court of Auditors, 2024). Consequently, digital transformation has become one of the key priorities in the development of modern healthcare systems, contributing to improvements in the quality, efficiency, safety, and accessibility of healthcare services (Natakusumah et al., 2022). Furthermore, the development of digital healthcare is based on the principles of Industry 4.0 (Basulo-Ribeiro & Teixeira, 2024) and Industry 5.0, which promote the adoption of digital technologies to develop sustainable, patient-centered healthcare systems (Fogaça et al., 2025; Golovianko et al., 2023; Sindhwani et al., 2022).

Despite its expected benefits, the implementation of digital technologies remains a financially demanding process (Gentili et al., 2022; Nguyen et al., 2024). The adoption of digital solutions requires substantial upfront investments in hardware, software, and digital infrastructure (Faujdar et al., 2025; Hollander et al., 2025), while additional costs arise from staff training, system maintenance, and workflow redesign (Donovan et al., 2023; Insani et al., 2025). Beyond these direct implementation costs, the literature identifies several systemic financial barriers. Among the most significant is the wrong pocket problem, whereby one stakeholder bears the implementation costs while another benefits from the resulting financial gains (Nguyen et al., 2024; Rakers et al., 2023; Vesty et al., 2023). Other important barriers include activity-based funding models that inadequately reward the benefits of digital technologies, the lack of sustainable reimbursement mechanisms, and lower reimbursement rates for telemedicine services compared with in-person care (Huang-Ku et al., 2025; Nguyen et al., 2024).

Current research primarily focuses on the clinical benefits of digital technologies, their cost-effectiveness, and the evaluation of individual implementation projects. Financial and cost-related barriers are generally mentioned only marginally as part of broader

technological or organizational determinants of implementation. Nevertheless, these barriers may represent important factors influencing investment decision-making and the successful implementation of digital technologies in healthcare organizations. A systematic synthesis focusing specifically on the financial and cost-related barriers to digital transformation in healthcare organizations is therefore lacking. Accordingly, the aim of this systematic literature review, conducted in accordance with the PRISMA methodology, is to identify and synthesize the available evidence on the financial and cost-related barriers to digital transformation in healthcare organizations.

2 Research design and methodology

A systematic literature review was conducted according to the PRISMA guidelines, with the standard procedure appropriately simplified since the search for relevant sources was limited to a single database. The aim of the review was to identify and analyze the financial and cost barriers to implementing digital transformation in healthcare facilities. To this end, the following research question was formulated: What are the main financial and cost-related barriers hindering digital transformation in healthcare organizations?

The search for relevant publications was conducted using the Web of Science database on 14.6.2026. Web of Science was selected due to its multidisciplinary coverage and high-quality indexing of peer-reviewed journals. To identify relevant studies, the following search string was used: TS= (("digital health" OR "digital transformation" OR "Healthcare 4.0" OR "Healthcare 5.0" OR eHealth OR "smart hospital*") AND (hospital* OR "healthcare facilit*" OR "health system*")) AND TS= ("financ*" OR "cost*" OR "investment*" OR "reimbursement*" OR "funding" OR "economic evaluation*" OR "return on investment" OR "budget*") AND TI= (financ* OR cost* OR invest* OR econom* OR reimburs* OR budget* OR fund*). Using the above search string, a total of 184 records were identified in the Web of Science database. The identified records were subsequently screened using the eligibility criteria presented in Table 1.

Table 1

Eligibility criteria for the selection of scientific publications

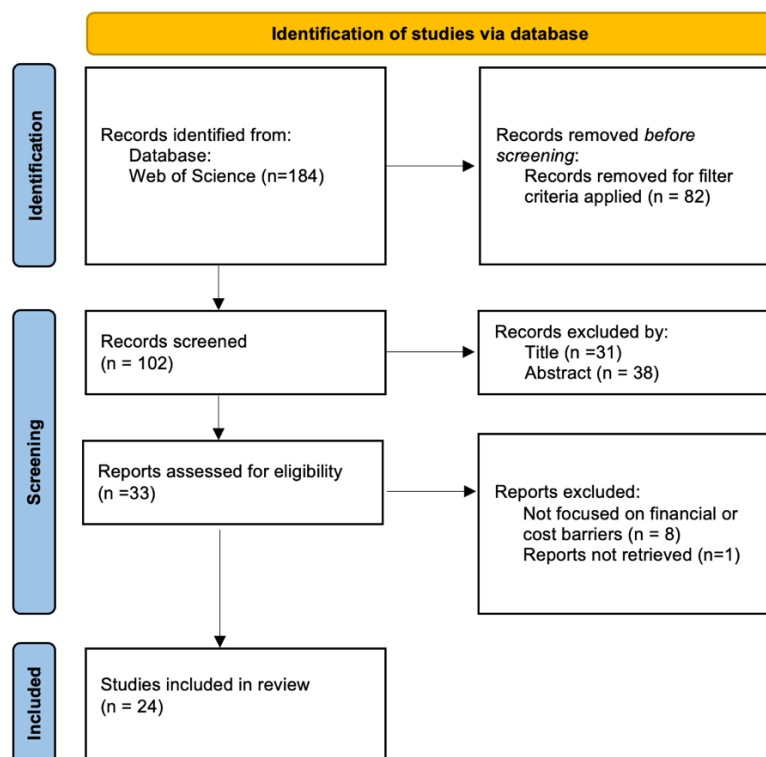
Criterion	Specification
Time period	2022-2026
Document type	Research articles; Review articles
Access type	Open access
Language	English

Source: Authors' own elaboration

After applying the eligibility criteria, 102 publications were included in the screening process. In the first screening stage, 31 publications were excluded based on their titles. In the second stage, the abstracts of the remaining studies were assessed, resulting in the exclusion of a further 38 publications due to their lack of relevance to the research topic. Consequently, 33 full-text articles were assessed for eligibility. Following a detailed full-text review, seven studies were excluded, including one due to the unavailability of the full text and six because they did not meet the scope of the systematic review. The

final sample comprised 24 studies. The complete study selection process is illustrated in the PRISMA flow diagram (Figure 1).

Figure 1
PRISMA Flow Diagram of the Study Selection Process



Source: own elaboration, according to (Page et al., 2021)

Relevant data on financial and cost-related barriers were extracted from the full texts of the included studies. The extracted data were then analyzed using qualitative content analysis and grouped into thematic categories based on recurring patterns identified across the included studies.

To provide additional context for the findings, the results of the systematic review were supplemented with statistical data from the OECD Health Working Papers and the European Court of Auditors Special Report, which offer insights into financial and investment trends in healthcare digitalization.

3 Research results

This section presents the findings of the systematic literature review, organized into three parts. The first provides an overview of the characteristics of the included studies (N = 24), including their geographical distribution, study design, level of analysis, and publication source (Table 2). The second presents the most frequently reported financial barriers to digital transformation in healthcare organizations (Table 3), while the third summarizes the most frequently reported cost-related barriers identified across the included studies (Table 4).

Table 2

Characteristics of the Included Studies

Author / Year	Country	Study Design	Level of Analysis	Source
(Rakers et al., 2023)	Netherlands	Qualitative study (interviews)	Reimbursement system	Health Policy and Technology
(Schwander et al., 2026)	Global	Narrative review	Investment decision-making	Health Policy and Technology
(Helldén et al., 2023)	Global	Review of funding applications	Donor and health system financing	The Lancet Digital Health
(De Sario Velasquez et al., 2024)	Global	Systematic review	Cost-effectiveness of digital technologies	Mayo Clinic Proceedings: Digital Health
(Dany & Pribadi, 2025)	Global (Indonesia)	Bibliometric analysis	Trends in hospital financing	Asia-Pacific Journal of Health Management
(Ye et al., 2026)	China	Mixed-method case study	Financial management of hospital groups	Risk Management and Healthcare Policy
(Faujdar et al., 2025)	India	Cost analysis	Primary healthcare	Indian Journal of Medical Research
(Boriani et al., 2022)	Europe	Expert survey and data mapping	National reimbursement systems	Europace
(Nanyonga et al., 2026)	Sub-Saharan Africa	Review	Health system financing strategies	Frontiers in Public Health
(Hollander et al., 2025)	United States	Expert panel discussion	Return on investment for healthcare management	Telemedicine Reports
(Schuetze et al., 2023)	Tanzania	Qualitative study (interviews)	Implementation of digital financing	Journal of Medical Internet Research
(Walter et al., 2023)	United States	Quantitative study (Difference-in-Differences)	Impact of virtual care	Journal of Medical Internet Research
(Insani et al., 2025)	Global	Systematic review	Economic impact	Journal of Medical Internet Research
(Huang-Ku et al., 2025)	Global	Scoping review and interviews	Public reimbursement models for telemedicine	Journal of Medical Internet Research
(Sapanel et al., 2025)	Global	Qualitative study	Economic decision-making of technology developers	Journal of Medical Internet Research

(Vesty et al., 2023)	Australia / Europe	Qualitative field study	Accounting models and investment	Meditari Accountancy Research
(Kessel et al., 2023)	Eight EU countries and Israel	Scoping review	National strategic reimbursement models	JMIR mHealth and uHealth
(Ikoona et al., 2026)	Africa	Framework development	Sustainability of health informatics investments	JMIR Public Health and Surveillance
(Wilson et al., 2023)	Kenya / Rwanda	Qualitative case studies	Services for universal health coverage	BMC Health Services Research
(Nguyen et al., 2024)	Australia	Framework development	Economic evaluation of digital hospitals	BMC Health Services Research
(Nadigel et al., 2025)	Canada	Research impact assessment	National funding programmes	Health Research Policy and Systems
(Donovan et al., 2023)	Global	Systematic review	Implementation costs in hospitals	Implementation Science
(Nguyen et al., 2022)	Global	Scoping review	Evaluation of electronic medical records (EMRs)	npj Digital Medicine
(Mathias et al., 2024)	Global	Policy perspective	Regulation and reimbursement of digital health technologies	npj Digital Medicine

Source: own elaboration

3.1 Characteristics of the included studies

Following the methodological procedure of the systematic literature review, a final set of studies was identified for analysis. To provide a clearer overview of the included studies, their key characteristics are summarized in Table 2.

The analysis of the included studies showed that the financial and cost-related barriers to digital transformation are examined at multiple levels of the healthcare system, ranging from individual healthcare organizations to national financing and reimbursement mechanisms, as well as international and donor funding in developing countries. This diversity indicates that the financial barriers to implementing digital technologies are systemic in nature and affect the healthcare system at multiple levels.

Based on the content analysis of the included studies, the most frequently reported financial and cost-related barriers to digital transformation in healthcare organizations were identified. These barriers are summarized in Tables 3 and 4.

3.2 Financial barriers

The content analysis identified several recurring financial barriers to digital transformation in healthcare organizations. These barriers primarily relate to healthcare financing and reimbursement mechanisms that influence the implementation and sustainability of digital technologies. The five most frequently reported financial barriers identified across the included studies are presented in Table 3.

Table 3
Most Frequent Financial Barriers to Digital Transformation

Financial Barrier	Description	Authors
Wrong Pocket Problem	Implementation costs are borne by one entity, while the financial benefits accrue to another.	(Nguyen et al., 2024; Rakers et al., 2023; Vesty et al., 2023)
Lack of Structural Reimbursement	Digital innovations lack sustainable reimbursement mechanisms and permanent payment codes.	(Boriani et al., 2022; Huang-Ku et al., 2025; Kessel et al., 2023; Rakers et al., 2023)
Unproven Return on Investment (ROI)	Limited evidence on long-term cost-effectiveness and financial returns creates investment uncertainty.	(Hollander et al., 2025; Insani et al., 2025; Nguyen et al., 2024; Schwander et al., 2026)
Lower Reimbursement Rates	Telemedicine and virtual services are often reimbursed at lower rates than in-person care.	(Huang-Ku et al., 2025; Kessel et al., 2023; Rakers et al., 2023)
Volume–Value Mismatch (Activity-Based Funding)	Activity-based payment models reward service volume rather than efficiency and prevention.	(Huang-Ku et al., 2025; Nguyen et al., 2024; Vesty et al., 2023)

Source: own elaboration

As shown in Table 3, the identified financial barriers are primarily associated with systemic shortcomings in healthcare financing and reimbursement mechanisms. The most frequently reported barrier was the wrong pocket problem, whereby one stakeholder bears the implementation costs while another benefits from the resulting

financial gains (Rakers et al., 2023; Nguyen et al., 2024; Vesty et al., 2023). Other commonly reported barriers included the lack of sustainable reimbursement mechanisms for digital health technologies, lower reimbursement rates for telemedicine services, uncertainty regarding the long-term return on investment, and activity-based funding models that prioritize service volume over efficiency (Boriani et al., 2022; Huang-Ku et al., 2025; Hollander et al., 2025; Insani et al., 2025; Nguyen et al., 2022; Kessel et al., 2023). The persistence of these reimbursement-related barriers may also be associated with broader weaknesses in the financial governance of healthcare digitalization across the European Union. The European Court of Auditors (2024) reported that only 8 of the 19 surveyed Member States maintain a comprehensive overview of EU funding allocated to healthcare digitalization. Limited transparency in the allocation and monitoring of these funds may, in turn, constrain the development of sustainable reimbursement frameworks for digital health technologies (European Court of Auditors, 2024).

These findings suggest that the financial barriers to digital transformation in healthcare are not isolated organizational challenges but rather the result of systemic financing and reimbursement mechanisms that continue to reward service volume rather than value.

3.3 Cost barriers

While the previous section focused on financial barriers related to healthcare financing and reimbursement, the included studies also reported several recurring cost-related barriers associated with the implementation of digital technologies. These barriers mainly reflect the direct costs of technology adoption and operation. The five most frequently reported cost-related barriers are summarized in Table 4.

Table 4
Most Frequent Cost Barriers to Digital Transformation

Cost Barrier	Description	Authors
High Upfront Investment Costs	High initial costs for hardware, software, and digital infrastructure, which frequently exceed original budget projections.	(Faujdar et al., 2025; Hollander et al., 2025; Insani et al., 2025; Nguyen et al., 2022)
Specialized IT Labor and Personnel	Often the largest cost component, involving wages for software developers, system engineers, data managers, and technical support teams.	(Donovan et al., 2023; Faujdar et al., 2025; Hollander et al., 2025; Insani et al., 2025)
Training and Change Management	Resources required for staff training and workflow redesign.	(Donovan et al., 2023; Hollander et al., 2025; Insani et al., 2025)
Recurring Maintenance & Licenses	Ongoing costs for software licenses, maintenance, and system updates.	(Faujdar et al., 2025; Insani et al., 2025; Rakers et al., 2023)
Productivity Loss (Learning Curve)	Temporary decline in staff productivity during technology adoption.	(Donovan et al., 2023; Nguyen et al., 2022)

Source: own elaboration

The findings presented in Table 4 indicate that the most frequently reported cost-related barrier was the high upfront investment in hardware, software, and digital infrastructure (Insani et al., 2025; Nguyen et al., 2022; Hollander et al., 2025; Faujdar et al., 2023). These findings are consistent with OECD data, which show that annual healthcare capital expenditure on ICT equipment and software/databases increased by 5.6% and 7.2%, respectively, between 2011 and 2023, reflecting the increasing investment required for the development of digital healthcare infrastructure (Morgan & Mueller, 2026). These costs are further compounded by ongoing expenditures related to specialized IT personnel and salaries, staff training, system maintenance, and temporary productivity losses during the adaptation to new technologies, which also require substantial time commitments from both employees and management (Donovan et al., 2023; Faujdar et al., 2023; Hollander et al., 2025; Rakers et al., 2023). These findings suggest that cost-related barriers extend beyond initial investment costs and include the human, operational, and organizational resources required throughout the implementation process.

Overall, the findings indicate that the implementation of digital technologies in healthcare organizations is influenced by both financial and cost-related barriers. While financial barriers are primarily associated with healthcare financing and reimbursement mechanisms, cost-related barriers reflect the substantial resources required for the implementation and long-term operation of digital technologies. Identifying these barriers provides valuable evidence to support more informed financial and investment decision-making by healthcare managers, while also contributing to the development of more effective financing mechanisms for digital transformation.

4 Discussion

The findings of this systematic review indicate that the financial barriers to digital transformation in healthcare are primarily rooted in healthcare financing systems rather than in the technologies themselves. The most prominent barrier identified was the wrong pocket problem, which arises when one stakeholder bears the costs of implementing digital technologies while another benefits from the resulting financial gains. Rakers et al. (2023) describe this phenomenon as one of the main obstacles to establishing sustainable reimbursement mechanisms for digital health technologies. This argument is further supported by Vesty et al. (2023), who emphasize that the distribution of costs and benefits across different levels of the healthcare system creates conflicts in investment decision-making and reduces stakeholders' willingness to invest in digital innovation. These findings suggest that successful digital transformation requires not only adequate financial resources but also better alignment of financial incentives among healthcare stakeholders.

Reimbursement mechanisms represent another important determinant of digital technology adoption. Huang-Ku et al. (2025) argue that telemedicine services are frequently undervalued because reimbursement systems often assume that virtual care requires fewer resources than face-to-face consultations. Rakers et al. (2023) complement this perspective by showing that financial incentives in many healthcare

systems remain explicitly designed to reward in-person physician visits rather than digital service delivery. While Huang-Ku et al. (2025) and Boriani et al. (2022) propose aligning reimbursement rates for digital services with those for conventional healthcare, Vesty et al. (2023) and Nguyen et al. (2024) argue that reimbursement reform alone is unlikely to be sufficient. Instead, they advocate a transition toward value-based payment models that reward healthcare outcomes rather than service volume. This interpretation is consistent with the findings of the present review, in which the mismatch between activity-based funding and the value generated by digital technologies emerged as one of the most frequently reported financial barriers.

The review also demonstrates that investment decisions are substantially influenced by uncertainty regarding the economic value of digital technologies. Nguyen et al. (2022) criticize the widespread reliance on cashable return on investment (ROI) when evaluating digital health investments, arguing that this approach captures only directly measurable financial savings while overlooking intangible benefits such as improved quality of care, patient satisfaction, and organizational performance. Similarly, Schwander et al. (2026) identify uncertainty regarding the long-term economic value of digital technologies as one of the main factors discouraging investment in digital transformation. Together, these findings suggest that conventional economic evaluation methods may underestimate the broader value created by digital health technologies.

Regarding cost-related barriers, the findings confirm that high upfront investments in hardware, software, and digital infrastructure remain a major challenge. Although Insani et al. (2025) identify these investments as one of the largest cost components of digital transformation, Donovan et al. (2023) argue that the dominant implementation costs are often associated with human capital, particularly the salaries of IT specialists, staff training, workflow redesign, and the time required for organizational adaptation. This perspective is consistent with the findings of the present review, in which specialized IT personnel, staff training, and temporary productivity losses were among the most frequently reported cost-related barriers. Consequently, healthcare organizations should consider not only the initial capital expenditure but also the long-term human, organizational, and operational resources required throughout the implementation process.

Overall, the findings indicate that financial and cost-related barriers are closely interconnected. While financial barriers shape the economic incentives for adopting digital technologies, cost-related barriers determine the organizational capacity to implement and sustain them. Addressing only one of these dimensions is therefore unlikely to accelerate digital transformation. Instead, successful implementation requires financing models that align financial incentives with the value created by digital technologies while also recognizing the long-term organizational resources needed to support their adoption and sustainable use.

Conclusion

This systematic literature review identified the main financial and cost-related barriers to digital transformation in healthcare organizations. Financial barriers were mainly

related to healthcare financing and reimbursement mechanisms, particularly the wrong pocket problem, the lack of sustainable reimbursement, and activity-based funding models. Cost-related barriers were associated with the resources required for implementation, including upfront investment, specialized IT personnel, staff training, system maintenance, and temporary productivity losses. These findings provide an overview of the main economic challenges that should be considered when planning and implementing digital transformation initiatives in healthcare organizations.

Several limitations should be acknowledged. The review was based on a single database (Web of Science), and only English-language open-access publications published between 2022 and 2026 were included. In addition, data extraction and categorization were performed by a single reviewer. Future research should include additional databases, broader publication coverage, and longer time periods. Empirical studies could further examine the identified barriers in different healthcare settings and support the development of more effective financing and investment strategies for digital transformation.

Acknowledgement

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References

- Basulo-Ribeiro, J., & Teixeira, L. (2024). The Future of Healthcare with Industry 5.0: Preliminary Interview-Based Qualitative Analysis. *Future Internet*, 16(3), Article 3. <https://doi.org/10.3390/fi16030068>
- Bocean, C. G., & Vărzaru, A. A. (2025). Health status in the era of digital transformation and sustainable economic development. *BMC Health Services Research*, 25(1), 343. <https://doi.org/10.1186/s12913-025-12498-y>
- Boriani, G., Burri, H., Svennberg, E., Imberti, J. F., Merino, J. L., & Leclercq, C. (2022). Current status of reimbursement practices for remote monitoring of cardiac implantable electrical devices across Europe. *EP Europace*, 24(12), 1875–1880. <https://doi.org/10.1093/europace/euac118>
- Dany, Y. A., & Pribadi, F. (2025). Trends of Research in Hospital Financing and Health Industry 4.0/5.0: A bibliometric analysis. *Asia Pacific Journal of Health Management*, 20(1). <https://doi.org/10.24083/apjhm.v20i1.3695>
- De Sario Velasquez, G. D., Borna, S., Maniaci, M. J., Coffey, J. D., Haider, C. R., Demaerschalk, B. M., & Forte, A. J. (2024). Economic Perspective of the Use of Wearables in Health Care: A Systematic Review. *Mayo Clinic Proceedings: Digital Health*, 2(3), 299–317. <https://doi.org/10.1016/j.mcpdig.2024.05.003>

- Donovan, T., Abell, B., Fernando, M., McPhail, S. M., & Carter, H. E. (2023). Implementation costs of hospital-based computerised decision support systems: A systematic review. *Implementation Science*, 18(1), 7. <https://doi.org/10.1186/s13012-023-01261-8>
- Duncan, R., Eden, R., Woods, L., Wong, I., & Sullivan, C. (2022). Synthesizing Dimensions of Digital Maturity in Hospitals: Systematic Review. *Journal of Medical Internet Research*, 24(3), e32994. <https://doi.org/10.2196/32994>
- European Court of Auditors. (2024). *Special report 25/2024: Digitalisation of healthcare*. <https://doi.org/10.2865/8114928>
- Faujdar, D. S., Prinja, S., Singh, T., Sahay, S., & Kumar, R. (2025). Costing analysis of an information & communications technology-enabled primary healthcare facility in India. *Indian Journal of Medical Research*, 157(4), 231–238. https://doi.org/10.4103/ijmr.IJMR_454_20
- Fogaça, D. R., Grijalvo, M., & Sacomano Neto, M. (2025). What Are Industry 4.0 and Industry 5.0 All About? An Integrative Institutional Model for the New Industrial Paradigms. *Administrative Sciences*, 15(4), 118. <https://doi.org/10.3390/admsci15040118>
- Gentili, A., Failla, G., Melnyk, A., Puleo, V., Tanna, G. L. D., Ricciardi, W., & Cascini, F. (2022). The cost-effectiveness of digital health interventions: A systematic review of the literature. *Frontiers in Public Health*, 10, 787135. <https://doi.org/10.3389/fpubh.2022.787135>
- Golovianko, M., Terziyan, V., Branytskyi, V., & Malyk, D. (2023). Industry 4.0 vs. Industry 5.0: Co-existence, Transition, or a Hybrid. *Procedia Computer Science, 4th International Conference on Industry 4.0 and Smart Manufacturing*, 217, 102–113. <https://doi.org/10.1016/j.procs.2022.12.206>
- Helldén, D., Tesfaye, S., Gachen, C., Lindstrand, A., & Källander, K. (2023). Digital health funding for COVID-19 vaccine deployment across four major donor agencies. *The Lancet Digital Health*, 5(9), e627–e631. [https://doi.org/10.1016/S2589-7500\(23\)00134-6](https://doi.org/10.1016/S2589-7500(23)00134-6)
- Hollander, J. E., Meyer, G., Derrickson, R., Yehia, B., & Docimo, A. (2025). Selling the Return on Investment for Digital Health. *Telemedicine Reports*, 6(1), 44–49. <https://doi.org/10.1089/tmr.2024.0069>
- Huang-Ku, E., Muenkaew, P., Chavarina, K. K., Tun, Y. M., Win, Z. N., Isaranuwatthai, W., Dabak, S. V., & Howard, N. (2025). Telemedicine Public Reimbursement Models for National and Subnational Jurisdictions: Scoping Review. *Journal of Medical Internet Research*, 27(1), e75478. <https://doi.org/10.2196/75478>
- Ikoona, E. N., Namulemo, L., Kaluya, R., Ikoona, R., & Sahr, F. (2026). Beyond Training: Systems Framework for Sustainable Health Informatics Investment in Africa. *JMIR Public Health and Surveillance*, 12(1), e89482. <https://doi.org/10.2196/89482>
- Insani, W. N., Zakiyah, N., Puspitasari, I. M., Permana, M. Y., Parmikanti, K., Rusyaman, E., & Suwantika, A. A. (2025). Digital Health Technology Interventions for Improving

Medication Safety: Systematic Review of Economic Evaluations. *Journal of Medical Internet Research*, 27(1), e65546. <https://doi.org/10.2196/65546>

Kessel, R. van, Srivastava, D., Kyriopoulos, I., Monti, G., Novillo-Ortiz, D., Milman, R., Zhang-Czabanowski, W. W., Nasi, G., Stern, A. D., Wharton, G., & Mossialos, E. (2023). Digital Health Reimbursement Strategies of 8 European Countries and Israel: Scoping Review and Policy Mapping. *JMIR mHealth and uHealth*, 11(1), e49003. <https://doi.org/10.2196/49003>

Kludacz-Alessandri, M., Hawrysz, L., Žak, K., & Zhang, W. (2025). The impact of digital transformational leadership on digital intensity among primary healthcare entities: A moderated mediation model. *BMC Health Services Research*, 25. <https://doi.org/10.1186/s12913-025-12283-x>

Mathias, R., McCulloch, P., Chalkidou, A., & Gilbert, S. (2024). How can regulation and reimbursement better accommodate flexible suites of digital health technologies? *NPJ Digital Medicine*, 7(1), 170. <https://doi.org/10.1038/s41746-024-01156-y>

Mauro, M., Noto, G., Prenestini, A., & Sarto, F. (2024). Digital transformation in healthcare: Assessing the role of digital technologies for managerial support processes. *Technological Forecasting and Social Change*, 209, 123781. <https://doi.org/10.1016/j.techfore.2024.123781>

Morgan, D., & Mueller, M. (2026). *Latest health spending trends and outlook: Balancing resilience and sustainability in challenging times* (193rd edn, OECD Health Working Papers) [OECD Health Working Papers]. <https://doi.org/10.1787/9fc8d4b1-en>

Nadigel, J., Kasaai, B., Thorsteinsdóttir, H., Rogers, S., McMahon, M., Rylett, R. J., & Glazier, R. H. (2025). Research impact assessment of a Canadian digital health funding program: A case study. *Health Research Policy and Systems*, 23(1), 81. <https://doi.org/10.1186/s12961-025-01356-2>

Natakusumah, K., Maulina, E., Muftiadi, A., & Purnomo, M. (2022). Digital transformation of health quality services in the healthcare industry during disruption and society 5.0 era. *Frontiers in Public Health*, 10. <https://doi.org/10.3389/fpubh.2022.971486>

Nguyen, K.-H., Comans, T., Nguyen, T. T., Simpson, D., Woods, L., Wright, C., Green, D., McNeil, K., & Sullivan, C. (2024). Cashing in: Cost-benefit analysis framework for digital hospitals. *BMC Health Services Research*, 24(1), 694. <https://doi.org/10.1186/s12913-024-11132-7>

Nguyen, K.-H., Wright, C., Simpson, D., Woods, L., Comans, T., & Sullivan, C. (2022). Economic evaluation and analyses of hospital-based electronic medical records (EMRs): A scoping review of international literature. *Npj Digital Medicine*, 5(1), 29. <https://doi.org/10.1038/s41746-022-00565-1>

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ...

- Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
- Rakers, M. M., van Os, H. J. A., Recourt, K., Mosis, G., Chavannes, N. H., & Struijs, J. N. (2023). Perceived barriers and facilitators of structural reimbursement for remote patient monitoring, an exploratory qualitative study. *Health Policy and Technology*, 12(1), 100718. <https://doi.org/10.1016/j.hlpt.2022.100718>
- Sapanel, Y., Cloutier, L. M., Morton, A., Lin, S., Seres, G., & Ho, D. (2025). Understanding Economic Decision-Making in Digital Therapeutics Development: Qualitative Approach. *Journal of Medical Internet Research*, 27(1), e79746. <https://doi.org/10.2196/79746>
- Schuetze, L., Srivastava, S., Missenye, A. M., Rwezaula, E. J., Stoermer, M., & Allegri, M. D. (2023). Factors Affecting the Successful Implementation of a Digital Intervention for Health Financing in a Low-Resource Setting at Scale: Semistructured Interview Study With Health Care Workers and Management Staff. *Journal of Medical Internet Research*, 25(1), e38818. <https://doi.org/10.2196/38818>
- Schwander, B., Frappier, J., & Zöllner, Y. F. (2026). Early health economic modelling in innovative health technologies: A framework for early decision-making. *Health Policy and Technology*, 15(5), 101203. <https://doi.org/10.1016/j.hlpt.2026.101203>
- Sindhwani, R., Afridi, S., Kumar, A., Banaitis, A., Luthra, S., & Singh, P. L. (2022). Can industry 5.0 revolutionize the wave of resilience and social value creation? A multi-criteria framework to analyze enablers. *Technology in Society*, 68, 101887. <https://doi.org/10.1016/j.techsoc.2022.101887>
- Vesty, G., Kokshagina, O., Jansson, M., Cheong, F., & Butler-Henderson, K. (2023). Accounting, valuing and investing in health care: Dealing with outdated accounting models. *Meditari Accountancy Research*, 31(1), 52–77. <https://doi.org/10.1108/MEDAR-06-2021-1334>
- Walter, R. J., Schwab, S. D., Wilkes, M., Yourk, D., Zahradka, N., Pugmire, J., Wolfberg, A., Merritt, A., Boster, J., Loudermilk, K., Hipp, S. J., & Morris, M. J. (2023). Financial and Clinical Impact of Virtual Care During the COVID-19 Pandemic: Difference-in-Differences Analysis. *Journal of Medical Internet Research*, 25(1), e44121. <https://doi.org/10.2196/44121>
- Wilson, D. R., Haas, S., Van Gelder, S., & Hitimana, R. (2023). Digital financial services for health in support of universal health coverage: Qualitative programmatic case studies from Kenya and Rwanda. *BMC Health Services Research*, 23(1), 1036. <https://doi.org/10.1186/s12913-023-09893-8>
- Ye, B., Pan, X., & Wu, Z. (2026). Financial Management Innovation in Hospital Groups: An Empirical Study of Ophthalmology Specialty Care Under Consolidation. *Risk Management and Healthcare Policy*, 19, 599522. <https://doi.org/10.2147/RMHP.S599522>

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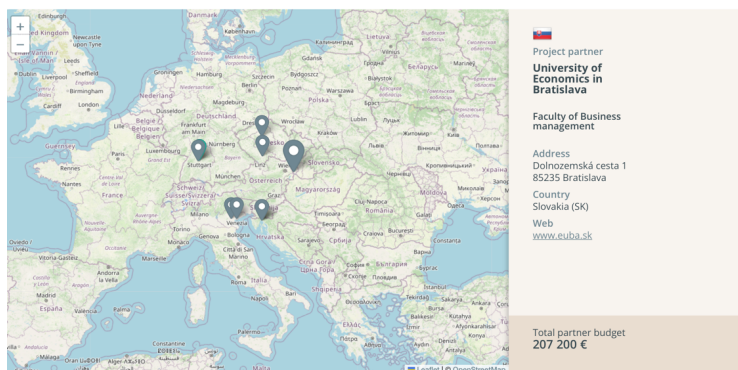
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Author's share: 50 %



Project partnership



Project overview

Futurepreneurs and SMEs for a sustainable Central Europe | Certification Scheme

Futurepreneurs are professionals that are driven by purpose and impact. They take on societal challenges and climate change with an entrepreneurial mindset and want to improve our lives. The GREENPACT project sets up partnerships between companies and futurepreneurs. The aim is to develop a certification scheme for a new generation of impact-driven top executives. To this end, the project develops joint action plans, pilot actions and a self-assessment tool.



Duration

Start date **04.2023**
End date **03.2026**

Project progress

20%

Project partners

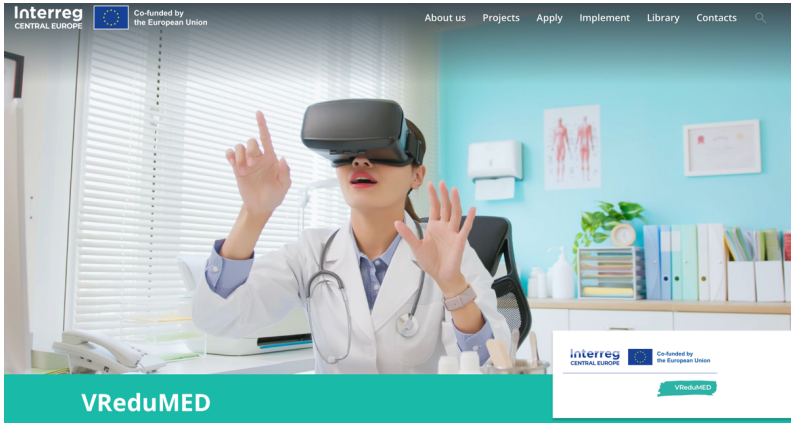
Lead partner
Stuttgart Media University

Startup Center

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Nobelstr. 10
740569 Stuttgart
Country
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Web
<https://www.hdm-stuttgart.de/en>

Project partner

- Stuttgart Region Economic Development Corporation**
- ENAI Veneto Social Enterprise**
- Region of Veneto - Department of Labour**
- STEP RI Science and Technology Park of the University of Rijeka Ltd**
- City of Rijeka**
- Czech Chamber of Commerce**
- Institute of Technology and Business in České Budějovice**
- University of Economics in Bratislava**



Project partners


Lead partner
South Bohemian Science and Technology Park, corp.

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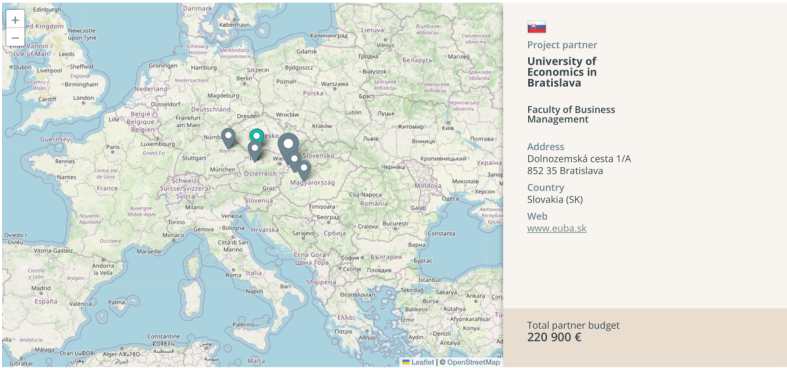
Project partner	
 University of South Bohemia in České Budějovice	▼
 Business Upper Austria	▼
 Education Group	▼
 University of Economics in Bratislava	▼
 National Institute of Children's Diseases	▼
 Strategic Partnership for Sensor Technologies	▼
 Ostbayerische Technische Hochschule Regensburg	▼
 Innoskart Business Development Nonprofit Ltd.	▼
 Széchenyi István University	▼



Duration

Start date	04.2023	Project progress 20%
End date	03.2026	

Project partnership



Project overview

Start date:

01 January 2024

Status: ongoing

End date:

30 June 2026



€1,540,470 budget

80.00 % funded by
Interreg Funds

7 countries

10 partners

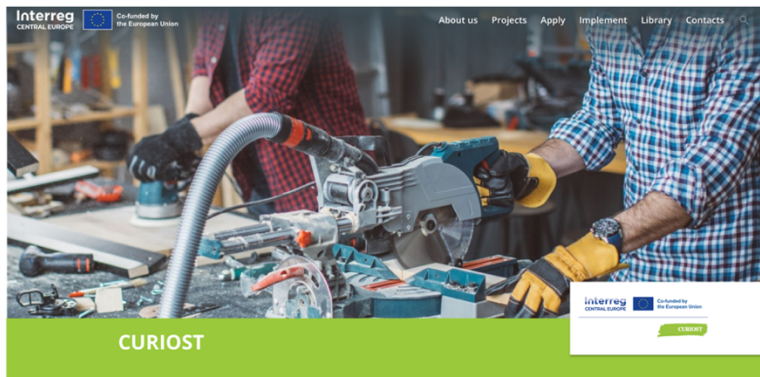


SOCIALLY RESPONSIBLE SLOW FOOD TOURISM IN THE DANUBE REGION

The main objective of the SReST project is to promote "slow food" tourism in the Danube region and enhance the employability of vulnerable groups by providing solutions that enable the valorisation of agrobiodiversity and gastronomic heritage and a fair distribution of generated benefits, including the well-being of the host communities.

By focusing on agro-biodiversity, food heritage and local identity, the goal is to broaden the socially responsible sustainable tourism offer and promote "slow food" tourism based on the exploration of gastronomic traditions and the local communities that preserve them. The project will help enhance local agricultural high-value chains while appreciating natural and cultural diversity of partner regions.

SReST will develop joint solutions to enhance socio-economic development and promote alternative models and competitive new tourism products of "slow food" itineraries grounded in agrobiodiversity and food heritage, tested in different territorial contexts of pilot regions. These solutions will not be limited to the local level, but will have a wider impact in the Danube area. Therefore, the success of the project will be based on close cooperation between partners from different countries and regions. You can learn more about the project partners [here](#).



Duration

Start date **06.2024**
End date **11.2026**

Project partners



Lead partner

Business Upper Austria

Mechatronics Cluster + Circular Economy
Team @ Plastics Cluster

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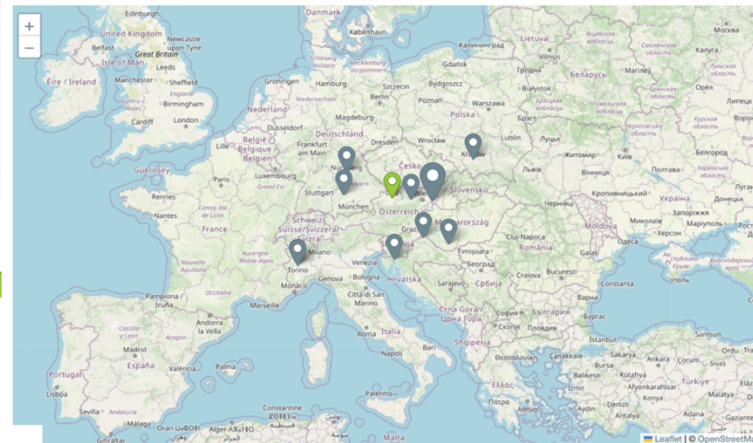
Country
Austria (AT)

Web
<https://www.biz-up.at>

Project partner

	ConPlusUltra Ltd	✓
	University of Economics in Bratislava	✓
	Chamber of Commerce and Industry of Pécs- Baranya	✓
	South Poland Cleantech Cluster Ltd.	✓
	STEP RI science and technology park of the University of Rijeka Ltd.	✓
	Development and Training Centre for the Metal Industry - Metal Centre Čakovec	✓
	MESAP Innovation Cluster	✓
	Science and Technology Park - Envipark	✓
	Bayern Innovativ	✓
	Cluster of Environmental Technologies Bavaria	✓

Project partnership



Project partner
University of Economics in Bratislava

Faculty of Business management

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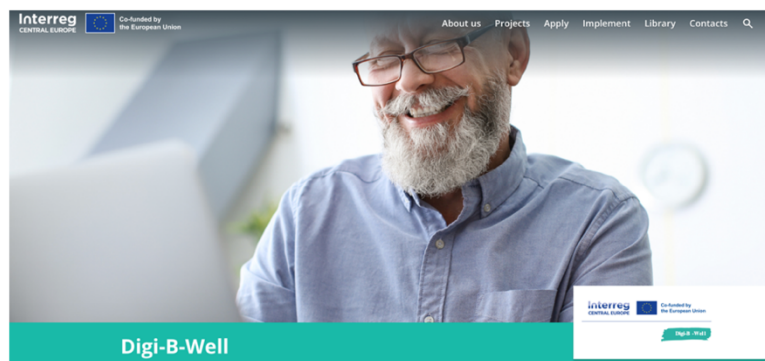
Total partner budget
174 020 €

Project overview

Circular design and development of Sustainable products in 4 key sectors in Central Europe

The ongoing transition to a circular economy is not only a tedious obligation for the manufacturing industry. It also offers an opportunity to develop innovative sustainable products. The CURIOST project helps small- and medium-sized companies in sectors like mechanics, packaging, plastics, and construction to harvest the potential benefits. They help selected companies to co-develop tailor-made, innovative, sustainable and circular product prototypes. The learnings are then aggregated into a universal strategy and action plans to accelerate the green transition in the manufacturing industry.





Duration

Start date **06.2024**
End date **05.2027**

Project partners



Lead partner

Primorje-Gorski Kotar County

Administrative Department for Regional Development, Infrastructure and Project Management

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51000 Rijeka

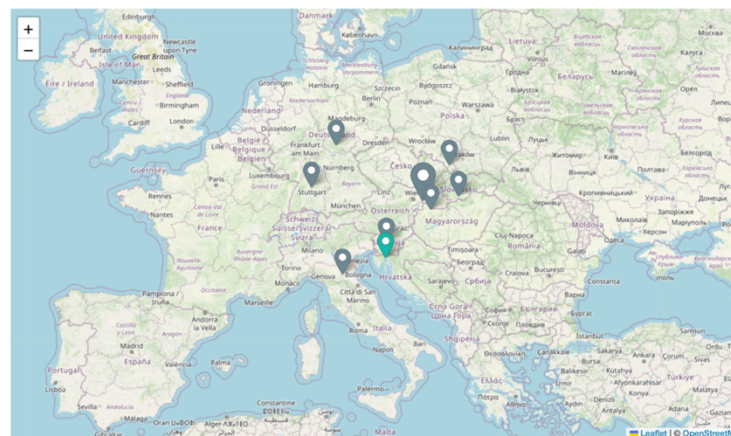
Country
Croatia (HR)

Web
www.pgz.hr

Project partner

	Alma Mater Studiorum - University of Bologna	▼
	Technical University Ilmenau	▼
	bwcon	▼
	Chamber of Commerce and Industry of Slovenia	▼
	Pannon Business Network Association	▼
	University of Economics in Bratislava	▼
	Regional Development Agency in Bielsko-Biala	▼
	City Lucenec	▼

Project partnership



Project partner
University of Economics in Bratislava
Faculty of Business Management
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85235 Bratislava
Country
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Web
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Total partner budget
286 428,83 €

Project overview

Enhancement of capacities of SMEs, public authorities and academia for digitalisation, digital era-fit management and achievement of digital well-being.

The digital transformation offers new opportunities for companies but also increases complexity. Especially employees over 55 can suffer from digital stress or burnout at the workplace. The Digi-B-Well project helps companies to transform and make employees fit for the digital age. The partners upskill competences of managers, public authorities, and academia to better prevent digital stress and burnout. They develop and test new tools to self-assess digital maturity and digital transformation models in companies. In addition, a digitalisation strategy and action plans ensure the uptake of their innovative solutions into broader policy and business practices.





Personalized Approach to Territorial Life and Career Support

Your path begins where you are. Let us help you walk it with purpose.

[Explore the Project](#)

Interreg
Danube Region



Co-funded by
the European Union

PATHS

Our Solution

PATHS introduces the **Life Path Support Service (LPSS)** model – a new approach to career guidance that is local, inclusive, and tailored to the individual.

Instead of one-size-fits-all programs, LPSS offers:

- Free, accessible services in small municipalities
- Career workshops, camps, and internships rooted in **self-awareness**
- Trained local **mentors** who provide personal guidance and support
- A long-term strategy for sustainable regional development

This model is being piloted in communities across Hungary, Slovakia, Czech Republic, Romania, Croatia, and Bosnia & Herzegovina – with expert support from Austria and Slovenia.

Project overview

Start date:

01 April 2025

Status: ongoing

End date:

31 March 2028



€2,516,726 budget

80.00 % funded by
Interreg Funds

9 countries

13 partners

What did this project achieve?

This project will:

- **Strengthen regions' ability** to deliver smart specialisation in a sustainable way.
- **Develop and test new methods** to move from the Entrepreneurial Discovery Process to the Ongoing Discovery Process.
- **Improve cooperation** between authorities, businesses and researchers.
- **Enable inclusive decisions** and make better use of regional resources.
- **Boost innovation capacity** and strengthen regional competitiveness.
- **Create stronger ecosystems** and new opportunities that benefit both the economy and society.

A few numbers



1,793,584 €
budget



01 May 2025-
31 Jul 2029



12 partners

Project summary

Across Europe, regions face similar challenges. How can we build **innovation systems that endure** – systems that meet today's needs while paving the way for a **sustainable future, economically, socially, and environmentally**?

This project helps **regional authorities and agencies** strengthen **long-term cooperation** around smart specialisation.

Through **practical frameworks and tools**, it supports regions in creating **strong, inclusive networks** with **lasting commitment** from key actors.

The project builds on engagement through the **Entrepreneurial Discovery Process** and other **participatory methods**. This ensures that collaboration is rooted in **real regional needs and ambitions**.

Who we are

Persist brings together nine partners from across Europe – regions, universities, and development agencies working together for smarter, more sustainable regional growth.

- **Region Jönköping County** (Sweden)
- **Podkarpackie Region** (Poland)
- **Regional Development Agency of Khmelnytskyi oblast** (Ukraine)
- **University of Economics in Bratislava** (Slovakia)
- **Ústí Region** (Czech Republic)
- **Regional Management Northern Hessen** (Germany)
- **University of Groningen** (Netherlands)
- **Business Innovation Center of Cartagena** (Spain)
- **Udhëtim i Lirë** (Albania)

Together, we share knowledge, test new ideas, and build long-term cooperation to strengthen smart specialisation across Europe.



A few numbers



1,617,350 €
budget



01 May 2025-
31 Jul 2029



9 partners

Project summary

Youth involvement is essential in all policy areas that affect their lives, as highlighted in the **EU Youth Strategy 2019–2027**. The project aims to develop **mechanisms and instruments** tailored to young people's needs, supporting the strengthening of their **voice in decision-making**, promoting effective use of resources, and fostering **cross-sector collaboration**.

The project's **innovative character** stems both from its **topic** and the **partnership structure**. The topic is highly relevant, as the gap between **urban strategies** and **youth interests** remains visible in the targeted regions. The partnership unites territories with contrasting demographic realities: some face **low birth rates** and an **ageing population**, while others stand out for having a **large youth population**, which is uncommon in many European areas.

The **overall objective** is to improve policies that enable **active youth participation** in community life and decision-making processes. The project seeks to create an environment where young people feel **valued, empowered, and motivated** to contribute to **societal progress and development**.

This objective will be achieved by:

- **Removing barriers and administrative blockages** that prevent young people from feeling appreciated;
- Encouraging them to **remain in or return to their birthplaces** and engage actively in their communities;
- **Engaging key stakeholders** (public institutions, NGOs, education, and private sector);
- **Transferring knowledge and good practices** from advanced regions to those with fewer youth-oriented solutions;
- Developing **tools and mechanisms** based on the gathered experiences;
- Promoting **social inclusion**, with a focus on **young emigrants** and the **youth diaspora**.

The project will be implemented within the framework of **territorial cooperation** among partner regions, through the **exchange of good practices and experiences** on youth participation.

