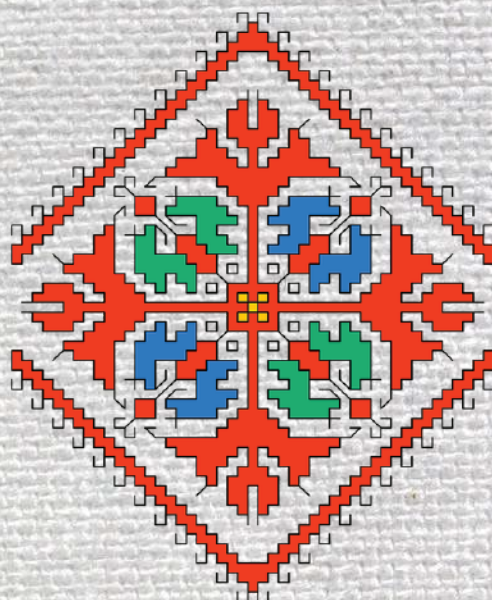


Образование, научни изследвания и иновации



Education,
scientific research
and innovation

ОБРАЗОВАНИЕ, НАУЧНИ ИЗСЛЕДВАНИЯ И ИНОВАЦИИ

**Научно списание
Година IV, книжка 3, 2026**

EDUCATION, SCIENTIFIC RESEARCH AND INNOVATIONS

**Scientific journal
Vol. IV, Issue III, 2026**

**ЗА БУКВИТЕ
ОПИСМЕНЕХЪ**

Профил на списанието

„Образование, научни изследвания и иновации“ е двуезично (на английски и български език) научно списание, което се издава от Академично издателство „За буквите – О писменехъ“ – гр. София, България. Изданието цели да популяризира висококачествени теоретични и приложни изследвания. Тематични рубрики на списанието са:

- История и археология;
- Обществени комуникации и информационни науки;
- Информатика и компютърни науки;
- Национална сигурност;
- Актуално.

Списанието отразява иновативни идеи, научни резултати, съвременни тенденции и перспективи за развитие в изброените научни области. Публикуват се само оригинални научни статии, преминали двойно сляпо рецензиране.

Списание „Образование, научни изследвания и иновации“ е със свободен достъп.

<https://e-journal.unibit.bg/>
ISSN 2815-4630
<https://doi.org/10.70300/WTRT9015>

Journal Scope

“Education, Scientific Research and Innovations” is a bilingual (in English and in Bulgarian) scientific journal published by the Academic Publisher “Za Bukvite – O Pismeneh” – Sofia, Bulgaria. The publication aims to promote high-quality theoretical and applied research results. The thematic sections of the journal are:

- History and archaeology;
- Public communications and information sciences;
- Informatics and computer sciences;
- National security;
- Current topics.

The journal reflects innovative ideas, scientific results, modern trends and prospects for development in the listed scientific fields. Only original scientific articles that have passed double-blind peer review are published.

The “Education, scientific research and innovation” journal is open access.

<https://e-journal.unibit.bg/>
ISSN 2815-4630
<https://doi.org/10.70300/WTRT9015>

ГЛАВЕН РЕДАКТОР

доц. д-р Елена Савова
Факултет по библиотекознание
и културно наследство
Университет по библиотекознание
и информационни технологии
бул. „Цариградско шосе“ № 119,
София 1784, България
тел.: +359 878 97 03 40
е-поща: e.ignatova@unibit.bg

EDITOR-IN-CHIEF

Assoc. Prof. Elena Savova, PhD
Faculty of Library Studies
and Cultural Heritage
University of Library Studies
and Information Technologies
119, Tsarigradsko Shosse Blvd.
Sofia 1784, Bulgaria
tel. +359 878 97 03 40
E-mail: e.ignatova@unibit.bg

ИЗДАТЕЛ

Академично издателство
„За буквите – О писменехъ“
Университет по библиотекознание
и информационни технологии

PUBLISHER

Academic Publisher
“Za Bukvite – O Pismeneh”
University of Library Studies and Information
Technologies

ДИРЕКТОР

доц. д-р Диана Стоянова
бул. „Цариградско шосе“ № 119,
ет. 2, стая 213
София 1784, България
тел.: +359 879 14 83 85
е-поща: d.stoyanova@unibit.bg

DIRECTOR

Assoc. Prof. Diana Stoyanova, PhD
119, Tsarigradsko Shosse Blvd.
fl. 2, room 213
Sofia 1784, Bulgaria
tel.: +359 879 14 83 85
E-mail: d.stoyanova@unibit.bg

Списание „Образование, научни изследвания
и иновации“ излиза четири пъти годишно:
книжка 1 – януари – март;
книжка 2 – април – юни;
книжка 3 – юли – септември;
книжка 4 – октомври – декември.

Journal “Education, Scientific Research and In-
novations” is published four times a year:
book 1 – January – March;
book 2 – April – June;
book 3 – July – September;
book 4 – October – December.

С изпращането на текст и илюстрации до
Академично издателство „За буквите – О пис-
менехъ“ авторът се съгласява да преотстъпи
правото за публикуването, анонсирането и
разпространението им за нуждите на всички
издания на Академично издателство „За бук-
вите – О писменехъ“. Материали, които не са
одобрили за публикуване, не се редактират и
не се връщат на авторите.

By sending texts or illustrations to the Aca-
demic Publisher “Za Bukvite – O Pismeneh”
the author agrees to submit the copyright for
publishing, dissemination and announcing in
all Academic Publisher “Za Bukvite – O Pis-
meneh” editions. Materials that are not ap-
proved for publication are not edited and are
not returned to the authors.

ГЛАВЕН РЕДАКТОР

доц. д-р Елена Савова

EDITOR-IN-CHIEF

Assoc. Prof. Elena Savova, PhD

РЕДАКЦИОННА КОЛЕГИЯ

проф. д-р Тереза Тренчева (България)
проф. д.н. Иван Гарванов (България)
проф. д-р Боряна Бужашка (България)
проф. Пламен Богданов (България)
проф. д-р Катя Рашева-Йорданова (България)
проф. Невзат Йозел (Турция)
проф. д-р Александр Максимович
Циганенко (Русия)
доц. д-р Карла Базили (Италия)
проф. Натали Стоянофф (Австралия)
проф. д-р Майкъл Бук (САЩ)
доц. д-р Ахмет Алтай (Турция)
проф. Ихтиор Беков (Узбекистан)
проф. д-р Маржена Валинска (Полша)
проф. д-р Анна Бартковияк (Полша)
проф. д-р Владо Бучковски
(Северна Македония)
проф. д-р Мустафа Хатиплер (Турция)
проф. д-р Мурат Четин (Турция)

EDITORIAL BOARD

Prof. Tereza Trencheva, PhD (Bulgaria)
Prof. Ivan Garvanov, DSc (Bulgaria)
Prof. Boryana Buzhashka, PhD (Bulgaria)
Prof. Plamen Bogdanov, PhD (Bulgaria)
Prof. Katia Rasheva-Yordanova, PhD
(Bulgaria)
Prof. Nevzat Özel, PhD (Turkey)
Prof. Alexander Tsiganenko, PhD (Russia)
Assoc. Prof. Carla Basili, PhD (Italy)
Prof. Natalie Stoianoff, PhD (Australia)
Prof. Michael Boock, PhD (USA)
Assoc. Prof. Ahmet Altay, PhD (Turkey)
Prof. Ikhtiyor Bekov, PhD (Uzbekistan)
Prof. Marzena Walińska, PhD (Poland)
Prof. Anna Bartkowiak, PhD (Poland)
Prof. Vlado Buchkovski, PhD
(North Macedonia)
Prof. Mustafa Hatipler, PhD (Turkey)
Prof. Murat Cetin, PhD (Turkey)

СЪДЪРЖАНИЕ**CONTENTS*****Информатика и компютърни науки******Informatics and Computer Sciences***

Европейската законодателна рамка eIDAS и eIDAS 2 като нормативна алтернатива на проверката на място при подписващия: дистанционното валидиране на електронния подпис като цел на Регламент (ЕС) № 910/2014
Александър Кирков, Димо Водкаджиев

The European Legislative Framework of eIDAS and eIDAS 2 as a Regulatory Alternative to On-Site Verification in the Presence of the Signatory: Remote Validation of Electronic Signatures as an Objective of Regulation (EU) No 910/2014
Alexander Kirkov, Dimo Vodkadjhiev

Внедряване на агенти на ИИ (AI) за управление на сънна апнея в американска цифрова здравна платформа: архитектура, избор на ГЕМ (LLM) и бизнес стойност
Красимир Николов

Deploying AI Agents for Sleep Apnea Management in a U.S. Digital Health Platform: Architecture, LLM Selection, and Business Value
Krasimir Nikolov

Обществени комуникации и информационни науки***Public Communications and Information Sciences***

Кризисна комуникация и управление на репутацията в дигитална спортна среда
Андреас Фиксмер

Crisis Communication and Reputation Management in Digital Sports Environments
Andreas Fixemer

Дизайн ориентирани изследвания като методологическа рамка за разработване на процесно ориентирани системи за управление на информацията
Андреас Кунц

Design-Oriented Research as a Method for the Development of Process-Oriented Information Management Systems
Andreas Kunz

Ролята на лидерството в изпълнението на корпоративната цел: концептуални основи и практически последици
Антония Цедлер

Role of Leadership in Implementing Corporate Purpose: Conceptual Foundations and Practical Implications
Antonia Zedler

Икономически предизвикателства пред сигурността във веригата на доставките
Бернд Михаел Енглер

Economic Challenges for Security in the Supply Chain
Bernd Michael Engler

Предизвикателства в комуникацията при базирано на данни устойчиво управление на активи в сектора на фондациите в Германия
Бьорн Пипер

Communication Challenges in Data-Driven Sustainable Asset Management in the German Foundation Sector
Björn Pieper

Генеративен изкуствен интелект в предприемаческите информационни процеси: управление на маркетинговата информация сред предприемачите от диаспората
Холгер Валтер Ерзам

Generative Artificial Intelligence in Entrepreneurial Information Processes: Managing Marketing Information Among Diaspora Entrepreneurs
Holger Walter Ehram

Управление на информацията и знанията в областта на публичните разходи за научни изследвания и развитие и частните инвестиции <i>Нико Фриш</i>	71	Management of Information and Knowledge in Public R&D Spending and Private Investment <i>Nico Frisch</i>
Прилагане на ефективни комуникационни стратегии за справяне с недостига на медицински сестри <i>Яле Йълмацер</i>	80	Implementing Effective Communication Strategies to Address the Shortage of Nurses <i>Jale Yilmazer</i>
Организационното учене като процес на комуникация и придобиване на знания: трансформация на ролята на лидерството <i>Юдит Маркс</i>	86	Organisational Learning as a Communication and Knowledge Process: the Transformation of Leadership Role <i>Judith Marx</i>
Влияние на вътрешнофирмената комуникация върху преживяването на стрес и психологическата устойчивост на служителите <i>Катарина Кастнер</i>	95	Impact of Internal Communication on Employees' Stress Experience and Resilience <i>Katharina Kastner</i>
Глобализация, енергетика и информационни процеси: геополитическа власт, неравенство и сътрудничество в глобалната енергийна система <i>Лиза Паулине Кром</i>	103	Globalization, Energy and Information Processes: Geopolitical Power, Inequality and Cooperation in the Global Energy System <i>Lisa Pauline Krohm</i>
Лидерство според фазите на проекта: базирана на литературата перспектива за лидерството в процеса на изпълнение на проект <i>Тимо Цименга</i>	110	Phase-Related Leadership in Projects: A Literature-Based Perspective on Leadership in the Course of a Project <i>Timo Zimenga</i>
Национална сигурност		National Security
Конфликтът в Украйна като стратегически шок за Европейския съюз: Еволюция на политиката за сигурност и отбрана и ограниченията пред европейската стратегическа автономия. Матрица за оценка на европейската стратегическа автономия (ESAAM) <i>Даниел Делчев</i>	119	The Conflict in Ukraine as a Strategic Disruption to the European Union: Evolution of Security and Defence Policy and the Constraints on European Strategic Autonomy. European Strategic Autonomy Assessment Matrix (ESAAM) <i>Daniel Delchev</i>
Реализмът на първо място? Реалистична и либерална логика в Стратегията за национална сигурност на САЩ за 2025 г. <i>Даниел Рутковски Граф фон Швайниц унд Крайн Фрайхер фон Каудер</i>	127	Realism First? Realist and Liberal Logics in the 2025 U.S. National Security Strategy <i>Daniel Rutkowski Graf von Schweinitz und Krain Freiherr von Kauder</i>

Здравеопазването от гледна точка на националната сигурност – модели, прилики, стратегии и противоречия <i>Герхард Деген</i>	133	Healthcare in Terms of National Security – Models, Similarities, Strategies, and Contradictions <i>Gerhard Degen</i>
Човешкият фактор в сигурността на персонала и информационната сигурност <i>Фрауке Криста Кюни</i>	141	Human Factors in Personnel Security and Information Security <i>Frauke Christa Kühni</i>
От оценка на риска до твърдения за знания: епистемна несигурност в управлението на риска за критични инфраструктури, базирано на ГЕМ (LLM) <i>Себастиан Грюнеберг</i>	148	From Risk Assessments to Knowledge Statements: Epistemic Uncertainty in LLM-Based Risk Management for Critical Infrastructures <i>Sebastian Grüneberg</i>

ИНФОРМАТИКА И КОМПЮТЪРНИ НАУКИ INFORMATICS AND COMPUTER SCIENCES

ЕВРОПЕЙСКАТА ЗАКОНОДАТЕЛНА РАМКА eIDAS И eIDAS 2 КАТО НОРМАТИВНА АЛТЕРНАТИВА НА ПРОВЕРКАТА НА МЯСТО ПРИ ПОДПИСВАЩИЯ: ДИСТАНЦИОННОТО ВАЛИДИРАНЕ НА ЕЛЕКТРОННИЯ ПОДПИС КАТО ЦЕЛ НА РЕГЛАМЕНТ (ЕС) № 910/2014

Александър Кирков

Университет по библиотекознание и информационни технологии

Димо Водкаджиев

Окръжен съд – Добрич

<https://doi.org/10.70300/HXZK2444>

Резюме: Настоящият доклад обосновава тезата, че европейската законодателна рамка в областта на електронната идентификация и удостоверителните услуги – Регламент (ЕС) № 910/2014 (eIDAS) и изменящият го Регламент (ЕС) 2024/1183 (eIDAS 2) – е, като цяло, насочена срещу проверката на място, при подписващия, на положения електронен подпис. Рамката целенасочено измества този традиционен способ за удостоверяване, като го замества с нормативно гарантирано дистанционно валидиране. Анализирани са стратегическите мотиви на Европейския съюз, нормативният механизъм на дистанционното валидиране по чл. 32 и чл. 33 от Регламент (ЕС) № 910/2014, както и развитието на тази концепция в eIDAS 2 чрез Европейския портфейл за цифрова самоличност и новите квалифицирани удостоверителни услуги. Обоснован е изводът, че дистанционната проверимост на подписа не е страничен ефект, а е цел на уредбата, а проверката на място – преодолян от правото на Съюза модел.

Ключови думи: електронен подпис; КЕП; eIDAS; дистанционно валидиране; удостоверителни услуги

ВЪВЕДЕНИЕ

Традиционният механизъм за удостоверяване на авторството на саморъчния подпис исторически предпоставя физическо присъствие – подписът се полага пред насрещната страна, пред длъжностно лице или пред нотариус, а при оспорване проверката му изисква графологическа експертиза върху оригиналния носител. Този модел е несъвместим с функционирането на единния цифров пазар, при който страните по електронната трансакция по правило се намират на различни места, нерядко в различни държави членки.

Предмет на настоящия доклад е тезата, че правната рамка, установена с Регламент (ЕС) № 910/2014 на Европейския парламент и на Съвета от 23 юли 2014 г. относно електронната идентификация и удостоверителните услуги при електронни трансакции на вътрешния пазар и за отмяна на Директива 1999/93/ЕО (наричан по-нататък „Регламент № 910/2014“ или „eIDAS“), както и нейното развитие чрез Регламент (ЕС) 2024/1183 („eIDAS 2“) са насочени, като цяло, срещу проверката на място при подписващия. Под „проверка на място“ в настоящото изложение се разбира всяка форма на удостоверяване на действителността на подписа, която предпоставя едновременно физическо присъствие на подписващия и на проверяващия или достъп до материален носител на волеизявлението.

Защитаваната теза е, че самата правно-техническа конструкция на електронния подпис по смисъла на чл. 3, т. 10–12 от Регламент № 910/2014 е създадена именно с цел проверките на автентичността и целостта на подписания документ или волеизявление да могат да бъдат извършвани отдалечено, при което резултатът от тази дистанционна проверка да бъде доверено приет от доверяващата се страна без необходимост от контакт с подписващия. В този смисъл рамката не просто допуска отдалечената проверка като алтернатива – тя е изградена срещу модела на проверката на място и последователно го измества от всички етапи на жизнения цикъл на електронния подпис.

СТРАТЕГИЧЕСКИ МОТИВИ НА ЕВРОПЕЙСКИЯ СЪЮЗ

Целите на европейския законодател са видими както от съображенията към Регламент № 910/2014, така и от програмните документи на Европейската комисия в областта на цифровата политика и те са нуждата от увеличаване на доверието и намаляване на административната тежест. Съгласно официалната позиция на Комисията Регламентът „улеснява сигурните трансгранични трансакции чрез създаване на рамка за цифрова самоличност и удостоверяване на автентичността“, като целта е „да се създаде доверие в електронните взаимодействия и да се насърчат безпроблемните цифрови услуги в ЕС“ (European Commission n.d.). Доверието тук има специфично нормативно съдържание: доверяващата се страна следва да може да приеме правните последици на електронното волеизявление, без да е възприела лично акта на подписването.

Първото съображение към Регламент № 910/2014 изрично констатира, че изграждането на доверие в онлайн средата е от ключово значение за икономическото и социалното развитие, тъй като липсата на доверие кара потребителите, предприятията и публичните органи да се въздържат от извършване на трансакции по електронен път. Регламентът преследва тази цел чрез два взаимно свързани инструмента: взаимното признаване на средствата за електронна идентификация между държавите членки и единния правен режим на удостоверителните услуги, ползващи се с еднаква правна сила в целия Съюз.

Вторият стратегически мотив е намаляването на административната тежест. Електронното подписване елиминира разходите за физическо явяване, куриерски пренос на оригинали, легализация и съхраняване на хартиени досиета.

Икономическото измерение се материализира в три основни направления: оптимизация на човешкия капитал чрез освобождаване на ресурси от рутинни задачи, снижаване на разходи за бизнеса и елиминиране на преките оперативни и логистични разходи за физически носители. Тази трансформация пренастройва публичния и частния сектор по векторите Правителство-към-Бизнес (G2B), Правителство-към-Граждани (G2C) и Правителство-към-Правителство (G2G), превръщайки дигиталната автентикация в двигател на макроикономическа ефективност.

В съображенията към Регламента изрично се подчертава необходимостта валидирането на електронни подписи да бъде „лесно и удобно за всички страни“, като за доверяващи се страни, които не желаят или не са в състояние сами да извършват валидиране на квалифицирани електронни подписи, „следва да се стимулират инвестициите в подобни услуги от страна на частния и публичния сектор“ (European Parliament and Council of the European Union 2014). Законодателят следователно не просто допуска дистанционната проверка – той институционализира пазар на услуги, чийто единствен предмет е тя.

В по-широк план уредбата се вписва в целите на програмния документ „Цифровото десетилетие на Европа: цели в областта на цифровите технологии за 2030 г.“, който предвижда достъпност на 100% от ключовите обществени услуги онлайн и цифрова самоличност за всички граждани на Съюза (European Commission 2026). Постигането на тези цели е логически несъвместимо със запазването на проверката на място като условие за правна сигурност на електронните волеизявления.

НОРМАТИВНИЯТ МЕХАНИЗЪМ НА ДИСТАНЦИОННАТА ПРОВЕРКА ПО РЕГЛАМЕНТ (ЕС) № 910/2014

3.1. Правна сила на електронния подпис и принцип на недискриминация

Съгласно чл. 25, § 1 от Регламент № 910/2014 правната сила и допустимостта на електронния подпис като доказателство в съдебни производства не могат да бъдат оспорени единствено на основание, че той е в електронна форма или че не отговаря на изискванията за квалифициран електронен подпис. Съгласно чл. 25, § 2 квалифицираният електронен подпис има значението на саморъчен подпис. Тази равностойност би била лишена от практически смисъл, ако приемането на електронно подписания документ предполагаше проверка в присъствието на подписващия – равностойността е функционална именно защо-

то проверимостта на подписа е иманентна на самия него и е отделима от личността и местонахождението на титуляря. С това Регламентът извършва фундаментална концептуална промяна: премества фокуса на правната сигурност от субективното възприятие на акта на подписване към обективната, технологично гарантирана проверка на резултата от този акт.

3.2. Усъвършенстваният електронен подпис като технологично условие за отдалечена проверимост

Изискванията към усъвършенствания електронен подпис по чл. 26 от Регламента – да е свързан по уникален начин с титуляря; да дава възможност за идентифициране на титуляря; да е създаден чрез данни, които титулярят може да използва с висока степен на доверие и единствено под свой контрол; и да е свързан с подписаните данни по начин, позволяващ да бъде открита всяка последваща промяна – представляват в своята съвкупност технологична гаранция, заместваща възприятието на проверяващия на място. Криптографският протокол на усъвършенствания, респективно и на квалифицирания подпис осигурява не просто защита срещу последващи промени, но и автоматизирана, неизтриваема електронна хронологична следа (audit trail). В контекста на дистанционната проверимост това елиминира рискове като антидатиране на актове или нерегламентирано модифициране на преписки, които са присъщи за традиционния хартиен документооборот.

Идентификацията на автора и целостта на изявлението се установяват криптографски, от съдържанието на самия подпис и придружаващото го удостоверение, а не чрез наблюдение на акта на подписване.

3.3. Доверителните списъци и марката за доверие като публична инфраструктура на дистанционното доверие

Член 22 от Регламента задължава всяка държава членка да създава, поддържа и публикува доверителни списъци, включващи информация за доставчиците на квалифицирани удостоверителни услуги и предоставяните от тях услуги. Както се подчертава и в актовете по изпълнението му, доверителните списъци „са от съществено значение за изграждането на доверие между операторите на пазара, тъй като позволяват валидиране на квалифицирания статус на доставчиците“ (European Commission 2025). Списъците са публично достъпни в машинночетим формат чрез информационното табло на Комисията (eIDAS Dashboard) (European Commission 2025b), което позволява всяко валидиращо приложение, от която и да е точка на Съюза, автоматизирано да установи дали удостоверението за подпис произхожда от квалифициран доставчик. Тази децентрализирана, но нормативно унифицирана архитектура на Доверителните списъци (TSLs) превръща автоматизираната проверка на криптографската верига на доверие (Chain of Trust) в единствен законен източник на сигурност, правейки физическата проверка институционално излишна. Това е дистанционна проверка *par excellence* – извършвана спрямо публичен регистър, а не спрямо лицето.

3.4. Членове 32–34: валидирането като самостоятелна, по дефиниция отдалечена дейност

Централно за защитаваната теза е обстоятелството, че Регламент № 910/2014 урежда валидирането на квалифицирани електронни подписи като самостоятелен нормативен институт. Член 32, § 1 изброява кумулативните условия, при които процесът на валидиране потвърждава действителността на квалифициран електронен подпис: удостоверението да е било към момента на подписването квалифицирано удостоверение за електронен подпис; да е издадено от квалифициран доставчик и да е било валидно към момента на подписването; данните за валидиране на подписа да съответстват на данните, предоставени на доверяващата се страна; уникалният набор от данни, представляващ титуляря, да е предоставен коректно; целостта на подписаните данни да не е нарушена; както и изискванията на чл. 26 да са били изпълнени към момента на подписването. Нито едно от изброените условия не предполага, нито допуска като релевантно физическото присъствие на подписващия – всички те са установими изцяло върху електронния подпис, удостоверението и доверителните списъци.

Нещо повече, чл. 33 урежда квалифицираната услуга по валидиране на квалифицирани електронни подписи, предоставяна от доставчик на удостоверителни услуги по дистанционен, автоматизиран и надежден начин на доверяващи се страни, които не извършват валидирането сами, а чл. 34 – квалифицираната услуга по съхраняване на квалифицирани електронни подписи, гарантираща продължена проверимост на подписа след изтичане на технологичния период на сигурност. Уредбата на валидирането като пазарна услуга, отделена както от подписващия, така и от доверяващата се страна, представлява най-силният систематичен аргумент, че проверката на електронния подпис е замислена като дейност, извършвана без каквато и да е връзка с местонахождението на титуляря.

3.5. Междинен извод

Систематичното тълкуване на чл. 22, чл. 25, чл. 26 и чл. 32–34 от Регламент № 910/2014 обосновава извода, че дистанционната проверимост не е допълнителна възможност, а конститутивен елемент на правния институт на електронния подпис. Рамката е насочена срещу проверката на място: законодателят съзнателно я лишава от нормативно значение, като урежда изчерпателен фактически състав на валидирането, в който физическото присъствие на подписващия не участва. Действителността на подписа се установява чрез обективирани, отдалечено достъпни удостоверителни средства, поради което всяко изискване за проверка в присъствието на титуляря би било не само излишно, но и несъвместимо с целите и систематиката на Регламента, доколкото би възстановило именно онези пречки пред трансграничните електронни трансакции, чието премахване той преследва.

РАЗВИТИЕ И ТЕНДЕНЦИИ В EIDAS 2: ЗАДЪЛБОЧАВАНЕ НА ДИСТАНЦИОННИЯ МОДЕЛ

Прегледът на действието на Регламент № 910/2014 установи непълноти – фрагментирано въвеждане на националните схеми за електронна идентификация, ограничена приложимост в частния сектор и недостатъчен контрол на гражданите върху собствените им данни (European Commission n.d.) (DigiSign n.d.). В отговор на 11 април 2024 г. бе приет Регламент (ЕС) 2024/1183 за изменение на Регламент № 910/2014 по отношение на създаването на европейска рамка за цифрова самоличност (eIDAS 2), одобрен от законодателите в началото на 2024 г. и пораждащ задължения за държавите членки в преходен период за осигуряване на достъп на гражданите до Европейски портфейл за цифрова самоличност (EUDI Wallet) (DigiSign n.d.) (Evrotrust 2024).

4.1. Европейският портфейл за цифрова самоличност

EUDI портфейлът е средство за електронна идентификация с високо ниво на осигуреност, издавано безплатно на всеки гражданин, който желае да го ползва, позволяващо съхраняване и избирателно споделяне на идентификационни данни и удостоверения за атрибути, както и полагане на квалифицирани електронни подписи (DigiSign, n.d.). С него дистанционният модел се пренася от етапа на проверката на вече положен подпис към целия жизнен цикъл на цифровото правоотношение: идентификацията на лицето пред доставчика на услуги, удостоверяването на негови атрибути и самото подписване се извършват отдалечено, в унифицирана и сертифицирана среда, призната във всички държави членки. Внедряването на EUDI портфейла бележи преход към архитектура на „нулево доверие“ (Zero Trust) и децентрализирана идентичност, при която доверяващата се страна валидира криптографски доказателства (verifiable credentials) дистанционно и в реално време, без изобщо да има логически канал за проверка на място.

4.2. Нови квалифицирани удостоверителни услуги

eIDAS 2 разширява каталога на квалифицираните удостоверителни услуги с електронното архивиране, електронните регистри и – с особено значение за разглежданата теза – управлението на устройства за създаване на електронен подпис от разстояние (remote QSCD) (European Commission n.d.) (DigiSign n.d.).

Тази нова уредба дава директен нормативен отговор на системните дефицити, свързани с хардуерната и софтуерната комплексност на класическите електронни подписи. Тра-

диционната зависимост от физически смарткарти, USB токени и инсталиране на локални драйвери създава сериозни бариери пред масовото навлизане на технологията сред крайните потребители. Чрез пренасянето на криптографските операции върху защитени отдалечени сървъри и използването на биометрична автентикация през мобилни устройства, eIDAS 2 преодолява тези хардуерни ограничения и осигурява технологична достъпност от ново поколение.

Изричната уредба на отдалеченото устройство за създаване на квалифициран подпис, при което данните за създаване на подписа се управляват от квалифициран доставчик от името на титуляря, означава, че дори актът на подписването вече не предполага физическо държане на материално средство (карта, токен) от подписващия.

Кръгът се затваря: както създаването, така и проверката на подписа са нормативно еманципирани от мястото, на което се намира лицето.

4.3. Дистанционно установяване на самоличност при издаване на удостоверения

Показателна за тенденцията е и еволюцията на изискванията за проверка на самоличността при издаване на квалифицирани удостоверения. Докато първоначалната редакция на чл. 24, § 1 от Регламент № 910/2014 поставяше като отправен метод физическото присъствие на лицето, eIDAS 2 урежда равностойни дистанционни способности – чрез средство за електронна идентификация с високо ниво на осигуреност, чрез EUDI портфейла или чрез сертифицирани процедури за дистанционна видеоидентификация, отговарящи на хармонизирани стандарти (DigiSign n.d.) (Evrotrust 2024). Така и последният етап, на който физическото присъствие имаше нормативно значение – първоначалното обвързване на криптографската самоличност с физическото лице – се отваря за дистанционно изпълнение.

4.4. Нормативни и технологични граници на дистанционния модел

Следва да се отбележи, че макар Регламент (ЕС) № 910/2014 и изменящият го Регламент (ЕС) 2024/1183 (eIDAS 2) целенасочено да избутват проверката на място от жизнения цикъл на удостоверителните услуги, техният обхват среща естествени граници, поставени от принципа на компетентността в правото на ЕС. Съществуват специфични правни сфери, в които държавите членки запазват своя суверенитет да уреждат материалноправните изисквания за форма на сделките и свързаните с тях процедури. Типичен пример в това отношение са производствата по съставяне на нотариални актове за разпореждане с недвижими имоти, учредяването на обезпечения, както и актовете в областта на семейното и наследственото право, при които националното законодателство традиционно императивно изисква едновременно физическо присъствие на страните пред длъжностно лице или нотариус.

Тези нормативни изключения обаче нямат капацитета да опровергават защитаваната в настоящото изследване теза. Те представляват външни за Регламента бариери, които произтичат от липсата на пълна хармонизация в гражданското и процесуалното право на ЕС, а не от вътрешни концептуални или технологични дефекти на дистанционния модел на валидиране. В тези случаи изискването за физическо явяване не е продиктувано от дефицит в сигурността на електронния подпис или невъзможност за отдалечена идентификация, а от специфични социално-правни функции на дадени институции.

4.5 Феноменът „хартиен архив“

Сериозна бариера пред ефективното функциониране на дистанционния модел е феноменът, познат като „хартиен архив“ – административната и правоприлагащата практика да се изисква принтиране на документи, които са генерирани, подписани и придвижвани изцяло в дигитален формат. Подобно изискване, репродуцирано от длъжностни лица в рамките на публичния сектор, разкрива дълбок концептуален дефицит и фундаментално неразбиране на правно-техническата специфика на електронните удостоверителни услуги.

От технологична и юридическа гледна точка превръщането на електронния документ в хартия напълно анулира положения в него електронен подпис. Върху хартията този специфичен и комплексен технологичен инструмент деградира до статична графика или текст, които са лишени от каквато и да е самостоятелна правна и доказателствена стойност в контекста на eIDAS. По този начин актът на принтирането не просто дублира информацията, а

унищожава правната сила на електронното волеизявление. Този системен дефицит категорично доказва, че за пълноценното действие на дистанционното подписване и валидиране по смисъла на чл. 32 и чл. 33 от Регламент (ЕС) № 910/2014 не е достатъчно единствено наличието на високотехнологична публична криптографска инфраструктура и доверителни списъци. Моделът изисква съответна нормативна опора на национално ниво, изразяваща се в налагането на императивни подзаконовни рестрикции и административнонаказателни санкции, които изрично да забраняват изискването на хартиен дубликат при наличен дигитален оригинал. Без подобна радикална промяна на процедурите административната инерция ще продължи да функционира като регресивен фактор, който изкуствено удържа проверката на място и компрометира стратегическите цели на ЕС за изграждане на единен цифров пазар.

ИЗВОДИ

Извършеният анализ потвърждава изследваната теза. Европейската законодателна рамка eIDAS и eIDAS 2, разглеждана като цяло, е насочена срещу проверката на място при подписващия: тя целенасочено изгражда правен и технологичен механизъм, който изключва такава проверка от фактическия състав на валидирането и я замества с дистанционно установяване на автентичността на волеизявлението и целостта на документа – чрез квалифицираното удостоверение, публичните доверителни списъци и регламентираната процедура по валидиране по чл. 32–33 от Регламент № 910/2014 – като резултатът от тази проверка се ползва с нормативно гарантирано доверие и еднаква правна сила в целия Съюз.

Мотивите на законодателя са последователни: изграждане на доверие в трансграничните електронни трансакции, премахване на пречките пред единния цифров пазар и намаляване на административната тежест за гражданите, предприятия и публичните администрации. eIDAS 2 не променя, а задълбочава тази парадигма, като чрез Европейския портфейл за цифрова самоличност, отдалечените устройства за създаване на подпис и дистанционните способи за установяване на самоличност разпространяват отдалечения модел върху целия жизнен цикъл на електронната идентичност и електронния подпис. Тенденцията на развитие на този вид законодателство е еднозначна: физическото присъствие престава да бъде гаранция за правна сигурност и бива заместено от проверими, публично достъпни и хармонизирани на равнището на Съюза удостоверителни механизми.

ЛИТЕРАТУРА

DIGISIGN, n.d. *eIDAS 2.0: Преглед на новостите в регулацията*. [viewed 28 July 2026]. Available from: <https://digisign.space/blog/eidas-2>

EVROTRUST, 2024. *eIDAS 2.0: Бъдещето на електронната идентичност в Европа*. 1 July 2024. [viewed 28 July 2026]. Available from: <https://evrotrust.com/bg/blog/eidas-2-0-b-deseto-na-elektronnata-identichnost-v-evropa/>

REFERENCES

DIGISIGN, n.d. *eIDAS 2.0: Pregled na novostite v regulatsiyata*. [viewed 28 July 2026]. Available from: <https://digisign.space/blog/eidas-2>

EUROPEAN COMMISSION, 2026. *Digital Decade Policy programme*. Shaping Europe's Digital Future. [viewed 28 July 2026]. Available from: <https://digital-strategy.ec.europa.eu/en/policies/digital-decade-policy-programme>

EUROPEAN COMMISSION, n.d. *eIDAS Dashboard: EU/EEA Trusted List Browser*. [viewed 18 July 2026]. Available from: <https://eidas.ec.europa.eu/efda/trust-services/browse/eidas/tls>

EUROPEAN COMMISSION, 2025. *eIDAS Regulation*. Shaping Europe's Digital Future. [viewed 30 July 2026]. Available from: <https://digital-strategy.ec.europa.eu/en/policies/eidas-regulation>

EUROPEAN COMMISSION, 2025. Commission Implementing Decision (EU) 2025/2164 of 27 October 2025 amending Implementing Decision (EU) 2015/1505 as regards the version of the standard on which the common template for the trusted lists is based. *Official Journal of the European Union*, L, 2025/2164, 28.10.2025. [viewed 15 July 2026]. Available from: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32025D2164>

EUROPEAN PARLIAMENT AND COUNCIL OF THE EUROPEAN UNION, 2014. Regulation (EU) No 910/2014 of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and

repealing Directive 1999/93/EC. *Official Journal of the European Union*, L 257, 28.8.2014, pp. 73–114. [viewed 30 July 2026]. Available from: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014R0910>

EUR-LEX, n.d. *Search results: Trust services, category 6370*. [viewed 28 July 2026]. Available from: https://eur-lex.europa.eu/search.html?DC_CODED=6370

EVROTRUST, 2024. *eIDAS 2.0: Badeshteto na elektronnata identichnost v Evropa*. 1 July 2024. [viewed 28 July 2026]. Available from: <https://evrotrust.com/bg/blog/eidas-2-0-b-deseto-na-elektronnata-identichnost-v-evropa/>

IDNOW, n.d. *eIDAS 2.0*. IDnow Glossary. [viewed 15 July 2026]. Available from: <https://idnow.io/idnow-glossary/>

VARBANOV, G., 2021. Electronic Identity and Personal Data Protection. In: *Protection of the Personal Data and the Digitalization – Challenges and Perspectives 2021 Conference Proceedings*, No. 1, pp. 156–162. Varna: University Publishing House “Science and Economics”, University of Economics – Varna. DOI: <https://doi.org/10.36997/PPDD2021.156>

**THE EUROPEAN LEGISLATIVE FRAMEWORK OF eIDAS AND eIDAS 2
AS A REGULATORY ALTERNATIVE TO ON-SITE VERIFICATION
IN THE PRESENCE OF THE SIGNATORY: REMOTE VALIDATION
OF ELECTRONIC SIGNATURES AS AN OBJECTIVE
OF REGULATION (EU) NO 910/2014**

Abstract: *This paper substantiates the thesis that the European legislative framework governing electronic identification and trust services – Regulation (EU) No 910/2014 (eIDAS) and its amending Regulation (EU) 2024/1183 (eIDAS 2) – is, as a whole, oriented away from the on-site verification, in the presence of the signatory, of an electronic signature that has been affixed. The framework deliberately moves away from this traditional method of verification, replacing it with legally guaranteed remote validation. The paper analyzes the European Union’s strategic rationale, the regulatory mechanism for remote validation under Articles 32 and 33 of Regulation (EU) No 910/2014, and the further development of this concept under eIDAS 2 through the European Digital Identity Wallet and the new qualified trust services. It substantiates the conclusion that the remote verifiability of a signature is not a collateral effect of the regulatory framework, but rather one of its objectives, while on-site verification represents a model that has been superseded by European Union law.*

Keywords: *electronic signature; qualified electronic signature; eIDAS; remote validation; trust services*

Alexander Kirkov, PhD

ORCID: 0009-0002-6637-4809

University of Library Studies and Information Technologies

Sofia, Bulgaria

E-mail: a.kirkov@unibit.bg

Dimo Vodkadhiev, Eng

ORCID: 0009-0003-1939-3975

District Court – Dobrich

Dobrich, Bulgaria

E-mail: vodkadhiev@gmail.com

ИНФОРМАТИКА И КОМПЮТЪРНИ НАУКИ
INFORMATICS AND COMPUTER SCIENCES

**DEPLOYING AI AGENTS FOR SLEEP APNEA MANAGEMENT IN A U.S. DIGITAL
HEALTH PLATFORM: ARCHITECTURE, LLM SELECTION,
AND BUSINESS VALUE**

Krasimir Nikolov

University of Library Studies and Information Technologies

<https://doi.org/10.70300/TIVP9872>

Abstract: Sleep apnea remains a major and frequently underdiagnosed public health challenge. Epidemiological estimates indicate that obstructive sleep apnea (OSA) affects nearly 936 million adults worldwide (Benjafield et al. 2019). Home Sleep Apnea Testing (HSAT) devices have expanded the possibilities for out-of-laboratory assessment and generate structured clinical data that may support intelligent workflow automation. This paper presents a reference technical architecture for deploying AI agents within a U.S. digital health platform specializing in sleep apnea care. The proposed system is built around a self-hosted large language model, specifically Llama 3.1 8B, served via vLLM on AWS GPU infrastructure and integrated with an existing Node.js/NestJS backend through a standardized REST API. To support a HIPAA-aligned deployment, the agent is restricted to structured patient data such as screening questionnaire results, AHI values, and CPAP adherence indicators and does not access raw physiological signals. The paper examines the infrastructure configuration, LLM selection criteria, and potential business value. Under the stated AWS pricing assumptions, the core GPU and model-storage infrastructure is estimated at approximately \$295 per month; this figure is illustrative and does not represent total cost of ownership. The proposed architecture requires task-specific clinical, security, and regulatory validation before production use.
Keywords: AI agents; sleep apnea; LLM deployment; digital health architecture; HIPAA compliance

INTRODUCTION

Sleep apnea represents a significant, yet frequently underaddressed, public health challenge in modern medicine. Epidemiological estimates indicate that obstructive sleep apnea (OSA) affects nearly 936 million adults worldwide (Benjafield et al. 2019). A substantial proportion of affected individuals remain undiagnosed, contributing to delayed treatment and an increased burden on healthcare systems. Left untreated, OSA is associated with serious comorbidities. The condition substantially elevates the risk of cardiovascular disease, type 2 diabetes, and hypertension, while simultaneously impairing cognitive performance over time (Lévy et al. 2015).

Traditionally, in-laboratory polysomnography (PSG) has served as the diagnostic reference standard for OSA. However, this procedure presents considerable practical barriers. It carries high costs, creates logistical burdens, and may contribute to delays in diagnostic assessment and treatment initiation (Kapur et al. 2017). The introduction of Home Sleep Apnea Testing (HSAT) devices – such as the WatchPAT series developed by Itamar Medical – has substantially altered this landscape. These devices can expand access to sleep-disordered breathing assessment by allowing eligible patients to complete diagnostic testing in their home environment, with results subsequently reviewed remotely by credentialed clinicians (Corral et al. 2017).

Digital health platforms that coordinate the end-to-end HSAT workflow naturally accumulate structured datasets throughout the patient journey. From initial intake and insurance verification to study fulfillment, clinical review, and CPAP treatment initiation, these platforms generate records covering screening questionnaires, diagnostic outcomes, treatment assignments, and adherence metrics. Collectively, such structured data may provide a suitable foundation for intelligent and automated clinical workflow support.

Artificial intelligence agents offer a highly relevant mechanism for augmenting these clinical operations (Wang et al. 2024). In contrast to static, rule-based automation systems, AI agents can perform generate context-dependent action sequences rather than executing fixed rules over structured inputs, interact with predefined tools, and execute complex workflows according to specified instructions and constraints. Their behavior can be conditioned on the clinical context represented in the available data. When cases require human judgment, the agent can be configured to escalate them to qualified clinical personnel, while routine monitoring tasks can be performed continuously.

This paper addresses a focused research question: How can AI agents be technically designed, deployed, and integrated within a U.S. digital health platform for sleep apnea care while maintaining strict patient data privacy and supporting compliance with applicable HIPAA requirements? Three primary contributions are offered: (1) a reference architecture for a self-hosted, LLM-based AI agent operating within a Node.js/NestJS healthcare environment; (2) a comparative evaluation of open-weight language models suited for regulated clinical deployments; and (3) a practical mapping of AI agent capabilities to real-world workflow states within the sleep apnea care pathway.

RESEARCH METHODOLOGY

The study adopts a Design Science Research (DSR) methodology – a well-established framework in information systems and applied computer science that focuses on the construction and evaluation of purposeful technical artifacts (Hevner et al. 2004). This approach was selected because the research objective extends beyond descriptive analysis: the aim is to construct a technically viable solution to a real-world operational problem and evaluate its utility against a defined set of criteria (Peppers et al. 2007).

The investigation was structured across three sequential phases. In the first phase, a targeted literature review was conducted covering AI agent architectures, large language model deployment in healthcare, HIPAA-aligned infrastructure patterns, and sleep apnea clinical workflows. Sources were drawn from IEEE Xplore, PubMed, the ACM Digital Library, and relevant vendor technical documentation. The review was intended to identify technically and clinically relevant concepts rather than to constitute a systematic review or meta-analysis. In the second phase, a comparative technical evaluation of three open-weight language models was carried out based on a defined set of clinical deployment criteria. In the third phase, a reference architecture was synthesized and mapped to an existing clinical data model representative of a typical U.S. sleep apnea digital health platform.

The LLM evaluation was structured around five criteria of particular relevance to regulated healthcare environments. These include: (1) licensing permissiveness for commercial use and applicable use restrictions; (2) data residency, meaning the ability to operate fully within a private cloud without outbound transmission of Protected Health Information (PHI) to an external model provider; (3) reasoning and tool-calling capability for reliable multi-step task execution; (4) computational footprint, specifically VRAM requirements and compatibility with cost-effective GPU instance types; and (5) governance and regulatory considerations associated with model provenance, licensing, organizational policy, and deployment jurisdiction.

Infrastructure assessment was based on technical specifications and indicative AWS pricing for GPU-enabled instance types, using the g4dn.xlarge (16 GB NVIDIA T4) as the minimum development configuration and the g5.xlarge (24 GB NVIDIA A10G) as the recommended production setup. Model inference was assessed conceptually through a deployment-oriented technical analysis using vLLM, an open-source high-throughput inference engine, deployed as a containerized ECS task within a HIPAA-eligible AWS environment. Cost projections were calculated on a 30-day continuous operation basis, incorporating both on-demand and indicative spot instance pricing.

The clinical workflow analysis was conducted against a representative PostgreSQL schema modeled with Prisma ORM, reflecting the data architecture of a typical U.S. sleep apnea digital

health platform. Key entities examined included patient screening results, HST workflow state machines, diagnostic report structures, treatment records, and compliance indicators. Through this analysis, specific agent trigger points were identified – discrete state transitions where an AI agent can meaningfully intervene without requiring any access to raw physiological signal data from HST devices.

TECHNICAL ARCHITECTURE

The proposed AI agent system is architected as a modular, HIPAA-aligned extension to an existing Node.js/NestJS digital health backend. A micro-services pattern was adopted, whereby the LLM inference engine operates as a fully independent containerized service, structurally decoupled from the core application layer. This separation has two critical benefits: it reduces disruption to established clinical workflows and allows the inference engine to be scaled or replaced without requiring redeployment of the main application. The system is organized into four functional layers: an inference layer responsible for hosting and serving the language model; an agent orchestration layer implemented as a dedicated `ai/` module within the NestJS backend; a data access layer providing the agent with structured read access to patient workflow states and clinical summaries; and a human oversight layer that routes all agent outputs to clinical staff for mandatory review prior to any patient-facing action.

The language model is served through vLLM – a high-throughput, memory-efficient inference engine optimized for transformer-based models – deployed as a Docker container within an AWS ECS task. Model weights are stored on an Amazon EFS volume mounted to the task, ensuring persistence across container restarts and eliminating redundant downloads upon reinitialization. For production environments, a `g5.xlarge` instance equipped with a 24 GB NVIDIA A10G GPU is proposed as a baseline configuration. At 4-bit quantization, the evaluated model class can typically be accommodated within this GPU memory envelope, although exact VRAM requirements depend on model architecture, quantization method, context length, KV-cache allocation, batching strategy, and inference configuration. The inference service exposes a chat completions REST endpoint on port 8000, accessible exclusively within the private VPC. No inference traffic needs to be routed to an external model provider, thereby supporting containment of PHI within the organization’s controlled AWS environment.

The agent orchestration logic resides within a dedicated `ai/` module embedded in the existing NestJS application. This module executes a continuous tool-calling loop. On each invocation, the agent receives a system prompt embedding HIPAA guardrails, a task description, and a set of available tool definitions expressed as JSON schemas. The model reasons over the supplied context, then emits either a conclusive response or a structured tool invocation request. When a tool call is detected, the NestJS module executes the corresponding internal service method – such as retrieving a patient’s current HST workflow state, fetching screening questionnaire scores, or querying CPAP compliance data – and feeds the result back as a new context message (Wang et al. 2024). The loop continues until a final output is produced or a maximum iteration safeguard is reached.

A defining architectural constraint is that the agent operates exclusively on structured summary data. It has no access to raw physiological signals from HSAT devices, which remain within the clinical device ecosystem. This restriction intentionally reduces the PHI surface area, simplifies audit-trail requirements, and supports the HIPAA principle of minimum necessary access. Agent trigger points are mapped to discrete state transitions in the patient care pathway – spanning device ordering, study completion, clinical review, and treatment initiation. In every case, all agent outputs are reviewed by clinical staff before any downstream action is executed. This human-in-the-loop design functions as a risk-control mechanism and is consistent with broader principles applied to clinical decision-support and AI-enabled medical software; however, the regulatory classification of any specific implementation must be assessed separately.

Table 1. Infrastructure configuration and indicative cost comparison

Parameter	Minimum (Dev)	Recommended (Prod)	Indicative Spot (Prod)
Instance type	g4dn.xlarge	g5.xlarge	g5.xlarge
GPU	NVIDIA T4 (16GB)	NVIDIA A10G (24GB)	NVIDIA A10G (24GB)
Hourly cost	\$0.526	\$1.006	~\$0.40
Monthly cost	~\$380	~\$725	~\$295
Model storage (EFS)	~\$5/mo	~\$5/mo	~\$5/mo
Total/month	~\$385	~\$730	~\$295

LLM SELECTION AND COMPARATIVE ANALYSIS

Selecting an appropriate language model for a HIPAA-regulated healthcare environment requires evaluation criteria that extend well beyond standard benchmark performance. In the context of a self-hosted deployment, factors such as licensing terms, model provenance, the capacity for multi-step task execution, computational efficiency, governance requirements, and compatibility with organizational security policies may carry equal or greater weight (Moor et al. 2023).

Llama 3.1 8B Instruct, developed by Meta, represents a technically attractive candidate for self-hosted U.S. healthcare deployments because of its manageable computational requirements, broad software ecosystem, and availability for local inference. Its licensing framework permits a wide range of commercial uses, subject to the terms and restrictions of the Llama 3.1 Community License (Meta 2024). Its reliability for specific clinical tool-use workflows should be established empirically using task-specific evaluation data rather than assumed from general-purpose benchmarks. Mistral 7B Instruct v0.3, developed in France by Mistral AI, operates under the Apache 2.0 license (Mistral AI 2024). Its relatively small computational footprint may offer efficiency advantages for resource-constrained deployments. Its European provenance may also be operationally relevant for organizations whose procurement, governance, or cross-border data-transfer policies favor EU-based technology providers; however, GDPR does not impose a general requirement that personal data remain physically stored within the European Union.

DeepSeek-R1-Distill-Llama-8B presents a distinct technical profile. As a distilled derivative of the DeepSeek-R1 reasoning model based on Llama 3.1 8B, it is designed to retain reasoning-oriented capabilities within an approximately 8B-parameter model class (DeepSeek-AI 2025). Its suitability for complex tool-based clinical workflows is promising but should be established through task-specific benchmarking before conclusions about superiority over Llama or Mistral models are drawn. Its development by a Chinese organization may trigger additional organizational, procurement, cybersecurity, governance, or legal review depending on the policies and regulatory obligations applicable to the deploying healthcare organization. Model provenance alone, however, should not be treated as evidence of regulatory non-compliance.

Table 2. LLM candidate evaluation matrix

Criterion	Llama 3.1 8B	Mistral 7B	DeepSeek-R1-Distill-Llama-8B
License	Llama Community	Apache 2.0	MIT; derived from Llama 3.1
Provider jurisdiction	USA	France / EU	China
VRAM (4-bit quant)	~6 GB	~5 GB	~6 GB
Single-hop tool calls	Suitable; validation required	Suitable; validation required	Suitable; validation required
Multi-step chains (3+)	Requires task-specific testing	Requires task-specific testing	Reasoning-oriented; validation required
Governance considerations	Established U.S. ecosystem; organizational review required	EU-based provider; organizational review required	Additional institutional review may be appropriate
Recommendation	Primary candidate	Alternative candidate	Benchmark candidate

Based on the above evaluation, Llama 3.1 8B Instruct is proposed as the initial production candidate, subject to task-specific validation and organizational approval. DeepSeek-R1-Distill-Llama-8B is recommended for parallel benchmarking on equivalent infrastructure. Because the architecture abstracts the inference layer from the core NestJS application, model substitution can be achieved with limited changes to the surrounding orchestration logic. Should benchmarking demonstrate superior task-level performance and the relevant governance requirements be satisfied, DeepSeek-R1-Distill-Llama-8B could represent an alternative deployment option without requiring substantial architectural modification. Mistral 7B remains a secondary option for organizations that prioritize Apache 2.0 licensing, lightweight deployment, or specific European procurement and governance considerations.

BUSINESS VALUE AND RETURN ON INVESTMENT

The deployment of AI agents in a sleep apnea digital health platform has the potential to generate value across three dimensions: operational efficiency, clinical scalability, and revenue-cycle support. Traditional care pathways depend heavily on manual touchpoints – patient intake coordination, insurance eligibility verification, HSAT device logistics, clinical review scheduling, and treatment follow-up. Each of these steps consumes staff time that tends to increase with patient volume. An AI-assisted system, by contrast, can automate or support selected repetitive workflow-monitoring tasks at comparatively low incremental compute cost once the infrastructure is operational.

The illustrative compute and storage cost of the proposed self-hosted system amounts to approximately \$295 per month under the spot-pricing scenario shown in Table 1. Because this infrastructure cost does not necessarily increase linearly with patient volume, the compute cost per monitored patient may decline as utilization increases, provided that system capacity is not exceeded. For a platform serving 500 active patients monthly, the estimated infrastructure expenditure corresponds to approximately \$0.60 per patient. This calculation represents infrastructure cost only and excludes software engineering, maintenance, security operations, monitoring, networking, backups, clinical review time, and other organizational costs.

A deployed AI agent system can process multiple workflow events concurrently, subject to the throughput, latency, context-length, batching, and GPU-capacity limits of the selected deployment configuration. Rather than replacing clinical coordinators, the agent can continuously monitor predefined workflow state transitions and prioritize cases for human attention. This capacity may be especially relevant given the documented workforce constraints in sleep medicine, which contribute to persistent bottlenecks in OSA diagnosis and treatment pathways (Kirsch 2018). The AI agent does not replace clinical judgment; it functions as a workflow-support mechanism that may allow clinical teams to allocate more attention to cases requiring professional assessment.

The proposed architecture may support documentation and monitoring activities associated with Remote Physiologic Monitoring (RPM) under the CMS reimbursement framework. Relevant CPT codes include 99453, 99454, and 99457 (CMS 2024). Whether a specific workflow qualifies for reimbursement depends on the applicable CMS coverage, billing, device, monitoring, and clinical-interaction requirements and cannot be determined solely by the presence of an AI agent. The agent can support documentation, workflow tracking, and identification of missing adherence data, while billable clinical services must continue to satisfy all applicable human-service and documentation requirements. Furthermore, by monitoring available CPAP usage data, the agent may identify patients approaching the CMS adherence threshold – PAP use of at least four hours per night on 70% of nights during a consecutive 30-day period within the first three months of initial use – and flag them for proactive clinical outreach (CMS n.d.).

From a risk management perspective, the fully self-hosted deployment model reduces dependency on external AI inference providers and may reduce the number of third parties processing PHI. This does not itself establish HIPAA compliance. Compliance depends on the broader administrative, physical, and technical safeguards implemented by the covered entity or business associate, including appropriate contractual arrangements, access controls, encryption, logging,

monitoring, incident response, and workforce procedures. As U.S. state-level health data privacy legislation continues to expand beyond federal HIPAA requirements, this architecture may provide greater organizational control over data flows and processing locations (Goldstein et al. 2023). The mandatory human-in-the-loop design reduces, but does not eliminate, risks associated with autonomous AI-generated recommendations in clinical environments.

DISCUSSION

The proposed architecture demonstrates that technically capable, privacy-preserving AI agents for sleep apnea care management can be designed using open-weight models and self-hosted infrastructure in a manner that avoids routine transmission of PHI to third-party model API providers.

Several architectural decisions are particularly important. The restriction of the agent to structured summary data – excluding raw physiological signals from HSAT devices – represents both a deliberate constraint and a privacy advantage. It significantly reduces the PHI surface area, simplifies audit-trail requirements, and supports a privacy-by-design and compliance-oriented architecture. The tool-calling loop implemented within the NestJS ai/ module provides a flexible extensibility pattern. Because each available tool is defined as a discrete JSON schema, new capabilities can be added without modifying the core orchestration logic – a pattern that aligns with established principles of maintainable healthcare software architecture (Blobel 2018).

The LLM evaluation reveals that no single model can be considered universally optimal across all relevant criteria. Llama 3.1 8B offers a potentially strong combination of ecosystem maturity, manageable computational requirements, and suitability for structured tool execution in U.S.-based deployments. DeepSeek-R1-Distill-Llama-8B presents a potentially valuable reasoning-oriented alternative for multi-step workflows, but its comparative advantage requires direct empirical validation using the target clinical tasks. This finding highlights a recurring tension in healthcare AI adoption: strong general-purpose reasoning performance does not necessarily provide the optimal balance of accuracy, governance, licensing, operational maturity, computational cost, and regulatory suitability for a particular clinical environment. Technical and governance criteria should therefore be evaluated jointly throughout the model-selection process.

Several limitations of the proposed system require acknowledgment. First, the architecture was designed and evaluated at the level of technical specification; empirical validation through production deployment and clinical outcome measurement remains future work. Second, the agent’s effectiveness is bounded by the completeness, accuracy, and timeliness of data entered into the underlying clinical information systems – a limitation common to EHR-integrated decision-support systems (Sittig and Singh 2012). Third, the explainability of LLM-generated outputs remains an open challenge. While the human-in-the-loop design mitigates some immediate operational and clinical risks, full transparency into the basis of individual model outputs is not guaranteed by the current architecture. Explainability, traceability, provenance of retrieved information, and reproducibility of agent actions should therefore be treated as explicit requirements in future evaluation (Tonekaboni et al. 2019).

Three directions for future development are identified. First, the integration of multi-agent coordination – where specialized sub-agents handle distinct aspects of the care pathway through a shared orchestration layer – could increase task specialization across individual workflow stages. Second, the application of retrieval-augmented generation (RAG) over clinical guidelines and payer policy documents could allow the agent to ground its responses in current clinical and reimbursement information without requiring frequent model retraining. Such a system would require version control, source provenance, document-governance procedures, and mechanisms to ensure that outdated policies are not retrieved as current guidance. Third, fine-tuning the base models on de-identified sleep apnea clinical notes could be investigated as a method for improving task-specific performance, provided that de-identification, data governance, training provenance, and resulting model-privacy risks are appropriately evaluated.

CONCLUSION

This paper presents a reference technical architecture for deploying AI agents within a U.S. digital health platform specializing in sleep apnea care. The structured clinical data generated by modern HSAT workflows offers a potentially powerful foundation for intelligent automation. The proposed system demonstrates a technical pathway for using such data without requiring the AI agent to access raw physiological signals or routinely transmit patient information to external model API providers.

The architecture rests on three core pillars: a self-hosted open-weight language model served within a private AWS cloud environment; a modular NestJS tool-calling orchestration layer; and a tightly controlled data-access model restricted to structured clinical summaries. This design can support organizational control over PHI processing and facilitate implementation of minimum-necessary access principles, while enabling the agent to surface actionable information for clinical staff review. HIPAA compliance, however, remains dependent on the complete set of administrative, physical, technical, contractual, and organizational safeguards surrounding the deployment.

Llama 3.1 8B Instruct is identified as the preferred initial candidate for production evaluation, offering a potentially favorable balance of ecosystem maturity, deployment flexibility, licensing characteristics, and computational efficiency for U.S. healthcare environments. Under the illustrative spot-instance pricing assumptions presented in this study, the estimated GPU and model-storage infrastructure cost remains near \$295 per month. This estimate should not be interpreted as the total cost of ownership of the AI system. The mandatory human-in-the-loop review principle is designed to augment, rather than autonomously replace, clinical judgment and provides an important risk-control mechanism; regulatory classification and compliance obligations must nevertheless be determined for each specific implementation and intended use.

Future work should prioritize empirical validation through live production deployment, task-specific benchmarking of candidate models, quantitative assessment of latency and throughput, exploration of multi-agent coordination for more granular clinical pathway coverage, and the application of retrieval-augmented generation to improve response grounding. The architecture presented in this study offers a replicable technical foundation for further evaluation by healthcare organizations seeking to integrate AI-agent capabilities into existing digital health infrastructure while maintaining strong privacy, governance, and human-oversight controls.

REFERENCES

- BENJAFIELD, A. V., AYAS, N. T., EASTWOOD, P. R., HEINZER, R., LIM, D. C., PARTHASARATHY, S., QUAN, S. F., TAPIA, I. E., WOEHRLE, H. and MALHOTRA, A., 2019. Estimation of the global prevalence and burden of obstructive sleep apnoea: A literature-based analysis. *The Lancet Respiratory Medicine*, vol. 7, issue 8, pp. 687–698. DOI: [https://doi.org/10.1016/S2213-2600\(19\)30198-5](https://doi.org/10.1016/S2213-2600(19)30198-5)
- BLOBEL, B., 2018. Architectural approach to eHealth for enabling paradigm changes in health. *Studies in Health Technology and Informatics*, vol. 248, pp. 10–24. DOI: <https://doi.org/10.3233/978-1-61499-951-5-10>
- CENTERS FOR MEDICARE & MEDICAID SERVICES (CMS), 2024. *Remote Physiologic Monitoring: CPT Codes 99453, 99454, 99457*. [viewed 10 April 2026]. Available from: <https://www.cms.gov/medicare/payment/fee-schedules/physician>
- CENTERS FOR MEDICARE & MEDICAID SERVICES (CMS). *Local Coverage Determination (LCD): Positive Airway Pressure (PAP) Devices for the Treatment of Obstructive Sleep Apnea (L33718)*. [viewed 28 June 2026]. Available from: <https://www.cms.gov/medicare-coverage-database/view/lcd.aspx?LCDId=33718>
- CORRAL, J., MASA, J. F., DURAN-CANTOLLA, J., TERAN, J., CABELLO, M., HERNANDEZ-VOTH, A. and MONTSERRAT, J. M., 2017. Alternatives to polysomnography for the diagnosis of sleep apnea syndromes. *Archivos de Bronconeumología*, vol. 53, issue 8, pp. 432–438. DOI: <https://doi.org/10.1016/j.arbres.2017.02.005>
- DEEPSEEK-AI, 2025. *DeepSeek-R1: Incentivizing Reasoning Capability in LLMs via Reinforcement Learning*. arXiv preprint, arXiv:2501.12948. [viewed 10 April 2026]. Available from: <https://arxiv.org/abs/2501.12948>
- U.S. FOOD AND DRUG ADMINISTRATION (FDA), 2019. *Proposed Regulatory Framework for Modifications to Artificial Intelligence/Machine Learning-Based Software as a Medical Device*. [viewed 10 April 2026]. Available from: <https://www.fda.gov/media/122535/download>

- GOLDSTEIN, M. M., PEWEN, W. F. and BLUMENTHAL, D., 2023. State health data privacy laws and the limits of HIPAA preemption. *Health Affairs*, vol. 42, issue 1, pp. 93–101. DOI: <https://doi.org/10.1377/hlthaff.2022.00734>
- HEVNER, A. R., MARCH, S. T., PARK, J. and RAM, S., 2004. Design science in information systems research. *MIS Quarterly*, vol. 28, issue 1, pp. 75–105. DOI: <https://doi.org/10.2307/25148625>
- KAPUR, V. K., AUCKLEY, D. H., CHOWDHURI, S., KUHLMANN, D. C., MEHRA, R., RAMAR, K. and HARROD, C. G., 2017. Clinical practice guideline for diagnostic testing for adult obstructive sleep apnea. *Journal of Clinical Sleep Medicine*, vol. 13, issue 3, pp. 479–504. DOI: <https://doi.org/10.5664/jcsm.6506>
- KIRSCH, D. B., 2018. To sleep, perchance to dream of a sleep medicine workforce. *Journal of Clinical Sleep Medicine*, vol. 14, issue 4, pp. 693–695. DOI: <https://doi.org/10.5664/jcsm.7070>
- LÉVY, P., KOHLER, M., McNICHOLAS, W. T., BARBÉ, F., McEVOY, R. D., SOMERS, V. K., LAVIE, L. and PÉPIN, J. L., 2015. Obstructive sleep apnoea syndrome. *Nature Reviews Disease Primers*, vol. 1, Article 15015. DOI: <https://doi.org/10.1038/nrdp.2015.15>
- META, 2024. *Llama 3.1: Model Information and Community License Agreement*. [viewed 28 June 2026]. Available from: <https://github.com/meta-llama/llama-models>
- MISTRAL AI, 2024. *Mistral 7B (v0.3)*. [viewed 28 June 2026]. Available from: <https://docs.mistral.ai/models/mistral-7b-0-3>
- MOOR, M., BANERJEE, O., ABAD, Z. S. H., KRUMHOLZ, H. M., LESKOVEC, J., TOPOL, E. J. and RAJPURKAR, P., 2023. Foundation models for generalist medical artificial intelligence. *Nature*, vol. 616, pp. 259–265. DOI: <https://doi.org/10.1038/s41586-023-05881-4>
- PEFFERS, K., TUUNANEN, T., ROTHENBERGER, M. A. and CHATTERJEE, S., 2007. A design science research methodology for information systems research. *Journal of Management Information Systems*, vol. 24, issue 3, pp. 45–77. DOI: <https://doi.org/10.2753/MIS0742-1222240302>
- SITTIG, D. F. and SINGH, H., 2012. Electronic health records and national patient-safety goals. *New England Journal of Medicine*, vol. 367, issue 19, pp. 1854–1860. DOI: <https://doi.org/10.1056/NEJMs1205420>
- TONEKABONI, S., JOSHI, S., McCRAIDEN, M. D. and GOLDENBERG, A., 2019. *What Clinicians Want from Explainable Artificial Intelligence for Diagnostic Decision Support*. arXiv preprint, arXiv:1905.05134. [viewed 10 April 2026]. Available from: <https://arxiv.org/abs/1905.05134>
- WANG, L., MA, C., FENG, X., ZHANG, Z., YANG, H., ZHANG, J., CHEN, Z., TANG, J., CHEN, X., LIN, Y. and ZHAO, W., 2024. A survey on large language model based autonomous agents. *Frontiers of Computer Science*, vol. 18, issue 6, Article 186345. DOI: <https://doi.org/10.1007/s11704-024-40231-1>
- WATSON, N. F., 2016. Health care savings: The economic value of diagnostic and therapeutic care for obstructive sleep apnea. *Journal of Clinical Sleep Medicine*, vol. 12, issue 8, pp. 1075–1077. DOI: <https://doi.org/10.5664/jcsm.5594>

ВНЕДРЯВАНЕ НА АГЕНТИ НА ИИ (AI) ЗА УПРАВЛЕНИЕ НА СЪННА АПНЕЯ В АМЕРИКАНСКА ЦИФРОВА ЗДРАВНА ПЛАТФОРМА: АРХИТЕКТУРА, ИЗБОР НА ГЕМ (LLM) И БИЗНЕС СТОЙНОСТ

Резюме: Сънната апнея остава значим и често недиагностициран проблем на съвременното здравеопазване. Епидемиологичните оценки показват, че обструктивната сънна апнея (OSA) засяга близо 936 милиона възрастни в световен мащаб (Benjafield et al. 2019). Навлизането на устройствата за домашно изследване за сънна апнея (HSAT) разширява възможностите за извънболнична диагностика и генерира структурирани клинични данни, които могат да подпомогнат интелигентната автоматизация на работните процеси. В настоящата статия се представя референтна техническа архитектура за внедряване на AI агенти в дигитална здравна платформа, специализирана в грижата за пациенти със сънна апнея. Предложената система се основава на локално хостван голям езиков модел, Llama 3.1 8B, обслужван чрез vLLM върху AWS GPU инфраструктура и интегриран с Node.js/NestJS бекенд посредством стандартизиран REST API. За подпомагане на внедряване, съобразено с изискванията на HIPAA, агентът е ограничен до структурирани пациентски данни – резултати от скринингови въпросници, АНІ стойности и показатели за придържане към CPAP терапията – и няма достъп до сурови физиологични сигнали. Разгледани са инфраструктурната конфигурация, критериите за избор на LLM и потенциалната бизнес стойност. При посочените

допускания за AWS ценообразуване основният разход за GPU и съхранение на модела е оценен приблизително на \$295 месечно; тази стойност е илюстративна и не представлява общата цена на притежание. Предложената архитектура изисква специфична клинична, техническа, регулаторна и сигурностна валидация преди внедряване в реална среда.

Ключови думи: AI агенти; сънна апнея; внедряване на LLM; цифрово здраве; HIPAA съответствие

Красимир Николов, студент
Университет по библиотекознание и информационни технологии
София, България
E-mail: krnikolov@gmail.com

ОБЩЕСТВЕНИ КОМУНИКАЦИИ И ИНФОРМАЦИОННИ НАУКИ
PUBLIC COMMUNICATIONS AND INFORMATION SCIENCES

**CRISIS COMMUNICATION AND REPUTATION MANAGEMENT IN DIGITAL
SPORTS ENVIRONMENTS**

Andreas Fixemer

University of Library Studies and Information Technologies

<https://doi.org/10.70300/HGAU5579>

Abstract: *Sport is a deeply rooted part of our society, characterized by a high level of emotional engagement among both active and passive stakeholders. Especially where a large fan base follows the activities of a club, public sentiment can shift dramatically in a very short time due to success or failure. It is essential to manage these shifts appropriately through a prudent communication strategy. The aim of this paper is to compile the essential aspects of crisis communication and, in doing so, to develop approaches to prevention and reputation management. This paper is based on a comprehensive literature review. The paper evaluates existing theoretical approaches as well as supplementary empirical observations. A key focus is the role of the stakeholders involved. The results show how the timely application of preventive measures can help prevent potential crises or ensure that a club is well-prepared for a crisis situation. At the same time, it becomes clear what contribution well-organized reputation management can make to limiting potential damage and restoring trust.*

Keywords: *Crisis Communication; Reputation Management; Sports Communication; Digital Media Environments; Stakeholder Communication*

INTRODUCTION

Sports have long been an integral part of our lives. Virtually everyone is connected in some way to the world of international sports – whether they participate in sports themselves or simply feel an emotional connection to a team or athlete and thus follow sporting events through the media. For example, during soccer World Cups, we repeatedly observe the phenomenon that even those with no direct connection to soccer are drawn into the tournament through a sense of national solidarity. In hardly any other field can the emotions experienced shift as rapidly as in sports, where success and failure are often close together or follow one another (Palomba/Zhang/Hedlund 2024: 2). If organizations fail to address these emotions through communication, situations can escalate. Well-organized communication management is therefore indispensable for the long-term sustainability of an organization (cf. Koerber/Zabara 2017: 198; Panksepp et al. 2014: 472). Against this backdrop, this article addresses two key questions. What communicative measures are suitable for prevention? Such measures can be implemented in a much more orderly manner during a positive phase than when a crisis has already occurred and immediate action may be required. Second, approaches to reputation management should provide insights into how an organization can build long-term trust among various stakeholders even beyond individual crisis situations.

RESEARCH METHODOLOGY

This article presents a qualitative literature review and examines the communication behavior of individuals and organizations in the context of professionally organized sports. Following an initial conceptual framework, the author first outlines the fundamental causes and phases of crises and then explores proven communication strategies in crisis situations. We then examine which stakeholder organizations in the sports context must address in crisis situations (cf. Hutchins/Rowe 2014: 279). This ultimately yields both concrete approaches to prevention and considerations for long-term reputation management.

RESULTS

Organizations and individuals in sport can run into crises at any time. Poor results, internal problems within a club, outside influences, or damage to reputation may all trigger such situations. In such situations, choosing the right communication strategy can make the decisive difference between an organization successfully managing a crisis and the crisis escalating further.

Typology of Crises

First, let's clarify the key terminology related to crisis communication. We will focus on defining the terms "crisis," "crisis management," and "crisis communication." We will then examine the main types of crisis communication.

Brown defines a crisis "as the perception of an unpredictable event that threatens stakeholders' key expectations and can seriously impact an organization's performance and lead to negative outcomes" (Brown 2014: 21). With her definition, she articulates the unpredictable or unforeseen nature of a crisis. Other authors, such as Kitchin and Purcell, indirectly contradict this view and at least leave open the possibility of recognizing warning signs that indicate a deterioration (cf. Kitchin/Purcell 2017: 15). For Jafri and Yahya, the concept of crisis management encompasses "a process planned to avoid or reduce the impact a crisis can inflict on an organization and its stakeholders." Furthermore, they state, "It is a creative process to eradicate major risk elements that cause a bad reputation for the organization. This activity will allow those concerned to obtain guidance regarding their future path and practice best communication management skills." (Jafri/Yahya 2019: 3). They therefore focus on any activities that help minimize risks or, ideally, avoid them altogether. In doing so, they also refer to the concept of "reputation," which we will address at the end of this study.

The central focus of this working paper is crisis communication. Authors such as Coombs point out the thematic connection to crisis management. Coombs writes, "Crisis management needs evidence-based crisis communication guidance. Evidence-based guidance for decision-making in a crisis must be supported by scientific evidence." Coombs thus views research findings, empirical studies, and communication strategies that have proven successful as an important basis for decision-making in crises (Coombs 2007: 163). In their roadmap, Manoli and Anagnostou outline a plan for how communication can be organized in times of crisis (cf. Manoli/Anagnostou 2023).

Reasons and Triggers of Crises

To prevent crises, it can be helpful to identify potential causes and triggers of problems. In the sports sector, various events can serve as such triggers. For one thing, prolonged failure can plunge athletes into a crisis. A prolonged losing streak puts nearly all organizations and clubs in a precarious position due to the economic dependencies associated with competitive sports. In addition, internal misconduct by athletes or even by the organization's own management can lead to a problematic situation. Depending on the extent of the public impact, so-called "shitstorms" triggered by individuals or small groups can spread to the entire club structure (cf. Hutchins/Rowe 2010: 710–711).



Figure 1. Crisis Communication Roadmap according to Manoli/Anagnostou 2023

Other causes of a crisis can include financial irregularities within an organization, violations of applicable law, or problems with a contractual partner such as a sponsor. External factors can also lead to difficulties. For example, extreme weather changes can lead to the cancellation of events, which can put an organization in financial trouble. Technical problems can arise when IT infrastructure fails (cf. Hutchins/Rowe 2010: 699). Crises often arise from a combination of internal problems and external factors. Prominent examples from the history of sports:

– Athlete-related reputation crisis: Throughout his career, tennis player Novak Djokovic has refused to get vaccinated against COVID-19. This has at times led to major conflicts both within Djokovic's team and with his sponsor Lacoste (cf. Agini 2022).

– Event-based crisis: Due to the global COVID-19 pandemic, Japan was forced to postpone the 2020 Olympic Games to 2021, leaving the stadiums empty for a year (cf. Wang/Jiang 2021).

– Individual/team-based crisis: Frandsen and Johansen highlight an incident in which "Danish handball coach Anja Andersen withdrew her team in the middle of a match watched by a large number of spectators. The incident caused immediate consternation, not only among sports officials but also in the Danish media, posing a serious threat to the image of both the handball coach and her club" (Frandsen/Johansen 2017: 85).

– Fisher cites Tiger Woods' apology as a prominent example: "Tiger Woods' corrective action for addressing adulterous affairs was to enter a rehabilitation facility for sexual addiction" (Fisher 2012: 32).

Phases of a Crisis

To prevent a crisis or effectively manage crisis situations that have already arisen, it is helpful to have a more detailed understanding of the individual phases that an organization goes through during a crisis. Fiederer and Ternès (2017) provide a detailed overview of this in their 5-phase model:

(1) Prevention

This phase involves preventive activities. Relevant stakeholders are made aware of potential risks, and their attention is heightened. Should a crisis nevertheless be unavoidable, crisis plans and the assignment of responsibilities help an organization become operational as quickly as possible.

(2) Warm Up

If warning signs emerge and are recognized in time, concerning developments can be monitored early on. Implementing appropriate monitoring can be helpful. Proactive communication with the public can also help positively influence public perception.

(3) Acute und Hot

This is the peak of the crisis. At this moment, it is decided whether the situation will be brought under control or continue to escalate. Organizations at the center of media attention must now not only coordinate their communication efforts but also withstand the pressure of public reporting.

(4) Cool Down

The crisis gradually subsides, and media attention gradually wanes. Nevertheless, risks remain that the organization's reputation will be damaged or permanently compromised. The task now is to stabilize the situation, limit consequential damage, and gradually return to regular business operations.

(5) Lessons Learned

In the final phase, the organization systematically reviews the crisis. It analyzes the causes, evaluates its own communication measures as well as public reactions, and assesses which goals the organization achieved and which remained unmet. The insights gained help to develop new preventive measures and better prepare for potential future crises.

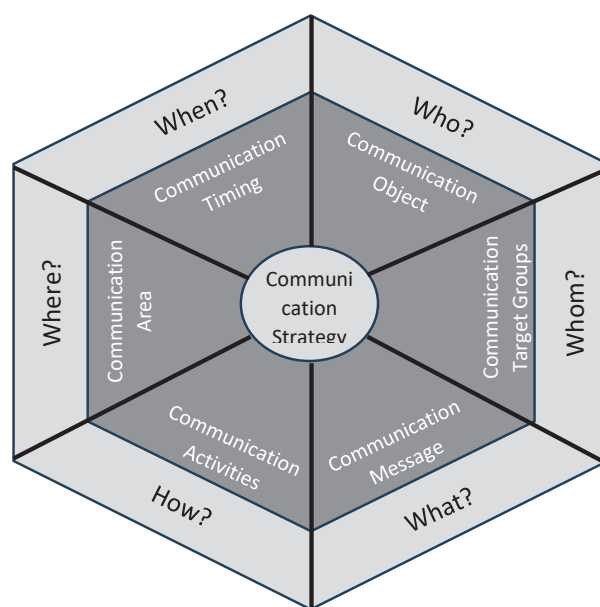


Figure 2. Strategy Elements for Specific Communication Instruments
(cf. Bruhn 2015: 246)

Communication Strategies in a Crisis

After having taken a largely theoretical look at the topic of crisis communication so far, we will now examine the relevant strategies that have become established over the years. The following figure, based on Bruhn, illustrates some key aspects of a potential communication strategy (cf. Bruhn 2015: 246).

Another factor to consider when choosing communication strategies is the way a party acts during a crisis. Töpfer contrasts a proactive or offensive approach with a reactive, defensive one.

According to him, a defensive communication strategy is characterized by a rather cautious disclosure of the situation. Such a strategy is appropriate when public interest and media pressure are relatively low, or when a stakeholder risks making themselves vulnerable by being too open. At the same time, Töpfer sees the danger that outsiders will obtain information from other sources, quickly placing the actor in a passive position. In this case, there is even a risk that this reticence

could be interpreted as an attempt at deception (Töpfer 2008: 369). Proactive communication involves the early and comprehensive disclosure of the causes and effects of the crisis. Töpfer emphasizes that stakeholders must communicate openly, comprehensively, and honestly in this context. This type of strategy thus serves, among other things, to prevent rumors and misinformation caused by external factors. However, there is a risk that an attempt to provide comprehensive information could also be perceived as mere posturing if the information is incomplete or unclear. In such cases, a party may even risk losing trust (cf. Toepfer 2008: 369; Palomba/Zhang/Hedlund 2024: 1–4).

A comparison of the two strategies makes it clear that they cannot exist independently of one another. Although – or perhaps precisely because – Töpfer speaks of an “honest and comprehensive” openness in the context of the offensive strategy, it remains to be determined in each individual case how much information is necessary to meet the criterion of “comprehensive”. In practice, organizations and individuals under pressure often share only the information that is likely to become public anyway through journalists or other outside actors (cf. Brown/Billings 2013: 75). One example from sport can be found in the Canterbury Bulldogs case. A proper example in sports is the case of the Canterbury Bulldogs. In the wake of the salary cap scandal, officials initially denied the allegations and communicated only the bare minimum to the public. When new facts became public, the club changed its communication strategy. The subsequent response thus occurred only under pressure from information that had already been published, rather than out of self-initiated transparency (cf. Bruce/Tini 2008: 111, Kurnal 2021: 46).

Communication Channels and Stakeholders During Crises

Today, nearly every organization in the professional sector conducts its own public relations activities to convey information to the outside world in a targeted manner and to actively shape its public image. This involves, among other things, providing the press with up-to-date information and keeping other external stakeholders informed about current events. The core tasks of these departments include issuing press releases, organizing and moderating press conferences, maintaining digital platforms such as websites and social media channels, and sending emails, for example, for regular newsletters (cf. Marini/Artusi/Rizzi 2023: 1). Thus, PR professionals have the dual task of monitoring public sentiment while simultaneously advising club leadership. Consequently, public relations, external communication via the press and social media, and internal communication are among the essential channels of communication in times of crisis (cf. Hutchins/Rowe 2014: 280).

In this context, it is important to clearly identify the parties with whom communication takes place. Especially in times of crisis, when external pressure to meet expectations is also a time-sensitive factor and an organization such as a sports club must act quickly, the various stakeholders must be provided with sufficient and satisfactory information in a timely manner. Professional sports organizations are influenced by various internal and external stakeholders, including the media, fans, commercial partners, politicians, and the general public (cf. Thormann 2024: 3).

- Sponsors: To ensure financial viability, the organization should keep them directly informed about the current situation. Teams in charge should also speak openly about reputational risks if it wants to keep the partnership stable (cf. Thormann 2024: 48–49).
- Media: The media serve as the primary external voice. It is crucial to present the facts consistently across all channels. Press statements prepared in advance can later provide valuable time to act (cf. Simpson 2024: 18; Himelboim 2010: 373).
- Fans: In large clubs, fans often constitute the largest stakeholder group. It is therefore important to engage with them with empathy and authenticity, emphasize shared values, take responsibility for mistakes, and explain planned measures in a transparent manner (cf. Simpson 2024: 4, Mamo/Tainsky/Babiak 2021: 147).
- Members/Management/Team: The goal here is to establish internal transparency. This can be achieved through regular status reports and by involving the workforce in preparatory measures (cf. Simpson 2024: 5).
- Authorities/Regulators: All steps must be taken within a legally sound framework. To this end, those responsible must observe compliance guidelines and adhere to deadlines and

other legal requirements. When dealing with authorities, it is often important to provide information early on to avoid potential sanctions (cf. Coombs 2007: 165).

Recommendations for Action on Prevention and Reputation Management in Sports

The discussion so far has shown that the scope for action available to affected parties facing a crisis is sometimes limited and dependent on numerous internal factors. It is significantly easier to take action when an organization is not under acute pressure. Depending on the assessment of the risk situation, it may make sense to take preventive measures to avoid a potential critical situation or at least minimize existing risks.

- (1.) An early assessment of potential risks can identify events that are highly likely to occur and have the potential to cause significant damage. In addition, organizations should monitor information generated and disseminated digitally that is produced not by the organization itself but by external actors. This includes, for example, public reporting or content circulating on social media.
- (2.) A prepared crisis plan with clearly defined responsibilities facilitates action in an emergency. This may include a crisis management team consisting of club leadership, the communications department, legal counsel, human resources, and, if necessary, technical departments to enable rapid coordination. In many clubs and organizations, it is also specified who speaks with external actors – such as the press and when (cf. Simpson/Manoli/Skey 2025: 10). Additionally, prepared statements and digital information sections on club websites can significantly shorten response times.
- (3.) Simulate crisis situations in advance, for example through emergency drills, media training, and realistic crisis scenarios. In this way, test procedures and practice communication routines. In sport, these measures can better prepare young or inexperienced staff for unpredictable reactions from fans, sponsors, or the media.
- (4.) An important area is the ongoing engagement of relevant stakeholders. The organization should not wait until a crisis arises. Include external stakeholders – such as fans, sponsors, the media, and associations – as well as internal groups, such as its own employees, in the ongoing communication. Press conferences, dialogue events, town hall meetings, and organized Q&A sessions build trust in the organization and make expectations clear at an early stage (cf. Sato et al. 2015: 437).

No matter how effective and rigorous preventive measures may be, crises – especially those caused by external factors – cannot always be avoided. In such cases, an organization or athlete must address the question of whether their reputation is at risk during such a phase. Well-organized reputation management can help prevent such damage or recover from an image loss that has already occurred (cf. Sato et al. 2015: 444). The following measures are recommended:

- (1.) Sporting success usually leads to a positive image. This is clearly demonstrated every week in the coaching world of professional soccer. If a coach loses the favor of the club or sponsors following a losing streak, renewed success can quickly change perceptions of that person. To stick with the example of coaches, acknowledging mistakes – along with credibly presented corrective measures – can also help restore a tarnished image.
- (2.) In addition to athletic performance, a club's image is often closely tied to outsiders' views of its leadership and to the perception of whether those in charge are fulfilling their duties responsibly. A well-positioned and well-connected leadership can therefore also regain lost trust.
- (3.) Building communities and fostering good relationships with fan groups or fan liaisons can help, during critical phases, to quickly restore a damaged image and avert further damage to the club's reputation (cf. Sato et al. 2015: 444).
- (4.) Even though we have previously noted that, depending on the degree of openness, proactive communication carries certain risks, it should generally have positive side effects. Constant interaction with the press and supporters – that is, the parties closest to the club – offers the opportunity, in the event of a crisis, to influence the information reaching the outside world and thus avoid or at least limit misinformation.

CONCLUSION

The study shows that crises can indeed be managed. The key factor is how an organization's environment is integrated into its own sports operations. Preventive measures are often the first step toward resolving a crisis. In the long term, it is important to return to normal operations after such a phase and avoid lasting damage to one's reputation.

REFERENCES

- AGINI, S., 2022. Novak Djokovic's sponsor Lacoste to 'review events' around Australian deportation. *Financial Times*, 17 January 2022. [viewed 22 April 2026]. Available from: <https://www.ft.com/content/1e437dd8-6de9-4a88-8b53-a4b-c52994b84>
- BROWN, N. A., 2014. *The Convergence of Situational Crisis Communication Theory and Social Media: Empirically Testing the Effectiveness of Sports Fan-Enacted Crisis Communication*. Dissertation. University of Alabama. Available from: <https://ir-api.ua.edu/api/core/bitstreams/a5c99a75-d4e0-4bce-9d98-7df22b00d75f/content>
- BROWN, N. A. and BILLINGS, A. C., 2013. Sports fans as crisis communicators on social media websites. *Public Relations Review*, vol. 39, issue 1, pp. 74–81. DOI: <https://doi.org/10.1016/j.pubrev.2012.09.012>
- BRUCE, T. and TINI, T., 2008. Unique crisis response strategies in sports public relations: Rugby league and the case for diversion. *Public Relations Review*, vol. 34, issue 2, pp. 108–115. DOI: <https://doi.org/10.1016/j.pubrev.2008.03.015>
- BRUHN, M., 2015. *Kommunikationspolitik: Systematischer Einsatz der Kommunikation für Unternehmen*. 8th revised ed. München: Verlag Franz Vahlen.
- COOMBS, W. T., 2007. Protecting organization reputations during a crisis: The development and application of situational crisis communication theory. *Corporate Reputation Review*, vol. 10, issue 3, pp. 163–176. DOI: <https://doi.org/10.1057/palgrave.crr.1550049>
- FIEDERER, S. and TERNÈS, A., 2017. *Effiziente Krisenkommunikation – transparent und authentisch: Mit zahlreichen Praxisbeispielen*. Wiesbaden: Springer Gabler.
- FISHER, M. T., 2012. *Religious Leaders in Crisis: An Analysis of Image Restoration Strategies and Content Variables*. Dissertation, no. 716. Available from: <https://aquila.usm.edu/dissertations/716>
- FRANDSEN, F. and JOHANSEN, W., 2007. The Apology of a Sports Icon: Crisis Communication and Apologetic Ethics. *HERMES – Journal of Language and Communication in Business*, vol. 20, issue 38, pp. 85–104. DOI: <https://doi.org/10.7146/hjlc.v20i38.25906>
- HIMELBOIM, I., 2010. The International Network Structure of News Media: An Analysis of Hyperlinks Usage in News Web Sites. *Journal of Broadcasting & Electronic Media*, vol. 54, issue 3, pp. 373–390. DOI: <https://doi.org/10.1080/08838151.2010.499050>
- HUTCHINS, B. and ROWE, D., 2010. Reconfiguring Media Sport for the Online World: An Inquiry Into “Sports News and Digital Media”. *International Journal of Communication*, vol. 4, pp. 696–718. Available from: <https://ijoc.org/index.php/ijoc/article/view/758>
- HUTCHINS, B. and ROWE, D., 2014. *Sport Beyond Television: The Internet, Digital Media and the Rise of Networked Media Sport*. London: Routledge. DOI: <https://doi.org/10.4324/9780203120415>
- JAFRI, F. and YAHYA, A. H., 2021. An Overview of Crisis Management, Decision-Making, and Sports Media Concept. *e-Journal of Media and Society (e-JOMS)*, vol. 4, issue 1, pp. 1–12. Available from: <https://ir.uitm.edu.my/id/eprint/46573>
- KITCHIN, P. J. and PURCELL, P. A., 2017. Examining sport communications practitioners' approaches to issues management and crisis response in Northern Ireland. *Public Relations Review*. DOI: <https://doi.org/10.1016/j.pubrev.2017.07.001>
- KOERBER, D. and ZABARA, N., 2017. Preventing damage: The psychology of crisis communication buffers in organized sports. *Public Relations Review*, vol. 43, pp. 193–200. DOI: <https://doi.org/10.1016/j.pubrev.2016.12.002>
- KURNAL, J., 2021. Image Restoration Theory: Analysis of Polish Deputy Prime Minister's Tweets in Response to Postponed Polish Presidential Election in 2020. *International Journal of International Relations, Media and Mass Communication Studies*, vol. 7, issue 3, pp. 35–59. DOI: <https://doi.org/10.37745/ijirmmcs.15>
- MAMO, E., TAINSKY, S. and BABIAK, K., 2021. Types of CSR Initiatives and Fans' Social Outcomes: The Case of Professional Sport Organizations. *Sport Marketing Quarterly*, vol. 30, pp. 146–160. DOI: <https://doi.org/10.32731/SMQ.302.062021.06>
- MANOLI, A. E. and ANAGNOSTOU, M., 2023. Operational crisis communication management: A content analysis of FIFA's communication during Covid-19. *Sport Management Review*, vol. 26, issue 2, pp. 293–314. DOI: <https://doi.org/10.1080/14413523.2022.2059992>

- MARINI, D., ARTUSI, A. and RIZZI, A., 2003. Il problema della rappresentazione di una immagine nell'ambito dei beni culturali. In: ROSSI, M. and SALONIA, P. (eds.). *La comunicazione multimediale per i beni culturali*, pp. 221–238. Milano: Addison-Wesley.
- PALOMBA, L., ZHANG, J. and HEDLUND, D., 2024. Order of passive and interactive sports consumption and its influences on consumer emotions and sports gambling. *The Sport Journal*, pp. 1–13. Available from: <https://thesportjournal.org/article/order-of-passive-and-interactive-sports-consumption-and-its-influences-on-consumer-emotions-and-sports-gambling/>
- PANKSEPP, J., WRIGHT, J. S., DÖBRÖSSY, M. D., SCHLAEPFER, T. E. and COENEN, V. A., 2014. Affective Neuroscience Strategies for Understanding and Treating Depression: From Preclinical Models to Three Novel Therapeutics. *Clinical Psychological Science*, vol. 2, issue 4, pp. 472–494. DOI: <https://doi.org/10.1177/2167702614535913>
- SATO, S., KO, Y. J., PARK, C. and TAO, W., 2015. Athlete reputational crisis and consumer evaluation. *European Sport Management Quarterly*, vol. 15, issue 4, pp. 434–453. DOI: <https://doi.org/10.1080/16184742.2015.1065895>
- SIMPSON, B., 2024. *The Crisis Communication for Professional Sport (CCPS) Framework: An Analysis of Stakeholder Communication During the European Super League Crisis*. Thesis. Loughborough University. DOI: <https://doi.org/10.26174/thesis.lboro.27868737.v1>
- SIMPSON, B. S. C., MANOLI, A. E. and SKEY, M., 2025. A new approach to understanding crisis communication in sport: A news media analysis of the European Super League crisis. *European Sport Management Quarterly*. DOI: <https://doi.org/10.1080/16184742.2025.2542354>
- THORMANN, J., 2024. *Stakeholder Perspectives on Corporate Social Responsibility and Environmental Sustainability in Professional Sport*. Dissertation. Available from: https://pub.uni-bielefeld.de/download/3002478/3002479/Dissertation_Thormann_UB.pdf
- TOEPFER, A., 2008. Krisenkommunikation. In: MECKEL, M. and SCHMID, B. F. (eds.). *Unternehmenskommunikation: Kommunikationsmanagement aus Sicht der Unternehmensführung*. 2nd ed., pp. 355–402. Wiesbaden.
- WANG, N. and JIANG, Y., 2021. Legacy of the Tokyo 2020 Summer Olympic Games. *The Innovation*, vol. 2, issue 4, 100178. DOI: <https://doi.org/10.1016/j.xinn.2021.100178>

КРИЗИСНА КОМУНИКАЦИЯ И УПРАВЛЕНИЕ НА РЕПУТАЦИЯТА В ДИГИТАЛНА СПОРТНА СРЕДА

Резюме: Спортът е дълбоко вкоренена част от нашето общество, която се характеризира с висока степен на емоционална ангажираност както сред активните, така и сред пасивните заинтересовани страни. Особено когато дейността на даден клуб се следи от голяма група фенове, общественото мнение може да се промени драстично в много кратък срок в зависимост от успеха или провала. От съществено значение е тези промени да се управляват по подходящ начин чрез разумна комуникационна стратегия. Целта на настоящата статия е да обобщи основните аспекти на кризисната комуникация и по този начин да разработи подходи за превенция и управление на репутацията. Статията се основава на изчерпателен преглед на литературата. В нея се оценяват съществуващите теоретични подходи, както и допълнителни емпирични наблюдения. Основен акцент е ролята на заинтересованите страни. Резултатите показват как навременното прилагане на превантивни мерки може да помогне за предотвратяване на потенциални кризи или да гарантира, че даден клуб е добре подготвен за кризисна ситуация. Същевременно става ясно какъв принос може да има добре организираното управление на репутацията за ограничаване на потенциалните щети и възстановяване на доверието.

Ключови думи: кризисна комуникация; управление на репутацията; спортна комуникация; дигитални медийни среди; комуникация със заинтересованите страни

Андреас Фиксемер, докторант
Университет по библиотекознание и информационни технологии
София, България
E-mail: andreas.fixemer@bearingpoint.com

ОБЩЕСТВЕНИ КОМУНИКАЦИИ И ИНФОРМАЦИОННИ НАУКИ
PUBLIC COMMUNICATIONS AND INFORMATION SCIENCES

**DESIGN-ORIENTED RESEARCH AS A METHOD FOR THE DEVELOPMENT
OF PROCESS-ORIENTED INFORMATION MANAGEMENT SYSTEMS**

Andreas Kunz

University of Library Studies and Information Technologies

<https://doi.org/10.70300/GTWK6583>

Abstract: *This paper examines the suitability of Design Science Research (DSR) as a methodological framework for the development of process-oriented information management systems (PIMS) for the analysis, evaluation and design of industrial processes. The starting point is the assumption that the conventional standard methods used in practice for the development of information management systems (IMS) do not meet scientific requirements regarding systematicity and transferability. The study shows that DSR is particularly well-suited as a scientific framework for the systematic development of PIMS. To this end, a DSR-oriented approach is described that combines top-down decomposition and bottom-up specification, whilst systematically integrating system boundaries, constraints, influencing factors and target variables. PIMS enable the capture of industrial processes, the process-oriented structuring of data, and the generation of synthetic data. This allows for a reduction in operational trials and a shortening of innovation cycles. Triangulated validation based on literature findings and model studies further strengthens the traceability, validity and transferability of the developed solution.*

Keywords: *Design Science Research; Process Modulation; Information Management Systems; Synthetic Data; Validation*

INTRODUCTION

In an increasingly dynamic economic world, companies are faced with rising demands for efficiency, quality, flexibility and sustainability. To remain competitive, they must continuously optimize their industrial processes. The systematic analysis and evaluation of technical processes is therefore becoming increasingly important. Particularly in the case of complex industrial processes, it is necessary to capture, link and evaluate relevant information in a structured manner. Process-oriented information management systems (PIMS) offer a suitable approach for this, as they map industrial processes in their essential contexts and enable the systematic consideration of relevant influencing factors (cf. Biethahn et al. 2004, p. 18). In daily industrial practice, however, the development of such systems is often based on established standard methods, such as VDI 5600. According to Kletti (2015, p. 27), these standardized or experience-based methods are primarily geared towards practical application. Although these approaches generally yield good, practical solutions, from a scientific perspective, they exhibit shortcomings in terms of methodological rigor, traceability and general transferability. This is particularly true when complex process relationships need to be modelled, different influencing factors have to be integrated, and robust statements regarding the effects of process changes are required. Against this background, the research question arises as to what extent Design Science Research (DSR) is suitable as a scientifically sound methodological framework for the development of PIMS in a systematic, traceable and transferable manner. DSR aims to systematically develop artefacts relevant to practice and evaluate them under scientifically sound conditions. This approach combines scientific knowledge acquisition and application orientation in a unique way and therefore appears suitable for both providing a methodological foundation for the development of PIMS and meeting the requirements of industrial practice. This paper examines the suitability of the DSR approach for the development of PIMS for the analysis, evaluation and optimization of industrial processes. At its core is a DSR-based approach that combines a top-down decomposition of complex processes with a bottom-up specification, whilst systematically taking into account system boundaries, boundary conditions, influencing factors and target variables.

The aim of this paper is to present a methodologically robust development framework for PIMS and thereby contribute to the scientific foundation of their design and application in an industrial context.

RESEARCH METHODOLOGY

Methodologically, the work is based on two interlinked components. Firstly, a qualitative literature review is conducted to establish the theoretical foundations of key terms such as information management, information management systems, PIMS and DSR, as well as to identify established concepts of system modelling, evaluation and validation. Secondly, field observations are used to identify practice-relevant requirements for the structuring of industrial processes, the definition of system boundaries and the consideration of influencing factors. By linking these two components, the suitability of DSR as a methodological framework for the development of PIMS is to be established.

RESULTS

Information management and information management systems

According to Krcmar, information management (IM) aims to “make the best possible use of information as a resource in line with the organization’s objectives” (cf. Krcmar 2015, p. 10). Biethahn et al. (2004, pp. 25–26) describe information management as “the systematic, method-driven planning, steering, monitoring and management of all information-related activities”. This also includes the collection, recording, processing, storage and provision of information, as well as the design of the organizational structures required for this (cf. Biethahn et al. 2004, p.28). No uniform definition of the term ‘information management system’ (IMS) could be found in the relevant specialist literature. Biethahn et al. (2004, p. 10) define it as “a system for meeting all relevant information needs, particularly within the context of operational decision-making processes” (Biethahn et al. 2004, p. 10).

Heinrich, Riedl and Stelzer (2014, pp. 4–7) also do not provide a straightforward definition, but make it clear that information systems can perform both technical and organizational functions. They support IM by structuring information flows and automating certain tasks. The terms IM and IMS are closely interlinked; consequently, a clear distinction between the two terms often appears neither feasible nor meaningful in practice. Whilst traditional IMS ensure the supply of information, PIMS are geared towards supporting all operational processes along the value chain. The focus here is on the systematic recording, analysis and optimization of manufacturing processes based on integrated and process-oriented information flows. PIMS enable a holistic view of processes and their interdependencies by consolidating information from various sources and making it available in a process-oriented manner. These systems can be adapted to specific process requirements and support change through dynamic modelling.

A key feature is the use of synthetic data, which can be generated through model-based simulation without affecting operational activities. This ensures that updated information is available at an early stage and forms the basis for well-founded, data-driven decisions. PIMS thus enable detailed analyses and evaluations of changes to industrial processes and are, therefore, an essential component of process optimization. Particularly where processes consist of modularly structured processes and sub-processes, an inadequately integrated IM frequently leads to inconsistencies. Data is stored in silos, key performance indicators are interpreted without regard to system boundaries, and whilst optimization measures may have a local effect, they sometimes impair the overall system. PIMS address this gap by not only collecting or managing information, but also consistently embedding it within a process-oriented context, thereby enabling a holistic view of partial and sub-processes. Their central task is to analyze the effects of changes in process variables in a targeted manner and to simulate different scenarios.

A key factor in the successful implementation of a PIMS is consistent process structuring. The foundation for this is provided by a combination of top-down and bottom-up approaches, with the system approach serving as the methodological backbone. Target variables are defined as measur-

able, process-relevant parameters that are influenced by input variables and are to be maintained or adjusted through control within a defined framework. They serve as a reference for evaluating system performance. The illustration in Figure 1 depicts a conveyor belt process and simultaneously demonstrates why the process-oriented perspective is of central importance. Electrical energy acts as an input variable, belt transport as a target variable, whilst waste heat generated by friction acts as an output variable. Furthermore, the kinetic energy of the belt movement can in turn act as an input variable for downstream processes. This simple example alone demonstrates that process variables cannot be interpreted in isolation, but occur in chains and feedback loops that must be visualized and accounted for within a PIMS. For more complex systems, the system approach developed by Biethahn, Mucksch and Ruf (2004, pp. 25–26), which views the overall system as the interplay of various partial processes and their mutual relationships. Processes whose further decomposition yields no new insights are defined as sub-processes. Of particular importance here are the interfaces between partial and sub-processes, as they determine the nature of the interaction, whether substance-related or informational, and influence the boundary conditions of the process structure. Following this logic, partial and sub-processes with a significant influence on the overall system should be treated as essential partial processes and given priority. They may be aggregated for the sake of simplicity in the analysis, provided that no relevant causal relationships are lost in the process.

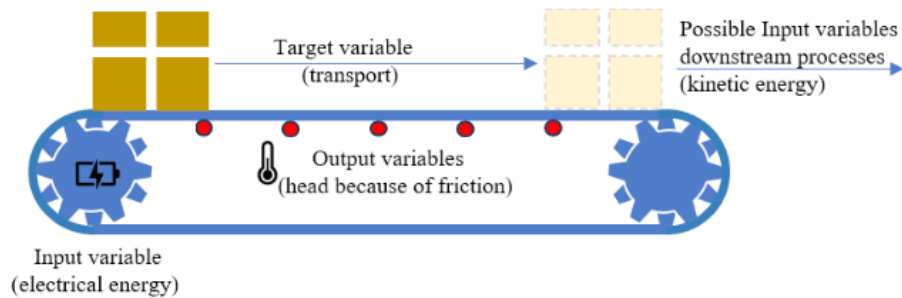


Fig. 1. Conveyor belt process for illustrative purposes (source: own illustration)

To ensure that PIMS do not become “unrealistic models”, a precise system definition is required. Terms such as boundary conditions, constraints, influencing factors and system boundaries, which are frequently used in information and control engineering, must therefore be clearly defined in the context of the selected process for the PIMS. Boundary conditions are to be understood as specifications or constraints that significantly influence the execution of a process or the design of a system. Typical boundary conditions are technical parameters such as temperature ranges, cycle times or physical system boundaries. Compliance with these is generally a prerequisite for a system to achieve its objectives. Influencing factors, by contrast, are described as dynamic variables that alter internal or external variables and can affect or modulate the process. Unlike static boundary conditions, they can change in response to alterations in the process flow, which is why a clear distinction between and consideration of both elements is essential for modelling and evaluation within the framework of a PIMS. Finally, system boundaries define the transition between the system under consideration and its environment, and determine which sub-processes, objects or data flows within the overall process are taken into account or are considered external influences. The targeted selection of system boundaries is regarded as a prerequisite for the transparency and consistency of process-oriented information management systems.

The conveyor belt example in Figure 1 also illustrates the practical significance of this distinction. Technical specifications of the drive motors may define a speed range as a boundary condition, whilst safety requirements without protective devices further restrict usage within this boundary condition as an influencing factor. The system under consideration comprises internal components such as motors, control systems, sensors, power supply and waste heat, whilst external elements such as material supply or onward transport lie outside the system boundary. For PIMS,

this results in the clear design requirement that the artefact must not only map process variables but also explicitly indicate which boundaries, boundary conditions and influencing factors apply, as otherwise simulations and evaluations cannot be interpreted and the risk of drawing incorrect conclusions increases.

Another key component of PIMS is the ability to generate synthetic data and thereby expand decision-making scope without necessarily having to carry out real operational trials immediately. The framework states that a PIMS developed using top-down and bottom-up approaches can serve as the basis for generating synthetic data. Synthetic data is also referred to as surrogate data and is generally not produced by measurement, but as the result of an algorithmic generation process. One way to generate synthetic data is through the targeted modification of existing data. The conveyor belt shown in Figure 1 can once again be used to illustrate this. A certain amount of electrical energy is required to move a mass from point A to point B. If additional or heavier packages are added, the energy requirement increases, and the mass being moved thus becomes a significant factor directly linked to energy consumption. It is precisely here that the added value of a PIMS becomes apparent compared to a purely physical analysis. Because although the laws of physics are well known, practical decisions (e.g. package sizes, load cases, operating modes) cannot be derived from physics alone. Rather, they require process-related analyses that take into account boundary conditions such as motor characteristics, friction coefficients and material properties in order to be able to model non-linear behavior as well. A PIMS does not necessarily have to be designed as a comprehensive software platform. A diagram comparing the motor characteristic curve and mass-dependent friction, and interpreting the overlap region as the optimal process range, already provides synthetic information about the load ranges within which the process can be considered optimal. At the same time, it can be deduced from this whether friction reduction or motor optimisation promises greater energy savings.

The Design Sciences Research Method

The Design Sciences Research (DSR) method, or the Design Sciences paradigm, as Hevner sometimes refers to DSR in his publications, has its origins in engineering (Hevner et al. 2004, p.76). According to Hevner et al. (2004, p. 76), DSR is a fundamental problem-solving paradigm that aims to create innovations, also referred to as an outcome or artefact. A deliberately designed and evaluable outcome that solves a specific problem whilst generating transferable design knowledge. According to Hevner et al. (2004, p. 76), ideas, practices, technical skills and products that enable the analysis, implementation, management and use of information systems to be carried out effectively and efficiently can also constitute artefacts. However, Hever et al. (2004, p. 76) explicitly point out that such artefacts are not exempt from the laws of nature. “Creation must always be based on existing core theories, which are applied, modified and expanded through the researchers’ experience, creativity, intuition and problem-solving skills” (Hever et al. 2004, p. 76). Weber, in particular, points out that the Design Sciences Research method is particularly suited to applied technical tasks, as this research approach combines practical utility with scientific rigor (Weber 2022, p. 102). Thus, the method of Design-oriented research, as described by Weber (2022, pp. 101–114), Benner-Wickner, Kneuper, Schlömer (2020, pp. 1–10), Hevner, Park, March, Ram (2004, pp. 75–105), and Österle, Becker, Frank, and Hess (2004, pp. 1–11), could represent a possible approach to the development of a PIMS. Hevner et al. (2004, pp. 101–114) first established guiding principles for the proper use of DSR in their paper “Design Sciences Research in Information Systems Research”. Österle et al. (2010, pp. 1–11) recommend the four-stage knowledge process shown in Figure 2 for application-oriented research.

The **analysis process** focuses on the systematic investigation of a practical problem and its application context in order to derive relevant requirements for the development of a suitable artefact.

The **design process**, which builds on this, comprises the targeted conception and development of this artefact based on the identified problem and the derived requirements.

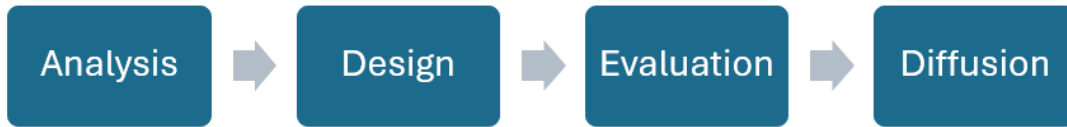


Fig. 2. Four-stage process according to Österle et al. (2010: 1–11), own illustration

The **evaluation process** then serves to systematically assess the developed artefact in terms of its suitability, effectiveness and achievement of objectives within the respective application context.

Finally, the **diffusion process** describes the preparation, communication and dissemination of the findings obtained, as well as the developed artefact, to relevant stakeholders in academia and practice.

Benner-Wickner et al. (2020, pp. 1–10) combine the guideline-based approach of Hevner et al. (2020, pp. 1–11) with the four-phase knowledge-generation process of Österle et al. (2020, pp. 1–11) and reinterpret both approaches, particularly in the context of applied research projects. The guiding principles further developed on this basis are summarised in Table 1 and classified with regard to the development of a PIMS.

Table 1. Guiding principles of Hevner et al. (2004, pp. 101–114) interpreted by Benner-Wickner et al. (2010, pp. 1–11), (own representation)

General guiding principles for DSR	Guiding principles relevant to the development of a PIMS
“Artefact design: DSR aims to produce a tangible result (artefact) and must achieve practical utility. This can be a method, a model or a product (Benner-Wickner et al. 2020, p. 5)”.	The PIMS itself is the artefact.
“Problem relevance: The result must solve an existing and current practical problem (Benner-Wickner et al. 2020, p. 5)”	Process changes or process optimisations to be investigated, for example, by using synthetic data
“Design evaluation: Whether the result solves the problem must be evaluated methodologically (Benner-Wickner et al. 2020, p. 5)”.	The literature describes various evaluation methods. In industrial engineering, case-based evaluation methods are frequently used, but these must meet the requirements of scientific quality criteria.
Research contributions: “In addition to solving the practical problem through the artefact, a contribution of general validity must also be made (Benner-Wickner et al. 2020, p. 5)”.	For PIMS, this implies that research hypotheses should be formulated as generally as possible and should not have a direct reference to a specific case study, unless this has relevance beyond the individual case.
Research rigor: When developing and evaluating the results, established methods from the literature must be applied correctly. Deviations from this are permissible if the deviation itself is the subject of the contribution (Benner-Wickner et al. 2020, p. 5).	For the development of a PIMS, this means that development and evaluation must be based on established methods from the literature. Deviations are only permissible if they are justified and themselves make a scientific contribution.
“Design as an optimization problem: Using Design Science Research, the result is developed incrementally in the search for the ‘perfect’ solution that meets all the framework conditions (Benner-Wickner et al. 2020, p.5)”.	The PIMS to be developed must be designed to be modular and expandable, so that new sub-processes can be integrated and existing ones re-evaluated in the event of changed boundary conditions.
“Publication suitability: The research contribution must be made accessible to the specialist audience (Benner-Wickner et al. 2020, p. 5)”.	As with any scientific work, publications are a mandatory component.

It is clear that both the general design principles of the DSR and the four-phase knowledge process can be applied to the development of a PIMS. Against this background, the DSR, as described by Benner-Wickner et al. (2020, pp. 1–10), can be regarded as a suitable methodological

framework for the development of a PIMS. The underlying logic of DSR corresponds to the central requirements of PIMS, such as the systematic structuring of complex problems, the goal-oriented design of an application-oriented artefact, its iterative further development, and the transparent evaluation of its effectiveness. DSR would thus enable a practice-oriented and, at the same time, scientifically sound conception of PIMS development.

Application of DSR to the development of a PIMS

If the four-phase DSR process, as shown in Figure 2, is applied to the development of a PIMS, a clearly structured procedural logic emerges. In the analysis phase, the PIMS to be developed is first situated as an artefact within the overall context of the development task. This involves identifying the underlying practical problem, assessing the state of the art, justifying the scientific and practical relevance, and defining the research object, research subject, and research aim. In addition, research hypotheses are formulated to ensure the traceability and subsequent verifiability of the research success. A further focus of the analysis phase is the establishment of a robust knowledge base. This comprises, on the one hand, the theoretical foundations of PIMS and, on the other hand, the subject-specific theoretical prerequisites of the use case. On this basis, key requirements for the PIMS are derived, particularly with regard to features, components, possible applications, boundary conditions, influencing factors, and input, output, and target variables of the relevant sub-processes. The analysis phase thus serves the function of both systematically structuring the problem domain and creating the conceptual prerequisites for the subsequent design of the artefact.

The design phase serves the systematic development of the PIMS as a solution-oriented artefact. In accordance with the DSR approach, the design does not take place in isolation, but is based on the requirements derived from the analysis and the results of the preceding literature review from the analysis phase. Methodologically, a top-down approach is combined with a bottom-up approach. First, the overall process is broken down into its essential partial processes in order to identify structural elements, interfaces and process-determining factors. Subsequently, the identified partial processes are gradually recombined into a consistent overall system. This development process involves identifying the essential partial processes, determining their boundary conditions, and evaluating and balancing them. The successive integration of the partial processes results in a quantifiable overall process that constitutes the actual PIMS. A key feature is that the system is not limited to the mere management of existing information, but, through the model-based linking of process-relevant variables, also enables the generation of synthetic data, thereby creating a basis for simulation, comparison and decision support.

The artefact design phase is followed by the evaluation phase, during which it is assessed whether the developed PIMS is suitable for addressing the identified practical problem in a methodologically sound manner. This phase of PIMS development may include, amongst other things, literature reviews, model studies, the actual creation of the PIMS, and its validation. In this phase, a relevant literature review no longer serves to build a general knowledge base, but rather to provide a sound basis of data and findings for the evaluation. This can be supplemented by model studies, which can be used to analyze selected aspects of the process under consideration in particular. The findings obtained from the literature review and model analyses are then integrated into the overall system to verify the validity of the PIMS.

Validation is hypothesis-driven and takes into account limiting and influencing factors. In this context, validation can be designed using a triangulation approach, whereby different sources of knowledge are systematically brought together and compared with one another. This ensures that the validity of the PIMS is not assessed from a single perspective, but is verified on the basis of several complementary approaches. In this way, it is examined whether the artefact allows for robust statements regarding the effects of process changes and thus meets the requirements of a scientifically sound and practically usable PIMS.

Finally, in the diffusion phase, consideration is given to the extent to which the research aim has been achieved, what further questions arise from the results, and what scientific and practical benefits the developed PIMS offers. This involves a critical assessment of the system both in the context of the specific case study and with regard to its transferability to other industrial process-

es. The result of the work is thus not merely an information system limited to a single case, but a referenceable model that can serve as a methodological basis for the development of further PIMS. In this sense, the diffusion phase fulfils the task of making the research contribution visible beyond the immediate application context and highlighting the relevance of the developed artefact for science and practice.

CONCLUSIONS/DISCUSSION

If the structure and logic of the PIMS, as well as the rigorous approach of the DSR, are consistently followed, the DSR proves to be a methodologically suitable approach. This is particularly true as PIMS are not merely technical systems, but also perform organizational and decision-support functions. In contrast to non-process-oriented information management systems, which primarily serve to provide and manage information, PIMS specifically focus on process knowledge in order to analyze, evaluate and further develop complex industrial processes. In this respect, they are particularly concordant with the fundamental principle of DSR, according to which scientifically sound and at the same time practically relevant artefacts are developed to solve specific problems. A further key argument for the particular suitability of DSR lies in the fact that PIMS cannot be understood as purely technical applications, but rather as designed artefacts in which models, data structures, process logic, and decision-making mechanisms are systematically brought together. It is precisely this combination of design, application, and scientific reflection that aligns with the philosophy of DSR. The strength of the top-down and bottom-up approaches becomes clearly evident when applying the DSR approach to the development of a PIMS. The systematic decomposition of the overall process into relevant partial and sub-processes serves to enable the bottom-up approach to integrate real data, process variables and dependencies. It is only by combining both perspectives that a PIMS can realistically map the process logic and actual information flows of industrial systems. This iterative combination of theoretical modelling and practical design is characteristic of DSR in particular. The strength of PIMS is most evident in modularly structured process chains, in which technical, economic and organizational factors, among others, can be considered together. Here, PIMS enable a holistic analysis of process interrelationships as well as the use of synthetic data to investigate scenarios, conflicting objectives and the effects of change. In doing so, they provide a basis for well-founded decisions without relying on costly or high-risk real-world experiments. Precisely because DSR is geared towards the development of problem-oriented and application-specific artefacts, this research approach offers a particularly suitable framework for the development of such systems. Furthermore, DSR focuses not only on the design but also on the systematic evaluation of the artefact. This is of central importance for PIMS, as their scientific and practical viability depends significantly on the quality of the data basis, the validity of the underlying models, and the transparent consideration of system boundaries and influencing factors. Triangulation, in which, in particular, findings from the literature, model investigations and integrated system evaluations are systematically linked, corresponds to the DSR concept of a methodologically sound artefact evaluation. In this way, it is possible to rigorously verify whether the developed PIMS enables reliable statements about process changes and thus meets both scientific and practical requirements.

Overall, it becomes clear that DSR is not merely a viable but a particularly well-suited methodological framework for the development of PIMS. The strengths of DSR lie precisely in that combination of problem-solving, artefact design, scientific grounding and systematic evaluation which is constitutive of PIMS. PIMS can therefore be developed not only meaningfully but also particularly consistently within the framework of Design-oriented research. DSR should even be regarded as the ideal methodological approach for structuring PIMS, validating them in a transparent manner, and making them scientifically transferable beyond individual cases.

REFERENCES

BENNER-WICKENER, M., KNEUPER, R. and SCHLOEMER, I., 2020. Available from: HYPERLINK „<https://hdl.handle.net/10419/229136>“ \t „_new“ <https://hdl.handle.net/10419/229136>

- BIETHAHN, J., MUCKSCH, H. and RUF, W., 2004. *Holistic Information Management. Volume I: Fundamentals*. 6th ed. Munich: Oldenbourg Wissenschaftsverlag GmbH.
- HEINRICH, L., RIEDL, R. and STELZER, D., 2014. *Information Management: Fundamentals, Tasks, Methods*. Munich: Oldenbourg Wissenschaftsverlag GmbH.
- HEVNER, A. R., MARCH, S. T., PARK, J. and RAM, S., 2004. Design Science in Information Systems Research. *Management Information Systems Quarterly*, vol. 28, pp. 75–105. Available from: HYPERLINK „https://www.researchgate.net/publication/201168946_Design_Science_in_Information_Systems_Research“ \t „_new“ https://www.researchgate.net/publication/201168946_Design_Science_in_Information_Systems_Research
- KLETTI, J., 2015. *MES – Modern Information Technology Supports Value Creation*. Berlin; Heidelberg: Springer Verlag.
- KRCMAR, H., 2015. *Introduction to Information Management*. Berlin; Heidelberg: Springer Gabler.
- OESTERLE, H., BECKER, J., FRANK, U. and HESS, T., 2010. Memorandum on design-oriented business informatics. *Schmalenbach Journal of Business Research*, vol. 62, issue 6, pp. 664–672. DOI: HYPERLINK „<https://doi.org/10.1007/BF03372838>“ \t „_new“ <https://doi.org/10.1007/BF03372838>
- WEBER, I., 2022. Design Science Research as a scientific approach for final-year projects with a design brief in application-oriented degree programmes. In: *AKWI Conference Proceedings of the 35th AKWI Annual Conference*, pp. 101–116. DOI: https://doi.org/10.30844/AKWI_2022_7

ДИЗАЙН ОРИЕНТИРАНИ ИЗСЛЕДВАНИЯ КАТО МЕТОДОЛОГИЧЕСКА РАМКА ЗА РАЗРАБОТВАНЕ НА ПРОЦЕСНО ОРИЕНТИРАНИ СИСТЕМИ ЗА УПРАВЛЕНИЕ НА ИНФОРМАЦИЯТА

Резюме: В тази статия се разглежда приложимостта на Design Science Research (DSR) като методологична рамка за разработване на процесно ориентирани системи за управление на информацията (PIMS) за анализ, оценка и проектиране на индустриални процеси. Изходна точка е предположението, че конвенционалните методи, използвани в практиката за разработване на системи за управление на информацията (IMS), отговарят само в ограничена степен на научните изисквания по отношение на систематичността и приложимостта. Изследването показва, че DSR като научна рамка е особено подходяща за систематичното разработване на PIMS. За тази цел се описва подход, ориентиран към DSR, който комбинира разлагане от горе надолу и конкретизиране от долу нагоре, както и систематично интегрира системни граници, гранични условия, влияещи фактори и целеви величини. Разработените PIMS позволяват регистрирането на индустриални процеси, процесно ориентираното структуриране на данни, както и генерирането на синтетични данни. Така могат да се намалят експлоатационните изпитания и да се съкратят иновационните цикли. Триангулативната валидация въз основа на литературни данни и моделирани изследвания допълнително укрепва проследимостта, информативната стойност и приложимостта на разработеното решение.

Ключови думи: изследвания в областта на науката за проектирането; модулиране на процесите; системи за управление на информацията; синтетични данни; валидиране

Андреас Кунц, докторант
Университет по библиотекознание и информационни технологии
Researcher ID (0009-0001-5851-5328)
E-mail: a.kunz@si-coatings.com

ОБЩЕСТВЕНИ КОМУНИКАЦИИ И ИНФОРМАЦИОННИ НАУКИ
PUBLIC COMMUNICATIONS AND INFORMATION SCIENCES

**ROLE OF LEADERSHIP IN IMPLEMENTING CORPORATE PURPOSE:
CONCEPTUAL FOUNDATIONS AND PRACTICAL IMPLICATIONS**

Antonia Zedler

University of Library Studies and Information Technologies

<https://doi.org/10.70300/WLRG8681>

Abstract: *This paper examines the role of leaders in the implementation of corporate purpose in organisations. Corporate purpose describes a specific goal that goes beyond mere profit maximization. The results show that the personal vision and values of the leader are crucial for authentically anchoring the purpose. Transformational leadership strengthens the moral motivation of employees and increases their commitment. Ambidextrous leadership flexibly combines open and closed leadership styles to combine innovation and efficient implementation. Structured change management based on Lewin's model supports necessary behavioral changes and institutionalizes the purpose. Effective stakeholder management integrates external expectations and strengthens the legitimacy of the purpose. Finally, a value-based corporate culture promotes long-term identification and commitment. The analysis shows that implementing corporate purpose requires a combination of appropriate leadership styles, change management and a purpose-oriented culture; further research is needed to clarify the specific requirements and effects of different leadership approaches.*

Keywords: *Corporate Purpose; Leadership; Transformational Leadership; Ambidextrous Leadership; Leadership Roles*

INTRODUCTION

The simmering Middle East conflict, the global financial crisis of 2008/2009, the Volkswagen diesel scandal, climate change, the COVID-19 pandemic and the war in Ukraine are just a few examples of global crises that have shaped the last two decades. Each of these crises illustrates how profoundly political, economic and ecological upheavals are changing the global landscape. In such times of upheaval, trust, both between individuals and within economic systems, is severely shaken. As a result, organizations tend to act as consumers of trust rather than generators of it (Hollensbe et al. 2014, p. 1227). Against this backdrop, corporate purpose emerges as a concept that has the potential to redefine the scope and scope of organizational activities (Hollensbe et al. 2014, p. 1228).

It has been acknowledged that corporate purpose has gained general interest in the general environment of serious global crises over the last couple of years (Tafuro and Piccaluga 2025, p. 1). The need for the conceptualization of corporate purpose was identified and followed by several studies on how corporate purpose can best be described and what its relationship is to other organizational concepts, such as mission and vision. Tafuro and Piccaluga identified that this research still lacks an understanding of how corporate purpose becomes effective in practice (Tafuro and Piccaluga 2025, p. 4).

Leaders play a critical role in implementing corporate purpose daily. However, to date, there has been little research into the role they play. This paper, therefore, examines the role leaders can play in implementing corporate purpose.

RESEARCH METHODOLOGY

The paper follows an integrative review to examine the role of leadership in implementing corporate purpose from different perspectives. This approach allows the inclusion of empirical studies as well as conceptual contributions and practice-oriented literature.

The literature search was conducted in relevant scientific databases such as *Scopus*, *Web of*

Science and *Google Scholar*. Keywords such as *corporate purpose*, *leadership*, *transformational leadership*, *ambidextrous leadership*, *change management*, *stakeholder management* and *organizational culture* were used. In addition, key theoretical works and practical publications were taken into account in order to create as comprehensive a picture as possible.

The literature was analyzed using qualitative content analysis. The focus was on identifying recurring subjects and conceptual overlaps between corporate purpose and various contemporary leadership approaches. In addition, contributions on change management, stakeholder management, and corporate culture were included to highlight the organizational framework conditions and practical implications.

In this way, the integrative review enables a link between theoretical foundations and practical concepts, which contributes both to the further development of scientific discourse and to the derivation of recommendations for action for leaders.

RESULTS

Corporate Purpose – Definition and Distinction

Historically, the purpose of organizations was centered towards profit maximization, particularly during the peak of the doctrine of maximizing shareholder value (Slintak and Dvorsky 2019, p. 16). Only in the last twenty years, the focus of purpose discussions moved towards creating a social value while maintaining a competitive advantage (Bratianu and Balanescu 2008, p. 19),

In recent years, loads of different interpretations of corporate purpose have been developed (Hurth, Ebert and Prabhu 2018, p. 7). Tafuro and Piccaluga acknowledged that the abstract nature of the concept of corporate purpose makes it difficult to define, but at the same time pointed out the need for conceptualizing corporate purpose (Tafuro and Piccaluga 2025, p. 1). The diversity of definitions in recent years has led to the identification of three main perspectives in approaches to corporate purpose (Tafuro and Piccaluga 2025, p. 2).

The first perspective considers the corporate purpose within the boundaries of the organization. From this point of view, the corporate purpose acts as a guiding force that provides orientation and directs the organization's actions, while at the same time ensuring strategic alignment. Alternatively, this perspective focuses primarily on the impact of corporate purpose on organizational viability. The second perspective extends the corporate purpose beyond the boundaries of the organization and highlights its social impact. It challenges the priority of profit maximization and instead favors solutions that align corporate goals with broader social progress. The third perspective positions the corporate purpose in relation to the common good. Furthermore, from this perspective, the organization could serve as a change agent to address global challenges (Tafuro and Piccaluga 2025, p. 3).

The analysis by Tafuro and Piccaluga shows the extent to which research on corporate purpose has now progressed. As a uniform definition remains largely open, the following paper follows the definition by Henderson and van den Steen: “a concrete goal or objective for the firm that reaches beyond profit maximization“ (Henderson and van den Steen 2015, p. 327).

The recent research of Tafuro and Piccaluga clearly shows that corporate purpose has evolved from a purely economic model. Therefore, purpose cannot be anchored solely at the level of strategies, but it must be lived and communicated, which is where leadership needs to take over. Leaders are crucial in determining whether a corporate purpose becomes effective, whether through communicating goals, balancing short-term economic requirements with long-term social goals, or shaping a corporate culture that supports its purpose.

Against this backdrop, the following section focuses on the role of leadership. It examines key leadership concepts and approaches, such as transformational and ambidextrous leadership, change management, stakeholder management, and corporate culture, to show how leadership enables and shapes the implementation of corporate purpose.

Leadership – Definition and Distinction

Leadership fundamentally affects everyone in an organization, and anyone who positively influences the behavior of others is in a leadership position (Hinterhuber, Renzl and Werner 2012,

pp. 258–259). Today, there is an ongoing controversy regarding the difference between leadership and management. Both leadership and management entail working with people and are concerned with effective goal accomplishment (Northouse 2019, p. 53). However, leadership can be traced back to Aristotle, while management was developed in more recent history to reduce chaos in organizations (Northouse 2019, p. 53). Management provides order and consistency by mastering routines, whereas leadership drives change by influencing others and creating a vision for transformation (Northouse 2019 p. 54). Northouse summarized leadership as a process in which one person influences a group of people to achieve a common goal (Northouse 2019, p. 57). Yukl extended the definition of leadership: “Leadership is the process of influencing others to understand and agree about what needs to be done and how to do it, and the process of facilitating individual and collective efforts to accomplish shared objectives.” (Yukl 2013, p. 7).

During the last decades, the content of leadership has not changed much; the fundamental behavior and actions have remained the same (Kouzes and Posner 2017, p. 27). It remains that an exemplary leader has to be able to imagine a future and communicate it to their subordinates (Kouzes and Posner 2017, p. 117). While the content of leadership has remained relatively stable, its context is continuously evolving, posing significant challenges for leaders. These challenges could be navigated by establishing a strong corporate purpose as a strategic baseline (Kouzes and Posner 2017, pp. 126–131).

For organizational effectiveness, long-term prosperity, and survival, organizations must adapt to their environment, including sudden changes (Yukl 2013, p. 277). The adaptation is enhanced by an accurate interpretation of the available information about the environment, while efficiency in this context means using all available resources to carry out essential operations in a way that minimizes costs and wasted efforts (Yukl 2013, p. 277). Therefore, a competitive strategy based on a corporate purpose, mission and vision should be formulated through change-oriented behavior and enacted daily by an exemplary leader (Yukl 2013, p. 279).

Role of Leaders in Implementing Corporate Purpose

As Bartlett and Ghoshal already pointed out in 1994, leaders are responsible for creating an organization that the members can identify with (Bartlett and Ghoshal 1994). Thus, leadership has a central role in formulating, defining and implementing the corporate purpose (Tafuro and Piccaluga 2025, p. 8).

Furthermore, the personal purpose of the leader emerges as a central element in shaping the definition of corporate purpose (Tafuro and Piccaluga 2025, p. 6). If the personal beliefs and core values of the leaders align with the corporate purpose, the corporate purpose might be enacted more authentically, and the personal beliefs can act as some kind of inter-personal glue and can hence strengthen employee commitment (Tafuro and Piccaluga 2025, pp. 6–7).

As an antecedent of implementing corporate purpose, the visionary leadership mindset has been identified (Tafuro and Piccaluga 2025, p. 8). A visionary leader needs to be able to articulate a picture of the future that is both inspirational and realistic. Additionally, they need to translate a stable purpose into inspiring long-term objectives to mobilize employees to participate in goal achievement beyond short-term goals (Tafuro and Piccaluga 2025, p. 8).

Transformational Leadership

Transformational leadership perceives. It emphasizes a dynamic exchange in which leaders shape the behavior of their followers while simultaneously being shaped by them, resulting in ongoing adjustments in response to acceptance or resistance (Yukl 1989, p. 271). At the core of this model lies the leader’s capacity to raise followers’ awareness of higher-order needs and moral values, thereby motivating them to move beyond self-interest in favor of organizational goals (Yukl 2013, p. 321).

Transformational leaders articulate an inspiring vision that not only underscores the necessity of change but also mobilizes employees to achieve results that exceed conventional expectations (Northouse 2019, pp. 264–273). Bass identifies four central dimensions of this leadership style: idealised influence, whereby leaders act as respected role models; inspirational motivation, through the communication of an engaging vision that elevates aspirations; intellectual stimula-

tion, which encourages critical reflection and innovation; and individualized consideration, where leaders respond to the unique needs of each follower with supportive guidance (Northouse 2019, pp. 270–272).

By adopting the role of mentor and advisor, transformational leaders build trust and empower their employees to participate actively in organizational transformation (Yukl 2013, p. 323). This leadership approach is widely acknowledged for its capacity to bring about profound shifts in members' attitudes and assumptions, thereby strengthening their alignment with the organisation's mission, values, and strategic objectives (Pundt and Nerdinger 2012, pp. 31–36).

Ambidextrous Leadership

The concept of ambidextrous leadership was first introduced in 2011 as a reaction to an inconclusive state of research on the relationship between leadership and innovation (Rosing and Zacher 2023). Leaders play a crucial role in today's economy in allocating and controlling organizational resources (Harandi, Khamseh and Sana 2024, p. 2) and the concept matches the complexity of organizational activities with an equally complex leadership approach (Kafetzopoulos 2022, p. 220).

In today's economy, leaders are required to efficiently handle their core business while simultaneously initiating innovations and new projects (Frehner 2023, p. 226). The concept acknowledges the engagement in two distinct types of leadership activities to achieve organizational ambidexterity (Kafetzopoulos 2022, p. 206).

Following the ambidextrous leadership approach, a leader must integrate two complementary behaviors that may appear contradictory, yet each provides the necessary context for either exploitation or exploration, resulting in a combination of the advantages of both leadership styles (Harandi, Khamseh and Sana 2024, p. 5). A leader should incorporate open and closed leadership styles and possess the ability to switch between them (Harandi, Khamseh and Sana 2024, p. 2). The open leadership style seeks to increase variance in employee behavior, thereby fostering creativity and supporting efforts to transform established processes (Rosing and Zacher 2023). On the contrary, the closed leadership style aims to reduce the variation in employee behavior to promote the implementation of specific instructions (Rosing and Zacher 2023). Both leadership styles combined foster innovation within an organization by stimulating exploratory behaviors while being in a controlled environment with a set goal (Harandi, Khamseh and Sana 2024, p. 7).

Change Management

In times of disruptions, organizations must manage change. The need for action is triggered by profound changes in the operating environment. These changes may or may not be accompanied by crises. Every change offers an opportunity for strategic renewal, to leverage the strengths and weaknesses of the organization and apply them to the new situation (Angerer and Roegner 2023, p. 5). It is important to focus on the attitudes of employees and on overcoming resistance to change (Angerer and Roegner 2023, p. 9).

Change management models serve as a compass throughout the whole change process. They facilitate or lead change efforts by determining the necessary processes and steps (Errida and Lotfi 2021, p. 2) and ensure that change records, planning, evaluation, authorization, prioritization, implementation and review are done in a controlled manner (Sarayreh, Khudair and Barakat 2013, p. 626).

Organizational change in general explains the movement of an organization from the current, known state to the desired, unknown state (Hussain et al. 2018, p. 123). Kurt Lewin was the first to develop a change management theory as a theoretical foundation of planned change management (Errida and Lotfi 2021, p. 2). He developed a change management model in which change is conceived as an alteration of existing strengths, while maintaining a three-stage framework to adapt to a repressing environment (Pawar and Charak 2017, pp. 79–80).

In the first stage, unfreeze, the main goal is to destabilize the equilibrium of the current state of the organization by removing the process that needs to be changed. In the second stage, move, the actual change is processed. Only after the change has been completed, the third stage, refreeze, can be performed. After the change is executed, it needs to be set as the new standard procedure (Pawar and Charak 2017, p. 80).

Lewin's change management model covers only three stages and thus remains at a highly abstract level. In subsequent years, additional models were developed; for example, Kotter introduced an eight-stage change management model. However, it must be acknowledged that most of these later models build upon the original Lewinian approach, which is why only this model is presented in this paper.

Stakeholder Management

In general, stakeholder management summarizes the shaping of an organization's relationship with its stakeholders (Kleb and Talaulicar 2022, p. 491). This is generally regarded as an organization's moral duty. It is important to differentiate between the claims of stakeholders in terms of interests, rights and property (Kleb and Talaulicar 2022, p. 492). Good stakeholder management and clear stakeholder communication are essential for an organization that wants to fulfil its responsibilities (Lautermann and Pfriem 2022, p. 537). A basis for this is knowing the expectations of stakeholders and taking them into account in every decision (Mayer 2020, p. 26).

Stakeholder management as it is practiced today is based on stakeholder theory, which was developed by Robert Freeman. The principle of the theory is that successful organizations create value for their stakeholders (Freeman, Harrison and Zyglidopoulos 2018, p. 2). The aim is to formulate, adapt and implement processes in such a way that all stakeholders are satisfied and the long-term success of the organization is assured (Freeman and McVea 2001, p. 10). The way in which stakeholder management is practiced has a direct influence on the value that an organization creates (Freeman, Harrison and Zyglidopoulos 2018, p. 3). Both economic and non-economic factors have an influence here, so that interactions must be taken into account (Freeman, Harrison and Zyglidopoulos 2018, p. 15).

Organizational Culture

Organizations are essentially social systems in which people collaborate over the long term (Nerdinger, Blickle and Schaper 2011, p. 143). Organizational culture refers to the unwritten rules that govern the behavior and integration of employees within the organization (Nerdinger, Blickle and Schaper 2011, p. 143).

All strategic statements that an organization issues contribute to the development of (unofficial) organizational culture (Altiok, 2011, p. 66). The culture influences all basic aspects of organizational life, including shared key values, standards, norms, beliefs and understandings that all members share (Altiok 2011, p. 66). Moreover, it reflects how the organization is perceived within its wider environment and plays a binding role in directing employees towards organizational objectives (Altiok 2011, p. 66).

Organizational culture is therefore closely linked to organizational identification, the point at which employees recognize themselves as members of the organization, associate specific feelings with it, and act in accordance with this association (van Dick 2017).

DISCUSSION

In the previous chapter, the conceptual foundations of the role of leaders in implementing corporate purpose were discussed. Concerning corporate purpose, it is clear that the increasing complexity of the environment in which organizations operate means that established methods of leadership are no longer necessarily sufficient to meet current needs. Instead, agility must be increased, and this goes hand in hand with the agility of leaders.

In order to reconcile the speed of the environment with the stability of the organization, attempts are made to shape the strategy based on a construct consisting of mission, vision and corporate purpose. This allows the path to the goal to be adapted more flexibly, while the objectives remain fundamentally the same.

The discussion shows that traditional leadership models alone cannot sustain corporate purpose in today's complex environment. Leaders must combine a visionary mindset with the capacity to translate purpose into concrete, long-term goals that inspire employees. Transformational leadership contributes to this by raising employees' awareness of greater needs, promoting moral commitment and offering individual support, which strengthens the focus on purpose-driven strategies.

At the same time, ambidextrous leadership enables leaders to switch between open and closed behaviour, facilitating both innovation and the efficient implementation of targeted initiatives. This duality is essential for maintaining organizational agility while preserving the stability required to integrate goals into daily processes.

Effective change management, in particular Lewin's change management model, forms the procedural basis for a change in mindset and the institutionalization of goals across structures. Complementary stakeholder management ensures that the expectations of various interest groups are incorporated into the formulation of goals, thereby increasing legitimacy and long-term value creation.

Finally, a supportive corporate culture that reflects shared values and norms acts as a link between goals, leadership and employee identity, promoting commitment and identification with the organization's corporate purpose.

CONCLUSION

In summary, implementing corporate purpose demands a synergistic blend of transformational and ambidextrous leadership, rigorous change and stakeholder management, and a purpose-centric culture, collectively enabling organizations to navigate complexity while delivering social and economic value. Based on the discussed conceptual foundations, it has been shown that leadership holds a crucial role in implementing corporate purpose. However, as Tafuro and Piccaluga had already pointed out, there is a need to investigate how different leadership styles might shape corporate purpose. Furthermore, it remains an open question what additional requirements leaders will face when implementing corporate purpose within the organization. These open questions need to be clarified in further research.

REFERENCES

- ALTİOK, P., 2011. Applicable vision, mission and the effects of strategic management on crisis resolve. *Procedia – Social and Behavioral Sciences*, vol. 24, pp. 61–71. DOI: <https://doi.org/10.1016/j.sbspro.2011.09.057>
- ANGERER, T. and ROEGNER, A. (eds.), 2023. *Managementforschung*. Wiesbaden: Springer Fachmedien Wiesbaden.
- BARTLETT, C. A. and GHOSHAL, S., 1994. Beyond Strategy to Purpose. *Harvard Business Review*, issue 11/12. [viewed 26 November 2025]. Available from: <https://hbr.org/1994/11/beyond-strategy-to-purpose>
- BRATIANU, C. and BALANESCU, G. V., 2008. Vision, mission and corporate values: A comparative analysis of the top 50 U.S. companies. *Management & Marketing*, issue 3, pp. 19–37.
- ERRIDA, A. and LOTFI, B., 2021. The determinants of organizational change management success: Literature review and case study. *International Journal of Engineering Business Management*, vol. 13, 184797902110162. DOI: <https://doi.org/10.1177/18479790211016273>
- FREEMAN, R. E., HARRISON, J. S. and ZYGLIDOPOULOS, S. C., 2018. *Stakeholder Theory: Concepts and Strategies*. Cambridge: Cambridge University Press.
- FREEMAN, R. E. E. and McVEA, J., 2001. A Stakeholder Approach to Strategic Management. *SSRN Electronic Journal*. DOI: <https://doi.org/10.2139/ssrn.263511>
- FREHNER, T., 2023. *Führung heute*. Berlin; Heidelberg: Springer Berlin Heidelberg.
- HARANDI, A., KHAMSEH, P. M. and SANA, S. S., 2024. Ambidextrous leadership: An emphasis on the mediating role of knowledge sharing and knowledge search. *Annals of Operations Research*. DOI: <https://doi.org/10.1007/s10479-024-06103-4>
- HENDERSON, R. and VAN DEN STEEN, E., 2015. Why Do Firms Have “Purpose”? The Firm's Role as a Carrier of Identity and Reputation. *American Economic Review*, vol. 105, issue 5, pp. 326–330. DOI: <https://doi.org/10.1257/aer.p20151072>
- HINTERHUBER, H. H., RENZL, B. and WERNER, C. H., 2012. Führung und Strategie. In: GROTE, S. (ed.). *Die Zukunft der Führung*, pp. 255–268. Berlin; Heidelberg: Springer Berlin Heidelberg.
- HOLLENSBE, E. et al., 2014. Organizations with Purpose. *Academy of Management Journal*, vol. 57, issue 5, pp. 1227–1234. DOI: <https://doi.org/10.5465/amj.2014.4005>
- HURTH, V., EBERT, C. and PRABHU, J., 2018. *Organisational Purpose: The Construct and Its Antecedents and*

- Consequences*. Working Paper No. 02/2018. Cambridge: Cambridge Judge Business School, University of Cambridge. Available from: <https://www.jbs.cam.ac.uk/faculty-research/publications/working-papers/working-papers-2011-2020/>
- HUSSAIN, S. T. et al., 2018. Kurt Lewin's change model: A critical review of the role of leadership and employee involvement in organizational change. *Journal of Innovation & Knowledge*, vol. 3, issue 3, pp. 123–127. DOI: <https://doi.org/10.1016/j.jik.2016.07.002>
- KAFETZOPOULOS, D., 2022. Ambidextrous leadership: A narrative literature review for theory development and directions for future research. *Baltic Journal of Management*, vol. 17, issue 2, pp. 206–232. DOI: <https://doi.org/10.1108/BJM-01-2021-0001>
- KLEB, I. and TALAULICAR, T., 2022. Stakeholder-Management. In: AßLÄNDER, M. S. (ed.). *Handbuch Wirtschaftsethik*, pp. 491–500. Stuttgart: J. B. Metzler.
- KOUZES, J. M. and POSNER, B. Z., 2017. *The Leadership Challenge: How to Make Extraordinary Things Happen in Organizations*. Hoboken, New Jersey: Wiley.
- LAUTERMANN, C. and PFRIEM, R., 2022. Nachhaltigkeitsberichterstattung. In: AßLÄNDER, M. S. (ed.). *Handbuch Wirtschaftsethik*, pp. 531–541. Stuttgart: J. B. Metzler.
- MAYER, K., 2020. *Nachhaltigkeit: 125 Fragen und Antworten*. Wiesbaden: Springer Fachmedien Wiesbaden.
- NERDINGER, F. W., BLICKLE, G. and SCHAPER, N., 2011. *Arbeits- und Organisationspsychologie: Mit 34 Tabellen*. 2nd ed. Berlin: Springer.
- NORTHOUSE, P. G., 2019. *Leadership: Theory and Practice*. Los Angeles: SAGE.
- PAWAR, A. and CHARAK, K., 2017. Study on Adaptability of Change Management: Review of Kurt Lewins and Kotter Model of Change. *International Journal of Social Science & Management*, issue 5, pp. 79–83.
- PUNDT, A. and NERDINGER, F. W., 2012. Transformationale Führung – Führung für den Wandel? In: GROTE, S. (ed.). *Die Zukunft der Führung*, pp. 27–45. Berlin; Heidelberg: Springer Berlin Heidelberg.
- ROSING, K. and ZACHER, H., 2023. Ambidextrous leadership: A review of theoretical developments and empirical evidence. In: *Handbook of Organizational Creativity*, pp. 51–70. Elsevier.
- SARAYREH, B. H., KHUDAIR, H. and BARAKAT, E. A., 2013. Comparative Study: The Kurt Lewin of Change Management. *International Journal of Computer and Information Technology*, vol. 2, issue 4, pp. 626–629. Available from: <https://www.ijcit.com/archives/volume2/issue4/Paper020413.pdf>
- SLINTAK, K. and DVORSKY, J., 2019. The Purpose of Firms and Its Influence on Formulating Their Missions and Visions. *Montenegrin Journal of Economics*, vol. 15, issue 2, pp. 15–29. DOI: <https://doi.org/10.14254/1800-5845/2019.15-2.2>
- TAFURO, M. and PICCALUGA, A., 2025. Bridging the understanding of corporate purpose with its effectiveness: A systematic literature review and research directions. *Journal of Management & Organization*, pp. 1–34. DOI: <https://doi.org/10.1017/jmo.2025.10044>
- VAN DICK, R., 2017. *Identifikation und Commitment fördern*. 2nd ed. Göttingen: Hogrefe.
- YUKL, G., 1989. Managerial Leadership: A Review of Theory and Research. *Journal of Management*, vol. 15, issue 2, pp. 251–289. DOI: <https://doi.org/10.1177/014920638901500207>
- YUKL, G., 2013. *Leadership in Organizations*. 8th ed. Boston: Pearson.

РОЛЯТА НА ЛИДЕРСТВОТО В ИЗПЪЛНЕНИЕТО НА КОРПОРАТИВНАТА ЦЕЛ: КОНЦЕПТУАЛНИ ОСНОВИ И ПРАКТИЧЕСКИ ПОСЛЕДИЦИ

Резюме: Тази статия разглежда ролята на лидерите при внедряването на корпоративната цел в организациите. Корпоративната цел описва специфична задача, която надхвърля простото максимизиране на печалбата. Резултатите показват, че личната визия и ценности на лидера са решаващи за автентичното целеполагане. Трансформационното лидерство засилва моралната мотивация на служителите и увеличава тяхната ангажираност. Амбидекстралното лидерство гъвкаво комбинира отворени и затворени лидерски стилове, за да съчетае иновацията и ефективното изпълнение. Структурираното управление на промяната, базирано на модела на Левин, подпомага необходимите поведенчески промени и институционализира целта. Ефективното управление на заинтересованите страни интегрира външните очаквания и засилва легитимността на целта. Накрая, ценностно ориентираната корпоративна култура насърчава дългосрочната идентифика-

ция и ангажираност. Анализът показва, че внедряването на корпоративната цел изисква комбинация от подходящи лидерски стилове, управление на промяната и култура, ориентирана към целта; необходими са допълнителни изследвания, за да се изяснят специфичните изисквания и ефекти на различните лидерски подходи.

Ключови думи: корпоративна цел; лидерство; трансформационно лидерство; амбидекстрално лидерство; лидерски роли

Антония Цедлер, докторант

ORCID ID: 0009-0003-3323-7979

Университет по библиотекознание и информационни технологии

София, България

E-mail: antonia.zedler@outlook.de

ОБЩЕСТВЕНИ КОМУНИКАЦИИ И ИНФОРМАЦИОННИ НАУКИ
PUBLIC COMMUNICATIONS AND INFORMATION SCIENCES

ECONOMIC CHALLENGES FOR SECURITY IN THE SUPPLY CHAIN

Bernd Michael Engler

University of Library Studies and Information Technologies

<https://doi.org/10.70300/DCLJ8447>

Abstract: *Security in supply chains is a key component in ensuring that processes and process participants can interact seamlessly and without disruption. Disruptions can be caused by both intentional and unintentional actions. Disruptions in the process can lead to significant damage. This damage can be financial, reputational, or legal in nature. To avert such damage, participants in a supply chain are required to prevent disruptions or reduce them to a minimum. This article examines the economic challenges in the supply chain. Based on a systematic literature review, the risks are presented, followed by the security aspects in the supply chain. The subsequent analysis of the challenges involved in mitigating these risks focuses on cybersecurity. Existing and implemented measures to defend against cyberattacks are highlighted, along with an outlook for the future. It becomes clear that cybersecurity has been a challenge in the past and will remain one in the future.*

Keywords: *business processes; supply chain security; cybersecurity challenges; supply chain resilience*

INTRODUCTION

Global supply chains are important for companies and allow them to compete in the international market. To achieve this, global networks, information and material flows, and business processes throughout the entire supply chain must be maintained (Kotzab 2005, p. 48).

At the same time, the complexity of supply chains has increased significantly in the past, and with it, their vulnerability to disruptions. This became clear, for example, during the COVID-19 pandemic. In a survey conducted as part of a study, more than 60% of respondents stated that the pandemic had had a significant or very significant impact on their supply chains (Huth 2025, p. 2).

Cloud technologies are being used more and more in businesses. A milestone in the use of cloud services was the launch of Amazon Web Services in 2006. This adoption was made possible by the growing prevalence of mobile interactive applications, the ability to utilize parallel computing resources, greater analytical capabilities, and the ability to extend computationally intensive desktop applications through cloud services (Armbrust et al. 2009, pp. 6–8).

A representative empirical study surveying more than 600 companies revealed that by 2025, 90% of the companies surveyed will already be using them. This represents a 9% increase compared to 2024. The 90% consists of both public and private clouds, with 41% already operating using a multi-cloud approach – that is, utilizing multiple cloud providers. Twenty-nine percent are using cloud technology as a hybrid approach, meaning in combination with their existing IT applications. It is noted that 67% of companies would come to a standstill without the use of cloud technologies (Wintergest 2025, pp. 2–10).

However, deliberately caused disruptions, such as cyberattacks on companies' information technology (IT) systems, can also lead to significant disruptions in business processes (Sarkis 2024, p. 562).

This article aims to highlight the challenges in the supply chain related to security, specifically cybersecurity, and discuss how resilience can be strengthened.

RESEARCH METHODOLOGY

This section provides an introduction to the topic and presents the research question. Based on a qualitative study and a systematic literature review, the theoretical foundations regarding safety aspects within the supply chain are developed.

The search is limited to Google Scholar and freely accessible sources and literature published by Springer. Sources from German- and English-speaking countries published since 2000 have been included.

The search was conducted using the following search combinations:

– **Google Scholar:** “supply chain security” AND “cybersecurity challenges” AND “supply chain resilience”

– **Springer:** “supply chain security” AND “security challenges”

The search yielded the following results:

– **Google Scholar:** The search returned 162 results. After evaluating their relevance and to avoid duplicates, approximately 20 sources were determined to be relevant.

– **Springer:** The search yielded 72 results. Since this article does not focus on software, container, or AI security, the literature can be narrowed down to the following approximately 15 sources.

To ensure the information is up-to-date, the literature review is limited to sources published no earlier than 2020. This article includes books, articles, and academic publications. The selection of literature is based on a search of the platforms mentioned, followed by an evaluation of the title, keywords, and abstract. If the criteria are met, a comprehensive literature review is conducted.

The final result is a recommendation regarding which aspects of supply chain security should be given greater consideration.

RESULTS

If supply chains do not function properly, a disruption occurs. These supply chain disruptions can be divided into four categories. They are:

- Environmental risks
- External risks
- Collaboration risks, as well as
- Internal risks

While environmental risks relate to the company or its underlying supply chain (e.g., natural disasters), external risks relate to demand and supply risks (e.g., transportation, delivery, or quality, as well as payment and sales conditions). Cooperation risks include both cultural differences between cooperation partners and divergent objectives, while internal corporate risks include management risks (e.g., poor decision-making) as well as disruptions to value-adding processes (Wellbrock und Ludin 2025, p. 10).

To ensure a smoothly functioning supply chain, the following security considerations must be taken into account:

Physical security: This term encompasses several aspects under the umbrella of VUCA (volatility, uncertainty, complexity, ambiguity) (Fig. 1). It involves fluctuations in variables within the supply chain, uncertainties due to missing input data needed for decision-making, and changes in the variety or overall clarity of the available information (Huth 2025, pp. 52–57).

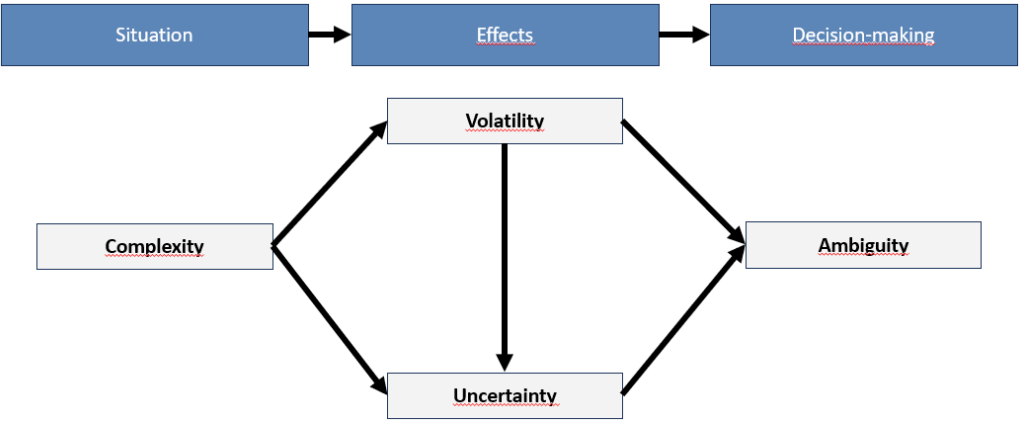


Fig. 1. VUCA Terms and Relationships (Huth 2025, p. 57)

Furthermore, the area of physical security also covers product piracy, theft, or illegal distribution, as well as the tampering of hardware. A distinction is made between attacks on customers and suppliers. The former refers to physical attacks, such as those involving counterfeit or tampered hardware or break-ins, while the latter refers more to theft, tampering, and counterfeiting with the aim of modifying or destroying such (Khokhar et al. 2024, pp. 255–260).

Cybersecurity: Here, various aspects are considered as input variables for cybersecurity, categorized into vectors (Fig. 2). The causes can stem from the network (e.g., network congestion), software vulnerabilities (e.g., malware), in hardware (e.g., due to tampered computer chips), through social engineering (e.g., via phone calls or phishing emails), and in the field of big data (e.g., when using very large amounts of data that require special protection due to their complexity). It is important to note that a disruption can be caused either intentionally or unintentionally (Hammi und El Madhoun 2026, pp. 5–14).

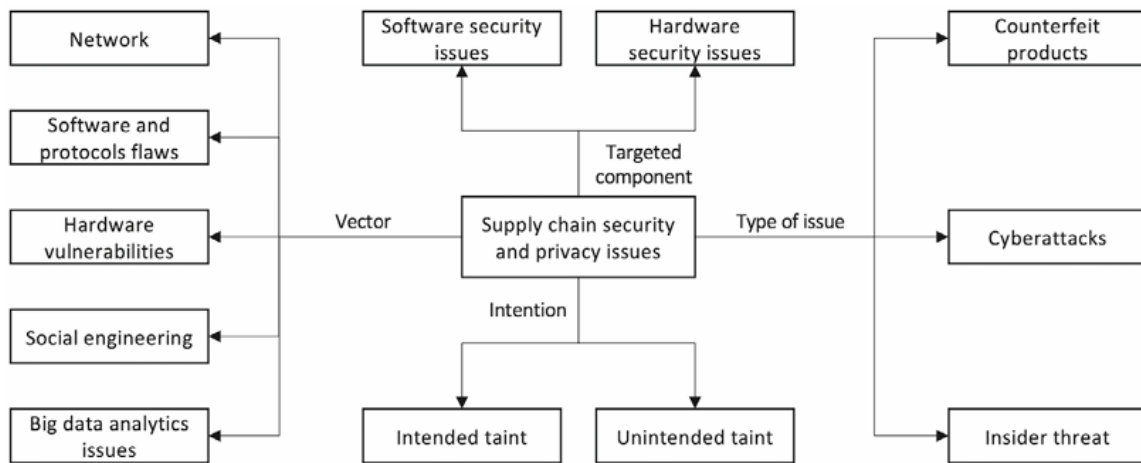


Fig. 2. Classification of Causes of Supply Chain Security Issues (Hammi und El Madhoun 2026, p. 7)

Cyber threats encompass a broad spectrum of attack vectors and vulnerabilities that jeopardize the availability, confidentiality, and integrity of supply chain processes and data. Since every component within the system is vulnerable to cyberattacks, the threats and vulnerabilities associated with the cyber supply chain (CSC) pose significant challenges to supply chain security. Risk-based approaches are necessary for risk assessment and mitigation. Particular emphasis is placed on the risks associated with malware, cyberterrorism, and data theft. For example, machine learning (ML) and cyber threat intelligence are cited here as tools for predicting and countering cyber threats (Nwankwo et al. 2024, pp. 1–3).

However, the increasing connectivity and digitization of supply chains also pose security risks. Attacks on the Internet of Things (IoT) are specifically mentioned in this context. Cyber threats in supply chain management (SCM) are multi-layered, diverse, and constantly evolving (Layode et al. 2024, pp. 1962–1963). In this area, they target vulnerabilities within the supply chain with the aim of disrupting services. These attacks can lead to the distribution of compromised products, disruptions in the supply process, and ultimately damage to a company’s reputation (Odimarha et al. 2024, p. 27).

Product Safety: Product safety is based on the premise that there can be no such thing as absolute product safety. Nevertheless, the law requires that risk be kept below the threshold risk. The threshold risk is the maximum acceptable risk. People, animals, and property must be protected from this risk. The hazards involved are classified as stochastic (random risks, such as component failure) and deterministic (predetermined hazards, such as those associated with the proper operation of a chainsaw) (Bauer 2018, p. 277).

Product safety can no longer be guaranteed due to attacks on the supply chain. Because of the interdependence and inherent complexity of the supply chain, the weakest link can cause damage to the entire supply chain. Sensitive data can be compromised, and damage can be caused (Alshammari und Mahinderjit Singh 2025, p. 67667–67668).

Compliance: In the strictest sense, compliance refers to adherence to standards, guidelines, and ethical values (Fig. 3). Some companies use a Code of Conduct (CoC) to establish internal corporate guidelines. Failure to comply with compliance regulations can have drastic consequences for the supply chain (for example, in cases of human rights violations or corruption). Moreover, due to the increased reach of the media, compliance violations are reaching more and more people (Wellbrock und Ludin 2025, p. 191–201).

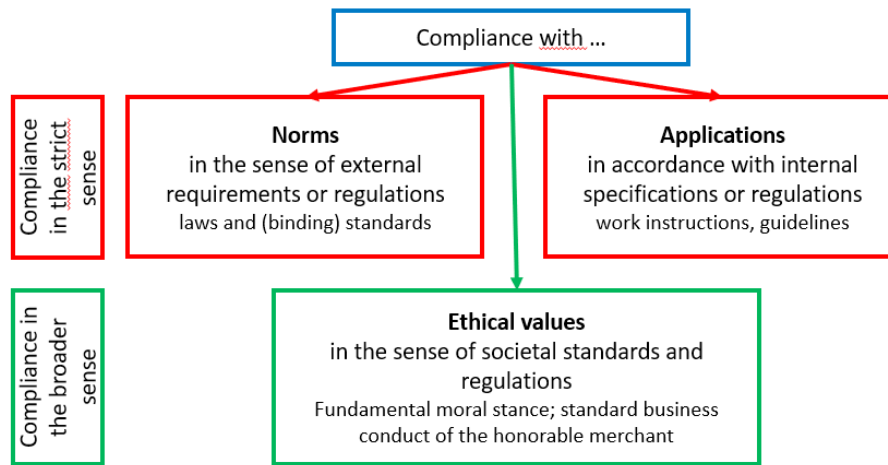


Fig. 3. Areas of Compliance (Wellbrock und Ludin 2025, p. 191)

It is emphasized that risk management must take into account unforeseeable and dynamic threats, as failure to do so could expose companies to the risk of serious operational disruptions, non-compliance with legal requirements, or a loss of customer trust. Standards serve as the foundation for compliance. For example, threat modeling is conducted using the STRIDE model (Spoofing, Tampering, Repudiation, Information Disclosure, Elevation of Privilege). This includes an adaptive and traceable system architecture that applies GS1 traceability standards. The third-party risk assessment also notes that the risk assessment of partners is likewise a part of compliance (Almohaimeed et al. 2025, p. 58–66).

Resilience: Resilience involves compensating for unforeseen disruptions or attaining a superior system state. It focuses on responding to disruptions while maintaining continuous business processes to enhance the supply chain’s competitiveness and performance. Responses can be categorized into proactive strategies (e.g., collaboration or workforce management) and reactive strategies (e.g., agility or redundant systems) (Biedermann und Kotzab 2021, pp. 9–10).

There are approaches aimed at revolutionizing resilience and security – for instance, in the power supply sector – through digital technologies. IoT-based methods can significantly enhance the resilience of interconnected microgrids. By creating a virtual replica of the physical microgrid via a digital twin (DT) that continuously receives data from IoT sensors, the system can generate real-time analyses and forecasts. These enable effective defense against cyberattacks based on proactive decision-making. ANGEL frameworks operate in a similar manner, detecting potential failures and anomalies (Achuthan et al. 2025, p. 9).

To ensure resilience, structured frameworks are crucial for addressing supply chain risks; existing guidelines and standards can be adopted and tailored to specific needs. The process begins by identifying vulnerabilities and critical resources to pinpoint critical attack vectors assessments that are regularly updated to reflect current operational environments. On this basis, continuous security measures are implemented to ensure the ongoing monitoring of cybersecurity incidents (Nwankwo et al. 2024, pp. 3–4).

Challenges in Ensuring Supply Chain Security

Companies across the board are facing complex, novel security challenges that span the entire supply chain. Globalized and increasingly complex supply chains are primary drivers of rising security risks. These risks involve a wide range of entities, including hardware and software vendors,

external service providers, internal departments, and the manufacturers themselves manifesting in everything from insider threats to counterfeit products entering the market (Roy et al. 2025, p. 185).

When risks arise across the entire supply chain model compounded by the globalization of companies' extensive value chains, the risk throughout the supply chain is multiplied. Similarly, the widespread use of IoT networks or interconnected systems creates further points of vulnerability for attacker (Latsiou und Lambrinoudakis 2026, p. 40).

In addition, the growing volume of data, the variety of data streams, and increasing speeds offer attackers additional potential (Charul und Bhatia 2026, p. 328).

Failure to consider the resulting risks can lead to significant damage. Resilient supply chains are required to withstand digital disruptions. Proactive supply chain security is essential for managing these risks. Conventional security measures are no longer sufficient today; a comprehensive perspective that takes both technical and non-technical factors into account is necessary. This entails viewing the entire supply chain ecosystem starting with the establishment of long-term relationships with partners and suppliers and extending to adherence to strict security standards at every stage, from goods receipt to final delivery (Adewusi et al. 2022, pp. 489–496).

Transparency is a crucial factor. Traceability across the entire supply chain is required. Companies are encouraged to invest in transparency using various approaches. It is also important to ensure transparency among the partners involved. Furthermore, partners and suppliers must be regularly and accurately vetted to ensure compliance with relevant security regulations in accordance with the security profile (Sreenivasulu Gajula 2025, pp. 3–8).

In addition, there is the integration of standard cybersecurity practices across all stages of the supply chain process. Sensitive data requires encryption, while intrusion detection systems are needed to monitor data traffic, and firewalls are essential to prevent unauthorized access (Roy et al. 2025, pp. 186–187).

It is particularly important to conduct regular security checks or audits to identify new vulnerabilities. In the late 20th century, manual testing could uncover complex vulnerabilities that automated tests missed. Automated security scanning tools revolutionized the detection of security vulnerabilities in the early 21st century. Modern application architectures and distributed components pushed existing approaches to their limits. Today, security mechanisms are being further developed with the aid of AI. Each new era addresses the limitations of the preceding one while simultaneously bringing new challenges (Ramachandran 2026, pp. 502–503).

Since, despite significant efforts, the possibility of security incidents cannot be entirely ruled out, companies should have emergency plans in place that cover all such scenarios. In the event of a cybersecurity breach or other incident, these plans should outline the initial steps to be taken, based on defined roles and responsibilities and identified stakeholders (Roy et al. 2025, p. 187).

Taking safety aspects into account, the aim is to examine the challenges within the supply chain when discussing the topic of safety.

CONCLUSION

The literature review aims to clarify the research question regarding the challenges associated with supply chain security. It has been shown that supply chain risks can be categorized into environmental risks, external risks, cooperation risks, and internal corporate risks. Security aspects must be taken into account to minimize these risks. These security aspects have been divided into four groups. **Physical security** addresses the product itself, considering factors such as VUCA-related challenges or product tampering. Another group focuses on **product safety**; this highlights that while product risk can never be entirely eliminated, the “limit risk” representing the maximum acceptable level of risk must not be exceeded. A further aspect concerns the scope of **compliance**, specifically the mandatory adherence to standards, directives, and ethical values throughout the entire supply chain. **Resilience** is also considered, focusing on the supply chain's ability to withstand disruptions and the necessity of proactive and reactive measures to avert potential issues. **Cybersecurity** receives significant attention in this article, particularly regarding the safeguarding of the supply chain; managing the various attack vectors is becoming increasingly difficult due to rising complexity and

data volumes. Cybersecurity measures must be effective against both intentional and unintentional disruptions. Consequently, risk strategies must be developed to minimize potential damage to the company. Transparency among all supply chain partners is essential for the early identification of disruptions. Firewalls and intrusion detection systems must employ state-of-the-art technology and be adapted to current conditions. Regular reviews of standards through audits and penetration tests are required. Since absolute security is unattainable despite the best efforts, companies must have emergency plans in place and be capable of implementing them when necessary. Ultimately, it becomes evident that while each new era resolves risks associated with the preceding one, it also introduces new challenges. For future research, it is recommended not to rely solely on a literature review but to also gain insights through, for example, semi-structured interviews with companies. Additionally, the number of articles evaluated could be increased by adjusting the time frame. The scope of cybersecurity in the context of artificial intelligence also offers further potential for investigating a new topic.

REFERENCES

- ACHUTHAN, K., GUPTA, B. B. and RAMAN, R., 2025. Bridging cybersecurity with digital twin technology: A thematic analysis. *International Journal of Information Security*. [viewed 12 June 2026].
- ADEWUSI, A. O., CHIEKEZIE, N. and EYO-UDO, N., 2022. Cybersecurity threats in agriculture supply chains: A comprehensive review. *World Journal of Advanced Research and Reviews*. [viewed 14 June 2026]. Available from: https://www.researchgate.net/profile/adebunmi-adewusi/publication/384049365_cybersecurity_threats_in_agriculture_supply_chains_a_comprehensive_review/links/67001a8df599e0392fb66b83/cybersecurity-threats-in-agriculture-supply-chains-a-comprehensive-review.pdf
- ALMOHAIMEED, M., ALBALWY, F., ALHARBI, R., ALQARNI, A. and ALJOHANI, A., 2025. *Developing a Comprehensive Cyber Risk Assessment Framework for Supply Chains: Insights into Third-Party Vulnerabilities and Security Gaps*. Available from: https://www.researchgate.net/profile/Aisha-Alqarni-3/publication/397720422_Developing_a_Comprehensive_Cyber_Risk_Assessment_Framework_for_Supply_Chains_Insights_into_Third-Party_Vulnerabilities_and_Security_Gaps/links/692f250918a6405a30fa85a5/Developing-a-Comprehensive-Cyber-Risk-Assessment-Framework-for-Supply-Chains-Insights-into-Third-Party-Vulnerabilities-and-Security-Gaps.pdf
- ALSHAMMARI, B. and MAHINDERJIT SINGH, M., 2025. A Systematic Literature Review on Tackling Cyber Threats for Cyber Logistic Chain and Conceptual Frameworks for Robust Detection Mechanisms. *IEEE Access*, vol. 13, pp. 67661–67692. DOI: <https://doi.org/10.1109/ACCESS.2025.3552689>
- ARMBRUST, M., FOX, A., GRIFFITH, R., JOSEPH, A. D., KATZ, R. H., KONWINSKI, A. et al., 2009. *Above the Clouds: A Berkeley View of Cloud Computing*. Berkeley: University of California. Available from: <http://www.eecs.berkeley.edu/Pubs/TechRpts/2009/EECS-2009-28.html>
- BAUER, M., 2018. *Das Recht des Technischen Produkts: Praxishandbuch für Unternehmensjuristen*. Wiesbaden: Vieweg. Available from: <https://ebookcentral.proquest.com/lib/kxp/detail.action?docID=5488844>
- BIEDERMANN, L. and KOTZAB, H., 2021. Supply Chain Risk Management und Supply Chain Resilienz. *WIST*, vol. 50, issue 4, pp. 4–12. DOI: <https://doi.org/10.15358/0340-1650-2021-4-4>
- CHARUL, K. M. and BHATIA, M. (eds.), 2026. *A Scientometric Exploration of Threats to IoT Security Landscape*. Springer US. [viewed 14 June 2026]. Available from: <https://www.springerprofessional.de/a-scientometric-exploration-of-threats-to-iot-security-landscape/52545850>
- HAMMI, B. and EL MADHOUN, N. (eds.), 2026. *Securing the Digital Supply Chain: Advances, Challenges, and Solutions*. 1st ed. Cham: Springer Nature Switzerland.
- HUTH, M., 2025. *Resilienz in Supply Chains: Effektive Strategien und Methoden für robuste und agile Lieferketten*. Wiesbaden; Heidelberg: Springer Gabler. Available from: <https://link.springer.com/978-3-658-47009-8>
- KHOKHAR, R. H., RANKOTHGE, W., RASHIDI, L., MOHAMMADIAN, H., GHORBANI, A., FREI, B. et al., 2024. *A survey on supply chain management: Exploring physical and cyber security challenges, threats, critical applications, and innovative technologies*. Available from: <https://search.proquest.com/openview/dccaf40b0731630dcd3e86ca3995d0a1/1?pq-origsite=gscholar&cbl=2045302>
- KOTZAB, H. (ed.), 2005. *Research Methodologies in Supply Chain Management*. Heidelberg: Physica-Verlag.
- LATSIOU, A. and LAMBRINOUDAKIS, C., 2026. Cyber Supply Chain Risk Management: From Threats to Treatment. *International Journal of Information Security*, vol. 25, issue 1, Article 40. DOI: <https://doi.org/10.1007/s10207-025-01207-9>

- LAYODE, O., NAIHO, H. N. N., LABAKE, T. T., ADELEKE, G. S., UDEH, E. O. and JOHNSON, E., 2024. Addressing cybersecurity challenges in sustainable supply chain management: A review of current practices and future directions. *International Journal of Management & Entrepreneurship Research*, vol. 6, issue 6, pp. 1954–1981. Available from: https://www.researchgate.net/profile/Oluwabunmi-Layode/publication/384017002_Addressing_Cybersecurity_Challenges_in_Sustainable_Supply_Chain_Management_A_Review_of_Current_Practices_and_Future_Directions/links/66e4b3acfa5e11512cb88fed/Addressing-Cybersecurity-Challenges-in-Sustainable-Supply-Chain-Management-A-Review-of-Current-Practices-and-Future-Directions.pdf
- NWANKWO, C. O., CHIKWENDU, O. C. and IGBOKWE, N. C., 2024. Enhancing smart manufacturing supply chains through cybersecurity measures. *International Journal of Engineering Inventions*, vol. 13, issue 12, pp. 1–6.
- ODIMARHA, A. C., AYODEJI, S. A. and ABAKU, E. A., 2024. Securing the digital supply chain: Cybersecurity best practices for logistics and shipping companies. *World Journal of Advanced Science and Technology*, vol. 5, issue 1, pp. 26–30.
- RAMACHANDRAN, M., 2026. Application Security with Machine Learning. In: *Guide to AI for Cybersecurity*, pp. 499–545. DOI: https://doi.org/10.1007/978-3-032-17367-6_13
- ROY, N. R., SINGH, A., KUMAR, P. and KAUL, A. (eds.), 2025. *Cyber Security and Digital Forensics: Select Proceedings of the 2nd International Conference, ReDCySec 2024*. 1st ed. Singapore: Springer Nature Singapore.
- SARKIS, J. (ed.), 2024. *The Palgrave Handbook of Supply Chain Management*. Cham: Springer International Publishing; Palgrave Macmillan.
- GAJULA, S., 2025. Cybersecurity in Supply Chain Management: Role of Identity and Access Management, Zero Trust, and Blockchain. *Asian Journal of Computer Science Engineering*. Available from: https://www.researchgate.net/profile/sreenivasulu-gajula-2/publication/394356510_cybersecurity_in_supply_chain_management_role_of_identity_and_access_management_zero_trust_and_blockchain
- WELLBROCK, W. and LUDIN, D. (eds.), 2025. *Management von Risiko, Nachhaltigkeit und KI in der Beschaffung*. Wiesbaden: Springer Fachmedien Wiesbaden; Springer Gabler.
- WINTERGEST, R., 2025. *Cloud Report 2025: Status Quo und Trends in Wirtschaft und Politik*. Berlin: Bitkom Research. [viewed 12 June 2026]. Available from: <https://www.bitkom.org/sites/main/files/2025-06/bitkom-pressekonzferenz-cloud-report-2025-praesentation.pdf>

ИКОНОМИЧЕСКИ ПРЕДИЗВИКАТЕЛСТВА ПРЕД СИГУРНОСТТА ВЪВ ВЕРИГАТА НА ДОСТАВКИТЕ

Резюме: Сигурността във веригите на доставки е основен елемент, който позволява на процесите и участниците в тях да взаимодействат безпроблемно и без прекъсвания. При това прекъсванията могат да бъдат както умишлени, така и непреднамерени. Прекъсванията в процеса могат да доведат до значителни щети. Те могат да бъдат както финансови, така и свързани с външния имидж или правни. За да се предотврати нанасянето на щети, участниците във веригата на доставките са длъжни да предотвратяват смущенията или да ги сведат до минимум. В настоящата статия се разглеждат икономическите предизвикателства във веригата. Чрез систематично проучване на литературата се представят рисковете, последвани от аспектите на сигурността във веригата на доставките. В последващия анализ на предизвикателствата, свързани с управлението на рисковете, се обръща специално внимание на обхвата на киберсигурността. Представени са съществуващите и прилаганите мерки за защита срещу кибератаки, както и перспективи за бъдещето. Става ясно, че темата за киберсигурността е била предизвикателство в миналото и ще остане такова и в бъдеще.

Ключови думи: бизнес процеси; сигурност на веригата на доставките; предизвикателства пред киберсигурността; устойчивост на веригата на доставките

Бернд Михаел Енглър, докторант
Университет по библиотекознание и информационни технологии
София, България
E-mail: berengler@aol.com

ОБЩЕСТВЕНИ КОМУНИКАЦИИ И ИНФОРМАЦИОННИ НАУКИ
PUBLIC COMMUNICATION AND INFORMATION SCIENCES

**COMMUNICATION CHALLENGES IN DATA-DRIVEN SUSTAINABLE ASSET
MANAGEMENT IN THE GERMAN FOUNDATION SECTOR**

Björn Pieper

University of Library Studies and Information Technologies

<https://doi.org/10.70300/MUQK7924>

Abstract: *Due to its federal structures, the lack of central data registers and high organizational heterogeneity, the German foundation sector is considered a ‘hard-to-reach’ population. This paper examines the challenges and appropriate communication strategies for data collection in the context of ESG-compliant investments by foundations. The aim is to identify effective communication channels and derive methodological implications for further research. Methodologically, the study is based on a standardized online survey of foundations, which was distributed via various communication channels (including email, networks and reminders). Different outreach strategies were empirically tested and evaluated in terms of their effectiveness. The results show that reaching this target group involves structural challenges, which are exacerbated by low response rates and self-selection processes. It also becomes clear that combined and target-group-specific communication approaches can ultimately increase willingness to participate. Overall, this paper provides practice-relevant insights for empirical research in hard-to-reach organizational contexts.*

Keywords: *communication channels; hard-to-reach population; empirical research; German foundation sector; sustainable asset allocation*

INTRODUCTION

The aspiration to make a meaningful contribution to society and the common good is described in the literature as a fundamental motive for human action and is closely linked to concepts such as altruism and social engagement (Anheier 2017). Social engagement is regarded as normatively desirable in many societies and can be found in various forms, shaped both by cultural factors and by individual resources – particularly financial means.

During processes of social differentiation, activities oriented towards the common good have become increasingly institutionalized in modern history. In this context, legally independent organisations committed to the common good emerged, operating within a regulated but not uniform legal framework: foundations. These represent a central organizational form of the so-called third sector, which is situated between the state and the market (Anheier/Salamon 2006). The foundation landscape in Germany is characterized by a high degree of heterogeneity, which stems from the diversity of possible foundation purposes, organizational forms and endowments. At the end of 2024, there were a total of 26,349 civil law foundations with legal capacity in Germany (see Figure 1). This corresponds to a long-term average net growth of around 2% per year, indicating that the sector continues to develop dynamically (Federal Association of German Foundations 2025).

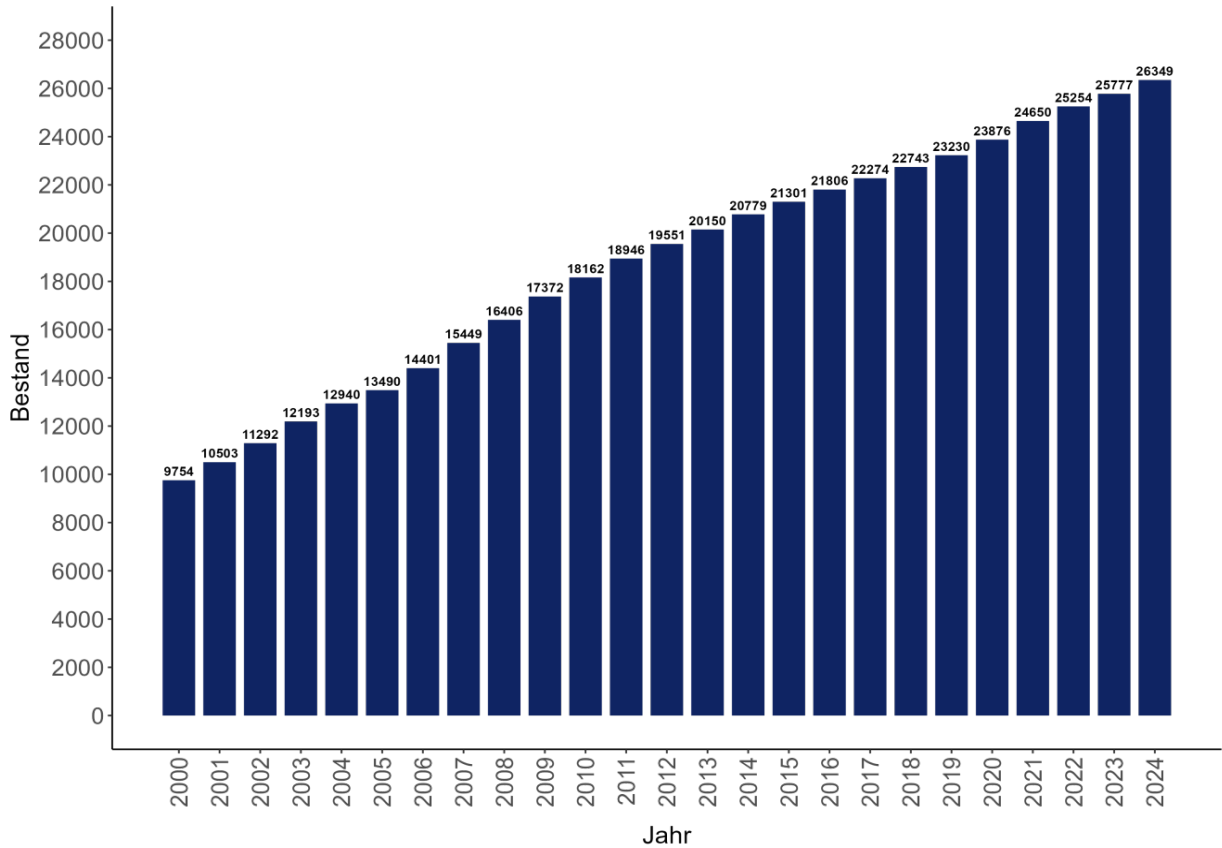


Fig. 1. Development of the number of foundations (foundations under civil law with legal capacity in Germany (2000–2024), Source: BDS, 2025

The regional distribution of foundations and their endowment levels vary considerably across Germany’s federal states. For historical reasons, the western German federal states already had a higher density of foundations than the eastern German federal states prior to German reunification. Since 1990 a positive trend in the establishment of new foundations has also been observed in the new federal states. Overall, foundation-setting activities often reflect the prevailing economic situation, meaning that economic crises – such as the financial crisis or the COVID-19 pandemic – influence the dynamics of the foundation sector (Federal Association of German Foundations 2023). The total assets of civil law foundations with legal capacity in Germany are estimated – depending on the estimation method – at around 100 to 110 billion euros. The 60 largest German foundations alone have an annual funding volume of around five billion euros. These figures underscore the considerable economic and socio-political significance of the foundation sector (German Bundestag 2019; Federal Association of German Foundations 2023). Against this backdrop, the foundation sector can be regarded as a central component of the third sector, contributing significantly to social development and social cohesion. At the same time, these figures highlight the marked heterogeneity of the foundation landscape, which manifests itself in different size categories, asset structures (e.g. financial versus non-financial assets) and legal frameworks. This diversity has led to a significant increase in academic interest in the structure, activities and impact of foundations in recent years.

Empirical research remains a particular challenge even in the face of advancing digitalization, as the available channels of communication and data collection are changing significantly. In the context of empirical research, the generation of specific, research-relevant data is essential, particularly when no suitable secondary data is available from publicly accessible sources. In such cases, depending on the research objective and study design, various methods of primary data collection are available.

Traditional data collection methods include face-to-face interviews, telephone surveys and postal surveys. These traditional methods are increasingly being supplemented or replaced by digital

approaches. These include web-based online questionnaires, email-based surveys, and the use of social networks and platforms to reach potential study participants. Furthermore, informal recruitment channels, such as recruitment via existing networks or word-of-mouth referrals (snowball sampling), are gaining in importance.

Empirical research shows, however, that the use of a single survey method is often insufficient to achieve valid and reliable results. Rather, research recommends combining several survey methods in the form of a mixed-methods approach to triangulate different data sources and thus increase the validity of the results (Diekmann 2020; Flick 2022; Schnell et al. 2018).

The so-called ‘hard-to-reach’ (HtR) groups pose a particular challenge for empirical research. They are characterized above all by limited reachability and accessibility for researchers, which is often attributable to specific social, structural or behavioral characteristics. These include, amongst other things, limited institutional ties, a lack of or difficult-to-access sampling frames, an increased need for anonymity, and potential mistrust of research projects. Furthermore, HtR groups are often characterized by small, hard-to-identify populations or by social stigmatization, which makes recruiting suitable study participants even more difficult. Examples include marginalized population groups, individuals with sensitive characteristics, or specific professional or organizational decision-makers. Against this backdrop, research into such groups requires the use of adaptive and often combined data collection strategies, such as network-based recruitment approaches, to generate valid and robust data (Heckathorn 1997; Atkinson/Flint 2001; Bonevski et al. 2014). Foundations can also be classified within the HtR group.

However, access to, and thus the channels for obtaining, valid and comparable data presents a key challenge for empirical research. This is because, to date, there are no uniform requirements in Germany regarding publication obligations, accounting or reporting. Supervision of foundations falls to the respective state authorities, whilst tax matters are regulated by the tax authorities of the federal states. These federal structures make it considerably more difficult to compare data, as different legal frameworks apply across the 16 federal states (Hüttemann 2022). This is also illustrated by the following Table 1, which shows the varying reporting requirements by federal state.

Table 1. Comparison of reporting requirements by federal state

Federal State	Reporting requirements for foundations	Publication requirements	Digital register available	Comments
Baden-Württemberg	Yes	No	partially	Registers not fully digitized
Bavaria	Yes	No	No	Paper-based registers
Berlin	Yes	Yes	Yes	Good digital accessibility
Brandenburg	Yes	No	Yes	Partially digitized registers
Bremen	Yes	No	No	Data available via the supervisory authority
Hamburg	Yes	Yes	Yes	Good online register
Hesse	Yes	No	No	Publication voluntary
Mecklenburg-Western Pomerania	Yes	No	No	No central database
Lower Saxony	Yes	No	No	Partially online registration
North Rhine-Westphalia	Yes	Yes (partially)	Yes (partially)	Pioneer in transparency initiatives
Rhineland-Palatinate	Yes	No	No	Internal supervisory data only
Saarland	Yes	No	No	Small foundation landscape
Saxony	Yes	No	No	Internal supervisory data only
Saxony-Anhalt	Yes	No	No	No publication requirement
Schleswig-Holstein	Yes	No	Yes	Register under development
Thuringia	Yes	No	No	No digital publication

Source: Own compilation based on the foundation laws of all 16 federal states, as of 2025.

Another factor limiting comparability is the structural diversity of the foundations themselves, particularly regarding their endowment, the composition of their capital and their respective legal forms. With the reform of foundation law through the Act on the Standardization of Foundation Law of 16 July 2021, which came into force in July 2023, a uniform federal civil law on foundations was established for the first time. A central element of this reform is the introduction of a nationwide register of foundations with public notice effect, to be maintained by the Federal Office of Justice (Section 82b BGB, as amended). The aim of this measure is to increase transparency and legal certainty in the foundation sector. However, the introduction of the register regulations, originally planned for 2026, has been postponed to 2028 due to technical and organizational challenges (Hüttemann 2022; Federal Ministry of Justice 2023).

This article therefore focuses on the communicative challenge of data collection for empirical studies in German foundations. In addition to the fundamental communication challenges in empirical research within the foundation sector, the data to be collected focused on a central question: How do foundations invest their endowment capital, and are these investments sustainable, i.e. ESG (Environmental, Social and Governance) compliant?

RESEARCH METHODOLOGY

Foundations can therefore be classified within the HtR group, along with all the associated communication challenges. The specific issue of ESG-compliant asset allocation further complicates access, making it difficult to obtain valid empirical study results. It is therefore virtually impossible to draw conclusions about the underlying population. Which methodology and communication channels are nevertheless suitable, or were chosen, to achieve results? The mixed-mode approach, involving personalized communication and multiple contact waves, appears to be a particularly suitable communication strategy. The following approach appears particularly suitable: email (primarily), networks (e.g. foundation associations), individual contact, and follow-up by telephone and email. Table 2 summarizes this exploratory approach.

Table 2. Methodology of the empirical approach and communication channels

Survey design	Standardized online survey of foundations in Germany	Communication via own networks, as well as through the Federal Association
Target population	Foundations with legal personality under civil law (excluding trust foundations), preferably without contributions in kind	
Sampling frame	Not a random sample in the strict sense, but an attempt at a complete survey with self-selection.	
	Membership directory of the Federal Association of German Foundations	
Survey method	Online questionnaire (standardized, with few open-ended questions)	Communication via direct email contact and follow-up, as well as direct (telephone) contact

Source: Own representation

Due to the limited availability of valid and standardized publications in the German foundation sector, particularly regarding the nature and size of foundation assets, a deliberate restriction of the population was applied in this study. The target group comprised exclusively foundations under civil law with legal capacity, whilst dependent (trust) foundations were excluded. This methodological decision leads to a systematic bias in the data set, as certain types of foundations are structurally excluded and thus a complete representation of the foundation sector cannot be guaranteed (Schnell et al. 2018).

The Federal Association of German Foundations, which acts as the sector’s most important umbrella organization, provides a central point of access to foundation-related data in Germany. Through its publicly accessible foundation database, the association provides various search options. A distinc-

tion is made between free basic access (‘Basic’) and extended paid access (‘Plus’). Whilst the Basic section primarily covers foundations with their own websites, the Plus section contains a more comprehensive record of currently around 31,000 foundations. In contrast, the freely accessible section lists around 13,000 foundations. In addition, the Federal Association regularly publishes overviews of the largest foundations in Germany, which are particularly significant in terms of their asset base and funding volume (Federal Association of German Foundations 2025).

For the empirical data collection, a standardized online questionnaire was developed, aimed at gaining insights into the experiences and expertise of foundations in dealing with ESG-compliant and mission-aligned investments. Potential participants were primarily contacted via email using publicly available contact details on the respective foundations’ websites. The recruitment process was multi-stage:

1. First, the thirty largest German foundations were specifically approached directly based on the relevant publication by the Federal Association of German Foundations.
2. In addition, foundations from the researchers’ own professional and institutional networks were contacted on an ongoing basis over a period of approximately three months.
3. Furthermore, email addresses of foundations were systematically researched and extracted by federal state using the Association’s Basic database. In this context, around 40 foundations were contacted daily over a period of approximately two months.
4. After around two months, a reminder was sent to all foundations contacted up to that point to increase the response rate.

Data collection was carried out entirely anonymously via an online platform, so that no conclusions could be drawn regarding the identity of the participating foundations. For this reason, it was not possible to determine which specific organizations had taken part in the survey. The analysis was therefore limited to the aggregate number of fully completed questionnaires. The empirical survey spanned a total of three months, covering the period from November 2025 to January 2026. The chosen approach corresponds to established methodological approaches in quantitative social research, particularly in the field of standardized online surveys, but at the same time exhibits typical limitations regarding response rates, sampling bias and representativeness (Diekmann 2020; Schnell et al. 2018).

RESULTS

During the three months of data collection, a total of 1,400 foundations in Germany were contacted. The methodology described above was communicated to them. In addition to the methodological limitations of the survey, the chosen communication channels proved to be of varying degrees of success. Furthermore, a quantitative pre-selection of the foundations contacted was carried out by federal state, based on the total number per federal state (foundation density). The following Table 3 shows the distribution by federal state.

Table 3. Overall overview by federal state

Federal state (number)	Federal state (number)
Bavaria (180)	Brandenburg (58)
Baden-Württemberg (175)	Bremen (58)
Hamburg (159)	Saxony (47)
Hesse (153)	Saxony-Anhalt (41)
North Rhine-Westphalia (123)	Schleswig-Holstein (40)
Rhineland-Palatinate (119)	Thuringia (36)
Lower Saxony (98)	Saarland (21)
Berlin (80)	Mecklenburg-Western Pomerania (14)
	Total 1402

Source: Own illustration

Figure 2 shows then the results for the survey period. The overview illustrates how the response rate (of fully completed questionnaires) developed in conjunction with the respective communication channels selected. Four phases of responses can be distinguished.

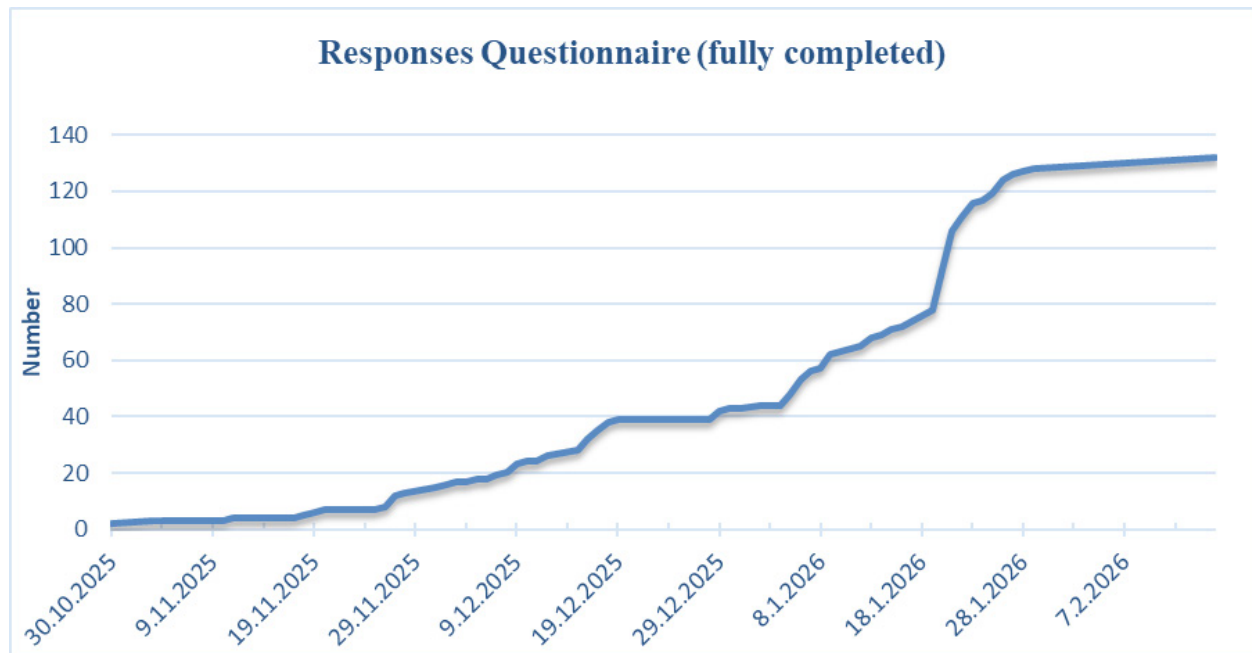


Fig. 2. Trend in responses (fully completed) and phase breakdown

Phase 1: November 2025 – Direct contact communication and multipliers

In this phase, letters were sent primarily to the thirty largest foundations, as well as to a large foundation network in North Rhine-Westphalia, the German Donors' Association in Essen (<https://www.stifterverband.org/>), which was intended to act as a multiplier. However, the response rate for fully completed online questionnaires was minimal, totalling 13 by the end of November, assuming that responses were provided promptly (within 14 days of receiving the message).

Phase 2: December 2025 – Email communication

This phase was characterized by the start of intensive research into the foundations via the Federal Association's database and the sending of emails. The continuous contact ensured a steady flow of responses. Nevertheless, the overall results merely tripled. By the end of this phase, 43 foundations had responded in full. The response rate stood at 4.82%

Phase 3: 1 to 18 January 2026 – Follow-up communication

This phase was characterized by an intensification of email correspondence, as well as a second round of direct telephone contact with the organization's own network of foundations. By the end of this phase, 72 questionnaires had already been fully completed by the foundations, bringing the response rate up to 5.14%.

Phase 4: Reminder communication (19 to 31 January 2026)

Over three days (19–21 February 2026), all 1,400 foundations that had been contacted up to that point were reminded once again of the initial request for support. The response rate rose to 9.42% by the end of January, corresponding to 132 fully completed questionnaires.

The significant increase in the response rate during the reminder phase is also confirmed by other studies, which found that repeated attempts to make contact had a significant influence on willingness to participate (Dillman et al. 2014). The near doubling of the response rate following the reminder highlights the importance of systematic follow-up strategies, particularly in organizational surveys.

A total of 760 page views (clicks) were recorded for this questionnaire (including accidental duplicate clicks, visits via search engines, etc.). A total of 132 questionnaires were completed in full. If all questionnaires actively started (from page 1) are totaled, a response rate of 16.14% (N:

227) was achieved. As the first page primarily asks for details of the foundations' size (assets, income, etc.), only pages 2–6 should be considered. If these figures are used as the basis for the calculation (N: 168) this results in a response rate of 12%.

CONCLUSIONS/DISCUSSION

The response rate achieved of 9.42% (fully completed questionnaires) should be interpreted in the context of organizational online surveys and the chosen communication channels. Empirical studies show that web-based surveys in organizations – particularly where participation is voluntary without material or non-material incentives – typically achieve response rates in the range of approximately 5% to 20% (Dillman, Smyth, Christian 2014). Against this background, the rate achieved in this study can be classified as falling within the methodologically expected range.

At the same time, potential biases in the sample must be considered. A self-selection bias is to be assumed, as it can be assumed that the survey was primarily participated in by those foundations that already demonstrate a heightened affinity for ESG issues or sustainable asset allocation. This systematic bias will limit the generalizability of the results and must be considered accordingly when interpreting the findings (Schnell et al. 2018).

Furthermore, foundations – particularly decision-makers in asset allocation – constitute, in part, a so-called 'hard-to-reach' (HtR) population. These groups are often characterized by restricted accessibility, limited time resources, low institutional transparency and a high degree of confidentiality. This gives rise to specific requirements for communication in the context of data collection (see Table 2 and Figure 2). These generally include a target group-specific approach, clear communication of the study's benefits and relevance, the guarantee of anonymity, and the building of trust in the scientific integrity of the research project. Furthermore, the literature recommends employing multi-stage contact strategies (e.g. personalized cover letters, follow-ups/reminders) and utilizing existing networks to increase willingness to participate (Dillman et al. 2014; Bonevski et al. 2014; Atkinson/Flint 2001).

The present results and the communication channels described thus confirm, on the one hand, the response rates for online surveys in an organizational context mentioned in the literature and can be assessed as methodologically satisfactory against the backdrop of the specific challenges – in particular a non-representative sample and the difficult accessibility of the target group (HtR group). On the other hand, the response rate alone does not provide any indication of the quality of the data collected. Rather, additional criteria such as validity, reliability and the consistency of the responses must be considered to comprehensively assess the quality of the data collection (Diekmann 2020).

REFERENCES

- ANHEIER, H. K., 2017. *Nonprofit Organizations: Theory, Management, Policy*. 2nd ed. London; New York: Routledge.
- ANHEIER, H. K. and SALAMON, L. M., 2006. The Nonprofit Sector in Comparative Perspective. In: POWELL, W. W. and STEINBERG, R. (eds.). *The Nonprofit Sector: A Research Handbook*. 2nd ed., pp. 89–114. New Haven: Yale University Press.
- ATKINSON, R. and FLINT, J., 2001. Accessing Hidden and Hard-to-Reach Populations: Snowball Research Strategies. *Social Research Update*, issue 33. University of Surrey.
- BONEVSKI, B., RANDELL, M., PAUL, C., CHAPMAN, K., TWYMAN, L., BRYANT, J., BROZEK, I. and HUGHES, C., 2014. Reaching the hard-to-reach: A systematic review of strategies for improving health and medical research with socially disadvantaged groups. *BMC Medical Research Methodology*, vol. 14, Article 42.
- BUNDESVERBAND DEUTSCHER STIFTUNGEN, 2023. *Stiftungsreport 2023*. Berlin: Bundesverband Deutscher Stiftungen.
- BUNDESVERBAND DEUTSCHER STIFTUNGEN, 2025. *Zahlen, Daten, Fakten zum deutschen Stiftungswesen 2024/2025*. Berlin: Bundesverband Deutscher Stiftungen.
- DEUTSCHER BUNDESTAG, 2019. *Unterrichtung durch die Bundesregierung: Bericht zur Lage und Entwicklung der Stiftungen*. Drucksache. Berlin: Deutscher Bundestag.

- DIEKMANN, A., 2020. *Empirische Sozialforschung: Grundlagen, Methoden, Anwendungen*. 14th ed. Reinbek bei Hamburg: Rowohlt.
- DILLMAN, D. A., SMYTH, J. D. and CHRISTIAN, L. M., 2014. *Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method*. 4th ed. Hoboken, NJ: Wiley.
- BUNDESMINISTERIUM DER JUSTIZ, 2023. *Reform des Stiftungsrechts*. Berlin: Bundesministerium der Justiz.
- FLICK, U., 2022. *Qualitative Sozialforschung: Eine Einführung*. 9th ed. Reinbek bei Hamburg: Rowohlt.
- HECKATHORN, D. D., 1997. Respondent-Driven Sampling: A New Approach to the Study of Hidden Populations. *Social Problems*, vol. 44, issue 2, pp. 174–199.
- HÜTTEMANN, R., 2022. *Gemeinnützigkeits- und Spendenrecht*. 5th ed. Köln: Otto Schmidt.
- SCHNELL, R., HILL, P. B. and ESSER, E., 2018. *Methoden der empirischen Sozialforschung*. 11th ed. München: Oldenbourg.
- TOURANGEAU, R., EDWARDS, B., JOHNSON, T. P., WOLTER, K. M. and BATES, N., 2014. *Hard-to-Survey Populations*. Cambridge: Cambridge University Press.

ПРЕДИЗВИКАТЕЛСТВА В КОМУНИКАЦИЯТА ПРИ БАЗИРАНО НА ДАННИ УСТОЙЧИВО УПРАВЛЕНИЕ НА АКТИВИ В СЕКТОРА НА ФОНДАЦИИТЕ В ГЕРМАНИЯ

Резюме: Поради федералната си структура, липсата на централни регистри за данни и високата организационна хетерогенност секторът на фондациите в Германия се счита за „труднодостъпна“ група. Настоящата статия разглежда предизвикателствата и подходящите комуникационни стратегии за събиране на данни в контекста на инвестициите на фондациите, съобразени с ESG критериите. Целта е да се идентифицират ефективни комуникационни канали и да се изведат методологични изводи за по-нататъшни изследвания. От методологична гледна точка проучването се основава на стандартизирано онлайн проучване сред фондации, разпространено чрез различни комуникационни канали (включително електронна поща, мрежи и напомняния). Различни стратегии за достигане до целевата група бяха тествани емпирично и оценени по отношение на своята ефективност. Резултатите показват, че достигането до тази целева група е свързано със структурни предизвикателства, утежнявани от ниските проценти на отговори и процесите на само-селекция. Става ясно също, че комбинираните и специфични за целевата група комуникационни подходи могат да повишат готовността за участие. Като цяло, тази статия предоставя практически полезни изводи за емпирични изследвания в контекста на труднодостъпни организации.

Ключови думи: канали за комуникация; труднодостъпни групи от населението; емпирични изследвания; германски сектор на фондациите; устойчиво разпределение на активите

Бьорн Пипер, докторант
Университет по библиотекознание и информационни технологии
София, България
E-mail: pieper@nordmetall.de

ОБЩЕСТВЕНИ КОМУНИКАЦИИ И ИНФОРМАЦИОННИ НАУКИ
PUBLIC COMMUNICATIONS AND INFORMATION SCIENCES

**GENERATIVE ARTIFICIAL INTELLIGENCE IN ENTREPRENEURIAL
INFORMATION PROCESSES: MANAGING MARKETING INFORMATION AMONG
DIASPORA ENTREPRENEURS**

Holger Walter Ehrsam

University of Library Studies and Information Technologies

<https://doi.org/10.70300/BDHX7830>

Abstract: *The article asks and answers how entrepreneurs can use generative artificial intelligence (GenAI) in their marketing information processes. The study is motivated by two factors. Firstly, the success of ChatGPT, developed by OpenAI, has attracted considerable attention from the media and various academic discourses. Secondly, the implications of this technology have been a subject of much discussion. The present paper aims to provide a comprehensive overview of the influence of GenAI on marketing processes in organisations undertaken by entrepreneurs. The development of the study was informed by academic sources and extensive literature research, and complemented by a survey conducted among Peruvian entrepreneurs residing in Germany. The article elucidates the rationales and utilisation of applications in marketing information processes, alongside impediments and competencies involved. The results of the study indicate that Peruvian entrepreneurs in Germany primarily utilise GenAI for efficiency purposes, exploration of new business models, and identification of opportunities. It is predominantly focused on creative and planning tasks, including the generation of ideas. Key constraints relate to quality and accuracy, as well as capability gaps; while competencies are generally strong, confidence in data analysis is a limiting factor in overall readiness.*

Keywords: *Information processes; entrepreneurship; marketing information; generative artificial intelligence (GenAI); diaspora Peru*

INTRODUCTION

Since November 2022, the concept of generative Artificial Intelligence (GenAI) has dominated discourse in the media, the economy, and politics (Bolz 2024). The release of ChatGPT by OpenAI has had a considerable impact on the field of marketing (Chui et al., 2023). A survey conducted by the trade association BITKOM revealed that 41% of companies in Germany are currently utilizing artificial intelligence (AI), with a further 48% planning and discussing its use (BITKOM, 2026). It is evident that the subject has a wide range of applications, which have been shown to increase efficiency, quality, and support innovation (Dahm and Neuhaus 2025).

A study conducted by SAS in 2024 found that approximately 74% of marketers consider it to be a pivotal factor in achieving success in marketing. Furthermore, the survey revealed that for 82% of respondents, the primary benefit identified was the reduction in time spent on repetitive tasks. Furthermore, GenAI has been demonstrated to facilitate the identification of business models, enable data-driven decision-making, and identify market opportunities (Kusetogullari et al. 2025).

A significant challenge is the selection of an appropriate tool, given the wide range of options available, with around 50,000 GenAI tools currently in operation (There's an AI for That, 2026). Furthermore, 61% of marketers report data protection as a problem, followed by 44% who mention GenAI-related competencies (SAS 2024). The integration of human competencies with the technical capabilities of GenAI has been demonstrated to enhance efficiency and innovation processes (Wecke 2024). In order to achieve the optimal utilization of GenAI, it is essential to cultivate the relevant competencies (Scarpa et al. 2024).

GenAI has the potential to support diaspora entrepreneurs in their marketing activities, although it is important to acknowledge the challenges that must be overcome to achieve this. This will be the focal point of the following analyses.

It should be noted that some of the findings presented in this article were first developed in the author's Master's thesis. Instead of reproducing the original work, the article employs a more focused and independently developed academic analysis to offer insights that build upon these foundations.

RESEARCH METHODOLOGY

The methodological approach of this publication is a comprehensive literature review and survey. The focus of this study will be on Peruvian diaspora entrepreneurs in Germany. The emphasis of this study is on the understanding of the function of GenAI in marketing activities and information processes. The analysis draws on academic books and peer-reviewed journal articles. A selection of practitioner-oriented reports and online publications were also included. In addition to the literature review, a survey was conducted with eleven Peruvian entrepreneurs residing in Germany. The collection of data was facilitated by the distribution of a questionnaire, which was executed using survey software. This approach was found to be beneficial for subsequent data analysis, thereby facilitating the organization and evaluation of the study. The resulting dataset was analyzed using descriptive statistics once the respondents had completed the questionnaire. Firstly, the analysis investigates the role and areas of application of GenAI in marketing-related information processes. This was followed by an examination of the barriers to usage and the key competencies required for GenAI in these processes. DeepL Write was used for language correction and stylistic improvement; the intellectual content remains the author's own.

The present study combines evidence from scientific literature, target-group publications and the entrepreneur survey, thereby providing a comprehensive understanding of the contemporary challenges facing diaspora entrepreneurs. This synthesis places particular emphasis on the Peruvian diaspora in Germany.

This paper builds on the methodological basis established in the author's master's thesis, which involved devising and implementing an exploratory research design. This paper revisits, condenses and further develops selected parts of that work.

RESULTS

Peruvian diaspora entrepreneurship in Germany

The concept of entrepreneurship is characterized by the utilization of available resources, the identification of business opportunities, and the role of the entrepreneur (Fust et al. 2019). The task of entrepreneurs is to transform ideas into products and to discover new markets (Kriedel 2017). In order to achieve success, it is essential that they possess competencies in the areas of ideas and opportunities, have access to resources, and are active (European Union 2018).

Research indicates that people from a diaspora are highly motivated to engage in entrepreneurial activities (Rana and Nipa 2019). The members of these communities are a minority in the host country and frequently report feelings of rejection and marginalization. They express a strong sense of obligation to support their home country and indicate a desire to return in the future (Cohen 2008).

Diaspora entrepreneurs have been shown to possess a high level of proficiency in the identification of commercial opportunities, coupled with the advantage of a robust network of connections with individuals within their respective diaspora communities. Furthermore, they have been found to possess a high level of cultural competence (Freiling 2019). In addition, they possess a strong desire to establish their own entrepreneurial activities (Rana and Nipa 2019) and are capable of identifying and filling market gaps through the implementation of innovative business models (Vanore 2018).

In the absence of statistical data, it is only possible to estimate the number of Peruvian diaspora entrepreneurs in Germany. In Germany, the entrepreneurial population constitutes approximately 3% of the total population (Statistisches Bundesamt 2026). Applying this rate to the estimated 30,000-strong Peruvian diaspora in Germany (Statistisches Bundesamt 2023), it is estimated that there are 900 Peruvian diaspora entrepreneurs in Germany.

Areas of application of GenAI in marketing-related information processes

Digitalization has a profound impact on organizational processes, necessitating the presence of both prepared managers and well-structured organizations. A combination of human and technological capabilities is required. As Krcmar (2015) argues, the management of information processes is dependent on both skill and cultural factors.

Marketing can be defined as the process of meeting customer expectations when an enterprise creates value for a product that is offered (Kotler et al. 2007). It is widely regarded as the predominant concept in this field (Bruhn 2019). Consequently, enterprises are obliged to carry out six specific tasks. Firstly, the analysis of the current situation is undertaken, followed by the definition of long-term company objectives. Thirdly, a strategy must be deduced, followed by operational planning of product, price, place and promotion. In the fifth instance, the planned content must be executed and finally controlled (Meffert et al. 2024).

GenAI, a part of AI, has developed into a tool capable of processing a variety of data simultaneously and generating new content (Wecke 2024a). GenAI is set to transform marketing-related information systems, with the potential to significantly enhance operational efficiency and performance (Rubera et al. 2025). As illustrated in Figure 1, GenAI has the potential to be employed across a variety of tasks. The utilization is recommended for research and strategy tasks, including market research and the development of buyer personas. It is followed by products, the utilisation of which as a tool for the generation of ideas and the facilitation of the creation of visual media, including but not limited to photography, text, and video. In the context of facilitating the information process with clients, GenAI has the capacity to personalize email campaigns and provide recommendations. Moreover, it facilitates the measurement of the performance of information processes for marketing campaigns. Finally, it enables marketing operations, such as the preparation of content for social media (Wecke 2024a).



Fig. 1. Use of GenAI for marketing tasks (Ehrsam, 2025)

As demonstrated in Figure 2, the vast majority of Peruvian entrepreneurs residing in Germany adopt GenAI primarily to achieve efficiency gains, such as optimizing workflows and reducing the time spent on manual tasks. Further factors include the exploration of novel business models and the identification of market opportunities. Conversely, the broader potential of GenAI in terms of its ability to enhance data-driven decision-making is considered to be of lesser significance. It is interesting to note that no mention is made of innovation, quality assurance, or any other factors that might be considered relevant (Ehrsam 2025).

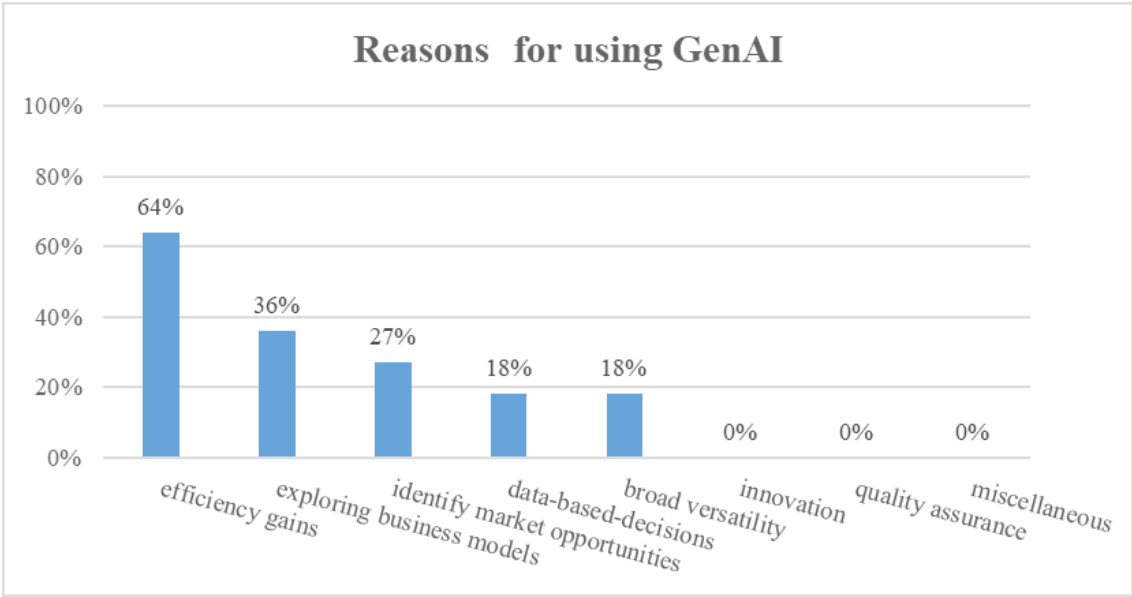


Fig. 2. Reasons for GenAI adoption among Peruvian entrepreneurs in Germany (Ehram, 2025)

The findings suggest that Peruvian diaspora entrepreneurs in Germany acknowledge the potential of GenAI in a range of marketing domains. As shown in Figure 3, idea generation represents the primary use case, whereas pattern identification is perceived as less relevant (Ehram 2025).

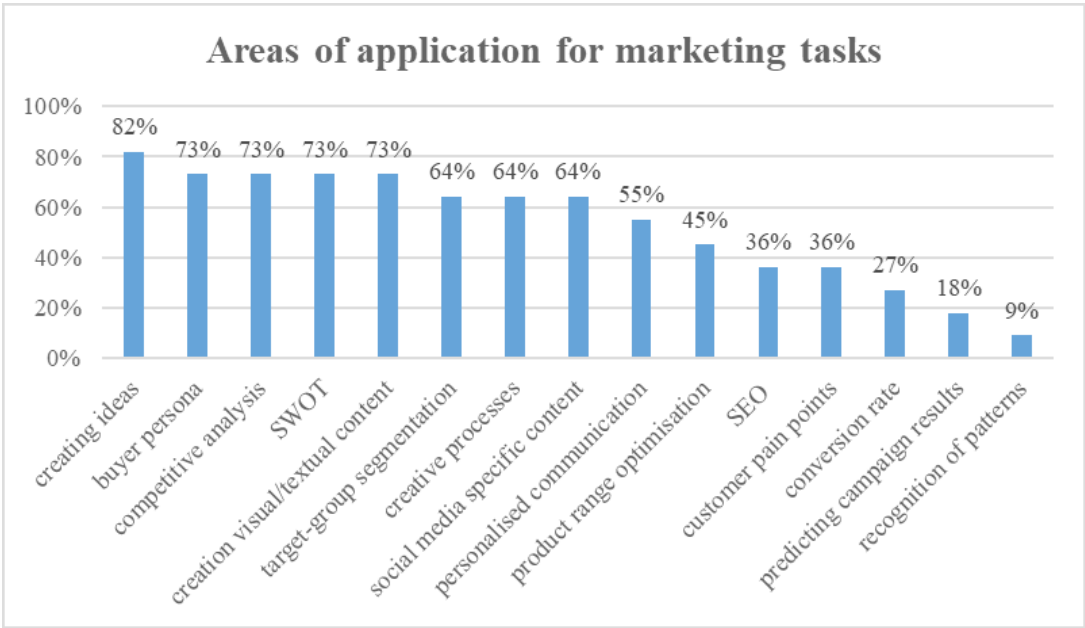


Fig. 3. Areas of GenAI use in marketing tasks among Peruvian entrepreneurs in Germany (Ehram, 2025)

As illustrated in Figure 4, the study also examined the key barriers to the utilization of GenAI. The most significant challenges experienced by participants are those related to quality concerns and limited access to suitable tools. This is in contrast to the few diaspora entrepreneurs who consider low personal and cultural resistance to be a significant challenge (Ehram 2025).

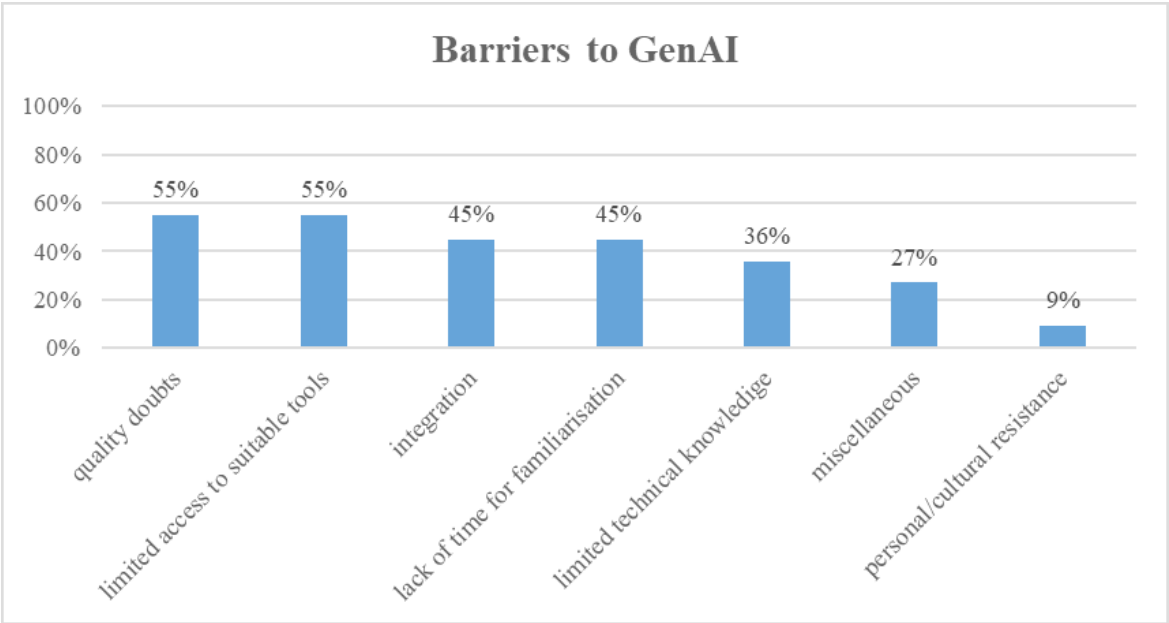


Fig. 4. Barriers to GenAI adoption among Peruvian entrepreneurs in Germany (Ehrsam, 2025)

Concerning the key competencies of diaspora entrepreneurs, Figure 5 demonstrates that 91% of respondents expressed a favorable opinion of their fundamental understanding of GenAI. Furthermore, an equal proportion of respondents stated that they utilize GenAI in a responsible manner, thereby signifying a commendable level of awareness concerning ethical and accountable practices. The level is almost equivalent, with 90% of the thinking being of a strategic nature.

In the domain of creative endeavors, a significant proportion of the participants have expressed high levels of satisfaction with their capabilities in the production of visual, textual, and video content, with 82% rating their proficiency in these domains as either good or very good. Furthermore, a substantial percentage of the participants, amounting to 82%, have also articulated a positive stance on continuous development and adaptability in the face of technological change. Furthermore, 81% of diaspora entrepreneurs evaluate their communication competence as strong, and 81% demonstrate a high level of confidence in understanding target groups.

With regard to the utilization of digital tools, 73% of participants expressed a high degree of confidence in their ability to competently operate them. Conversely, opinions regarding analytical abilities are more varied. A mere 54% of entrepreneurs rate their competence in analyzing data as good or very good (Ehrsam 2025).

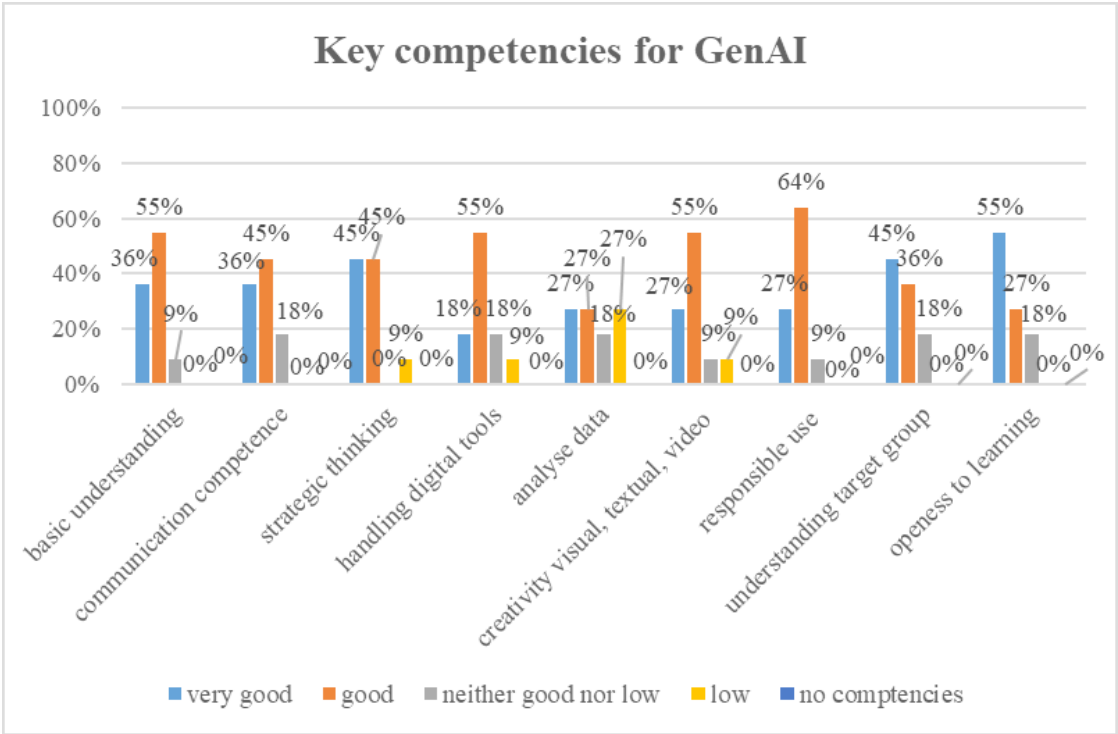


Fig. 5. Key competencies for GenAI among Peruvian entrepreneurs in Germany (Ehram, 2025).

DISCUSSION

With respect to the underlying motivations for adopting GenAI, 64% of Peruvian diaspora entrepreneurs identify efficiency gains as the dominant factor, thereby corroborating the findings of Dahm and Neuhaus (2025). The study’s findings underscore the efficacy of GenAI in enhancing both routine process execution and the handling of complex tasks. However, a discrepancy becomes apparent in the domain of innovation. While Dahm and Neuhaus (2025) emphasize the role of AI in enabling innovation, particularly in the development of new products and business models, Peruvian diaspora entrepreneurs in Germany do not primarily perceive GenAI as an innovation driver. While its relevance for business model development and market identification is acknowledged, this perception remains comparatively weaker.

Conversely, diaspora entrepreneurs evidently recognize the value of GenAI in the generation of ideas. This observation is consistent with the findings of BVDW (2025), which indicate that 88% of marketing agencies employ GenAI in ideation processes.

Concurrently, salient barriers persist, notably concerns regarding output quality and restricted access to appropriate tools. These results align with the findings of Hürtgen et al. (2024), who have identified significant concerns regarding the reliability and accuracy of AI-generated content.

From a capability perspective, the effective management of marketing-related information processes requires a combination of competencies, including technological literacy, strategic thinking, creative capabilities, data analytical skills, and a continuous learning orientation (Wecke 2024b). While Peruvian diaspora entrepreneurs demonstrate notable competencies in most of these domains, deficiencies persist in data analytical capabilities.

CONCLUSIONS

Individuals belonging to diaspora communities frequently exhibit a strong propensity to engage in entrepreneurial endeavors and demonstrate an aptitude for identifying business opportunities. Within the domain of marketing-related information systems, the integration of GenAI is anticipated to effect a transformation in processes, thereby engendering substantial performance enhancements. The potential applications of GenAI are extensive, encompassing domains such as research and strategy, product management, customer management, performance management, and marketing operations.

The Peruvian diaspora entrepreneurs in Germany is estimated to comprise approximately 30,000 individuals, of whom it is estimated that 900 are entrepreneurs. Their marketing activities are increasingly influenced by technological change and innovation, particularly driven by GenAI. The analysis yielded four key findings:

1. The primary motivation for Peruvian diaspora in Germany to adopt GenAI is efficiency gains.
2. The predominant application of GenAI is in the domain of idea generation.
3. The primary obstacles pertain to concerns regarding output quality and constrained access to appropriate tools.
4. With regard to competencies, Peruvian diaspora in Germany demonstrate a solid foundational understanding, use GenAI responsibly, and apply it for strategic purposes.

REFERENCES

- BITKOM, 2026. *Digitalisierung der Wirtschaft: Fast jedes Unternehmen beschäftigt sich mit KI* [online]. Available from: <https://www.bitkom.org/Presse/Presseinformation/Digitalisierung-der-Wirtschaft-Unternehmen-beschaeftigen-sich-mit-KI> [Accessed 23 March 2026].
- BOLZ, T., 2024. Generative KI: Relevanz und Modell für die Integration in Marketing und Sales. In: T. Bolz and G. Schuster, eds. *Generative Künstliche Intelligenz in Marketing und Sales – Innovative Unternehmenspraxis: Insights, Strategien und Impulse*. Wiesbaden: Springer Gabler, pp. 1–7.
- BRUHN, M., 2019. *Marketing: Grundlagen für Studium und Praxis*. 14th ed. Wiesbaden: Springer Gabler.
- BVDW, 2025. *Treiber der Transformation: Wie Agenturen generative KI nutzen*. Berlin: Bundesverband Digitale Wirtschaft.
- CÁCERES ROSELL, A., 2023. *Emprendimiento en el Perú: desafíos y retos* [online]. Available from: <https://www.elperuano.pe/noticia/231227-emprendimiento-en-el-peru-desafios-y-retos> [Accessed 23 March 2026].
- CHUI, M., HAZAN, E., ROBERTS, R., SINGLA, A., SMAJE, K., SUKHAREVSKY, A., YEE, L., ZEMMEL, R., 2023. *The economic potential of generative AI – The next productivity frontier* [online]. McKinsey & Company. Available from: <https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/the-economic-potential-of-generative-ai-the-next-productivity-frontier> [Accessed 6 March 2026].
- COHEN, R., 2008. *Global Diasporas: An Introduction*. 2nd ed. New York: Routledge.
- DAHM, M. H., NEUHAUS, U., 2025. Herausforderungen Künstliche Intelligenz und menschliche Freiheit. In: P. Altmiks, ed. *Soziale Marktwirtschaft und Freiheit – Analyse – Herausforderungen – Reformvorschläge*. Wiesbaden: Springer Gabler, pp. 121–147.
- EHRSAM, H., 2025. *Generative künstliche Intelligenz in der marktorientierten Unternehmensführung von Entrepreneuren mit Fokus auf Diaspora Entrepreneure aus Peru in Deutschland*. Unpublished master's thesis. Allensbach Hochschule.
- EUROPEAN UNION, 2018. *EntreComp: The Entrepreneurship Competence Framework*. Luxembourg: Publications Office of the European Union.
- FREILING, J., 2019. Leadership concepts for diaspora entrepreneurship. In: M. Elo and I. Minto-Coy, eds. *Diaspora Networks in International Business*. Cham: Springer Nature, pp. 323–336.
- FUEGLISTALLER, U., FUST, A., MÜLLER, C., MÜLLER, S., ZELLWEGGER, T., 2019. *Entrepreneurship: Modell – Umsetzung – Perspektiven*. 5th ed. Wiesbaden: Springer Gabler, 2019.
- HÜRTGEN, H., KEUTEL, M., SOMMER, G., 2024. Die nächste Revolution. In: F. Sängler and M. Jacob, eds. *Die nächste Revolution – Game Changer GenAI: Wie der Einzelhandel von generativer künstlicher Intelligenz profitiert*. Akzente, No. 1/2024. Consumer Industries & Retail Group, McKinsey & Company.
- IPSOS, 2021. *Emprendimiento – en tiempo de pandemia* [online]. Available from: https://www.ipsos.com/sites/default/files/ct/news/documents/2021-01/ipsos_emprendimiento_en_tiempos_de_pandemia_-_enero_2021.pdf [Accessed 5 March 2026].
- KOTLER, P., KELLER, K. L., BLIEMEL, F., 2007. *Marketing-Management*. 12th ed. München: Pearson.
- KRCMAR, H., 2015. *Informationsmanagement*. 6th ed. Berlin: Springer Gabler.
- KRIEDEL, R., 2017. *Systemkompetenz für Entrepreneure*. Wiesbaden: Springer Gabler.
- KUSETOGULLARI, A., KUSETOGULLARI, H., ANDERSSON, M., GORSHECK, T., 2025. *GenAI in Entrepreneurship – a systemic review of generative artificial intelligence in entrepreneurship research: Current issues and future directions*. Working Paper 2025:73. Swedish Entrepreneurship Forum [online]. 2025. Available from: https://entreprenorskapsforum.se/wp-content/uploads/2025/05/WP_73.pdf [Accessed 5 March 2026].

- LEMBERGER, K., EIBISCH, M., 2024. Wie generative KI Kreativprozesse und Content-Erstellung im Marketing beschleunigt: Ein Beispiel aus der IT-Branche. In: BITKOM, ed. *Künstliche Intelligenz im digitalen Marketing – Whitepaper*. Berlin: BITKOM, pp. 37–38.
- MEFFERT, H., BURMANN, C., KIRCHGEORG, M., EISENBEISS, M., 2024. *Marketing: Grundlagen marktorientierter Unternehmensführung*. 14th ed. Wiesbaden: Springer Gabler, 2024.
- RANA, M. B., NIPA, F. S., 2019. Entrepreneurship in an institutionally distant context: Bangladeshi diaspora entrepreneurs in Denmark. In: M. Elo and I. Minto-Coy, eds. *Diaspora Networks in International Business*. Cham: Springer Nature, pp. 529–555.
- RUBERA, G., LI, W., HULLAND, J., 2025. Generative artificial intelligence: Marketing's death knell or ringing in a new era? *Journal of the Academy of Marketing Science*, 2025, Vol. 53, pp. 673–676.
- SAS INSTITUTE, 2024. *Marketers and GenAI: Diving Into the Shallow End* [online]. Available from: <https://www.sas.com/content/dam/SAS/documents/marketing-whitepapers-ebooks/ebooks/en/gen-ai-for-marketers-research-report-114003.pdf> [Accessed 5 March 2026].
- SCARPA, P. F., LEON, H., PÉREZ MOIÑO, J., 2024. *Accelerating AI-Driven Marketing Maturity* [online]. Boston Consulting Group. Available from: <https://www.bcg.com/publications/2024/accelerating-ai-driven-marketing-maturity> [Accessed 6 March 2026].
- STATISTISCHES BUNDESAMT, 2026. *Nutzung von IKT in Unternehmen* [online]. Available from: <https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Unternehmen/IKT-in-Unternehmen-IKT-Branche/IKT-U-Erhebung/info.html> [Accessed 5 March 2026].
- THERE'S AN AI FOR THAT, 2026. *There's An AI For That* [online]. Available from: <https://theresanaiforthat.com> [Accessed 23 March 2026].
- VANORE, M., 2018. *Diaspora als Impulsgeberin für Entwicklung* [online]. Bundeszentrale für politische Bildung. Available from: <https://www.bpb.de/themen/migration-integration/kurzdossiers/migration-und-entwicklung/262806/diaspora-als-impulsgeberin-fuer-entwicklung/> [Accessed 5 March 2026].
- WECKE, B., 2024a. *Wachstum durch den Einsatz von generativer KI – Funktionsweise und Anwendungsgebiete im Marketing*. Wiesbaden: Springer Gabler.
- WECKE, B., 2024b. *Generative KI als neues Teammitglied im Marketing – Ein Leitfaden für Marketingmanager:innen*. Wiesbaden: Springer Gabler.

ГЕНЕРАТИВЕН ИЗКУСТВЕН ИНТЕЛЕКТ В ПРЕДПРИЕМАЧЕСКИТЕ ИНФОРМАЦИОННИ ПРОЦЕСИ: УПРАВЛЕНИЕ НА МАРКЕТИНГОВАТА ИНФОРМАЦИЯ СРЕД ПРЕДПРИЕМАЧИТЕ ОТ ДИАСПОРАТА

Резюме: Статията разглежда как предприемачите могат да използват генеративен изкуствен интелект (GenAI) в своите маркетингови информационни процеси. Изследването е мотивирано от нарастващото внимание към ChatGPT на OpenAI и широките дискусии относно последиците от тази технология. Целта е да се представи преглед на влиянието на GenAI върху маркетинговите процеси в предприемаческа среда. Проучването се базира на академична литература и анкета сред перуански предприемачи в Германия. Анализирани са мотивите за използване, областите на приложение, както и свързаните с това бариери и компетенции. Резултатите показват, че GenAI се използва основно за повишаване на ефективността, разработване на бизнес модели и идентифициране на възможности. Основните приложения са в творчески и планови задачи, особено в генерирането на идеи. Ограниченията са свързани с качеството, точността и липсата на определени умения. Въпреки общо силните компетенции, ограниченото доверие в анализа на данни остава ключово предизвикателство.

Ключови думи: информационни процеси; предприемачество; маркетингова информация; генеративен изкуствен интелект (GenAI); перуанска диаспора

Холгер Валтер Ерзам, докторант
Университет по библиотекознание и информационни технологии
София, България
E-mail: Holger_Ehrsam@yahoo.de

ОБЩЕСТВЕНИ КОМУНИКАЦИИ И ИНФОРМАЦИОННИ НАУКИ
PUBLIC COMMUNICATIONS AND INFORMATION SCIENCES

**MANAGEMENT OF INFORMATION AND KNOWLEDGE IN PUBLIC
R&D SPENDING AND PRIVATE INVESTMENT**

Nico Frisch

University of Library Studies and Information Technologies

<https://doi.org/10.70300/XPUJ2147>

Abstract: *This paper examines whether government spending on research and development (R&D) crowds out or stimulates private investment in Germany. While traditional economic perspectives emphasize displacement effects arising from funding competition, alternative theoretical frameworks suggest that public R&D can complement private investment by reducing uncertainty, improving efficiency, and expanding technological opportunities. In particular, state-funded basic research appears to support corporate innovation by providing foundational knowledge on which private investment can build. The analysis combines a conceptual discussion of crowding-out and crowding-in mechanisms with a descriptive examination of long-term trends in public and private R&D expenditures from 2000 to 2023. Beyond its macroeconomic perspective, the study contributes to the broader academic discourse on knowledge creation, dissemination, and utilization. By examining the role of public research funding as a catalyst for knowledge generation and innovation, the paper highlights the importance of institutional frameworks that transform scientific knowledge into economic and societal value. The findings indicate that public research investment functions as growth-enhancing capital formation rather than a substitute for private activity.*

Keywords: *Public R&D Spending; Private Investment; Crowding-In Effect; Innovation Policy; Endogenous Growth*

INTRODUCTION

A fundamental controversy in classical macroeconomic theory concerns the examination of the effect of government spending on private investment behavior. In neoclassical models, government spending acts as a primary disruptive factor for private investment, while Keynesian theory and endogenous growth theory postulate a stabilizing and stimulating effect in this context (Keynes 1936; Romer 1990). The form of government spending remains of crucial importance in this analysis, with investment in research and development (R&D) in particular having a complementary effect on private investment rather than crowding it out. This article analyzes the crowding-in effect in the context of government spending on R&D in relation to the funding structure of the Federal Republic of Germany (FRG). The central thesis of this article is that government funding in the field of basic research performs an incubation function that positively stimulates private investment. Due to the high level of uncertainty and (financial) risk, this private investment may not materialize without government start-up funding.

This topic examines the role of information, knowledge, innovation, and institutional structures in modern society. Public investment in research not only generates scientific knowledge but also facilitates its dissemination and transformation into technological and economic progress. Consequently, the interaction between public and private R&D investments can be understood as an important mechanism within knowledge-based economies.

In the classic crowding-out theory, government spending leads to rising interest rates, which in turn suppresses private investment. The assumption here is that public spending cannot generate independent productivity effects and is substitutable for private investment (Modigliani 1961; Barro 1974). In the context of the possible long-term impact of government spending on R&D, this analysis is theoretically limited.

The objective of this article is to systematically present the theoretical mechanisms of government R&D spending and to link them to empirical evidence from Germany. On a methodological

level, the article combines an analysis of the underlying theoretical framework with a descriptive evaluation of time series data on public and private R&D investment in Germany for the period from 2000 to 2023. The economic added value of the article lies in its integrated consideration of crowding-out and crowding-in effects in the area of government research funding and the derivation of policy implications for productivity-oriented fiscal measures.

RESEARCH METHODOLOGY

The research adopts a mixed conceptual–descriptive methodology, integrating a theoretical review of macroeconomic models with a descriptive analysis of official longitudinal secondary data on German public and private R&D expenditures. In order to achieve the objective of this article, it is necessary to examine the theoretical foundations of the mechanisms of government spending and private investment as a starting point for investigating crowding-out and crowding-in effects. The theoretical assessment depends to a large extent on macroeconomic model assumptions. In classical crowding-out theory, government spending leads to rising interest rates, which suppresses private investment. The assumption here is that public spending cannot generate independent productivity effects and is substitutable for private investment (Modigliani 1961; Barro 1974). This condition is met when the state invests in infrastructure that has a complementary effect on productivity, such as transport infrastructure, energy supply, research and development (R&D), and education. This is complemented by investment in innovative areas that promote technological development. Accordingly, public spending must generate non-rivalrous knowledge (basic research), as this knowledge can be used by multiple actors and is not subject to consumption, thereby increasing productivity (Barro 1990; Romer 1990). Against this backdrop, government investment in R&D plays a prominent role, as it is a key driver of innovation. The differences between these theoretical foundations are essential when analyzing crowding-out and crowding-in effects in the context of government R&D investment, as the factors of knowledge, innovation, and technical development cannot be integrated into the classical assumptions of a perfect market. In the context of the possible long-term impact of government spending on R&D, this assumption is theoretically limited.

RESULTS

At the heart of neoclassical theory is the assumption of limited capital supply. In this view, government investment increases the demand for savings, resulting in rising interest rates, which crowd out private investment. This assumption presupposes the logic of efficient financial markets in which capital can be transferred with complete mobility (without regulations, information asymmetries, and transaction costs) and the factors of production (labor, capital, land) are utilized optimally (Barro 1989; Mankiw 2019). In this view, the state and the private sector compete for the same limited resources, with an asymmetric distribution of these resources leading to a decline in investment by the other side. Taking modern economic relationships into account, this theoretical construct is only of limited significance. Demand-centered Keynesian theory also addresses market imperfections caused by uncertainties and the expectations of market participants (Keynes 1936). This view assumes that government spending (in productive areas) stabilizes demand in times of crisis and, at the same time, can stimulate private investment behavior by expanding production capacities through technological development (e.g., through R&D investments) and capital utilization. In addition, rising demand cultivates expectations in the private sector regarding the profitability of investment projects, which can lead to a crowding-in effect (DeLong & Summers 2012). Furthermore, this assumption is extended in the models of endogenous growth theory in the form of a long-term supply mechanism. Furthermore, technological development is not exogenous, but rather the result of targeted promotion through investment in knowledge, research, and human capital. In this context, government spending has an incubating effect on private investment by reducing uncertainty and shortening learning processes (e.g., in resource-intensive basic research) (Romer 1990; Bloom et al. 2019). It can therefore be concluded that government spending in productive areas such as R&D goes beyond short-term demand impulses and can generate long-term productivity gains.

Figure 1 illustrates the relationship between government spending (G1 and G2) and private investment (P1 and P2) in the context of the crowding-out and crowding-in effects.

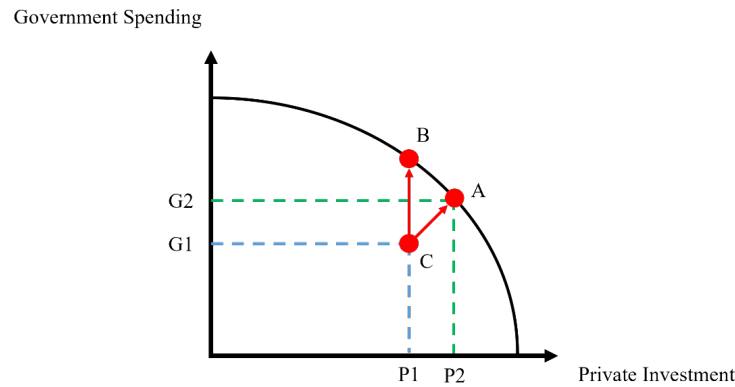


Fig. 1. Crowding-out versus crowding-in effects of government spending.
Source: Own illustration according to Keynes (1936) and Blanchard (2019).

Point C in the figure represents underutilization of production capacity, with government spending activating unused resources and thus not causing any crowding out. This situation corresponds to the description in Keynesian theory. The falling curve in the figure represents the analytical framework assuming a competitive relationship between government and private investment (crowding out). Point A describes the situation of targeted government investment that complements the private sector. This investment, particularly in infrastructure, knowledge, and human capital, generates an expansion of production capacity to the outer curve (crowding-in). Based on the summary representation of the relationship between government and private investment, it can be concluded that budgetary discipline in modern economies should not be set statically by regulatory authorities but should be dynamically geared towards long-term productivity gains.

Reducing uncertainty is a key feature of crowding-in effects. Uncertainty and information asymmetry are particularly pronounced in basic research, as this area involves significantly high costs. Furthermore, this is accompanied by constant uncertainty about the commercial use of the corresponding research results, as the focus of this orientation is not primarily application oriented. In this context, there is a significant risk for private investment in financing basic research (Dixit & Pindyck 1994). Government spending on R&D and infrastructure projects can be interpreted as providing impetus through political support in these areas. This impetus can reduce uncertainty for the private sector and create planning security with regard to investment strategies. (Rodrik 2008; Bloom et al. 2019). At the same time, government activity expands the technological possibilities within which private actors can identify profitable projects.

The prominent role of public R&D funding in this article stems from the economic characteristics of knowledge and expertise as factors of production. The knowledge generated does not compete with other knowledge and expands through dissemination. However, the social benefits cannot be fully internalized by private actors (Arrow 1962; Nelson 1959). For this reason, without government involvement, market failure would result from underinvestment in cost-intensive basic research and the resulting follow-up funding for application-oriented research projects. In this context, government spending does not constitute direct market intervention, but rather a correction of an imperfect market (Stiglitz 1989). This fact illustrates the complementary effect of government investment in R&D and the possible existence of a presumed crowding-in effect in this context.

In addition to promoting stability and reducing uncertainty, public R&D funding also generates knowledge spillovers that extend beyond institutional and sectoral boundaries, leading – particularly in private-sector firms – to new insights and processes, as well as a skilled workforce, without these actors having to bear the costs of generating this knowledge (Griliches 1992; Jones & Williams 1998). Furthermore, government funding programs lower barriers to market entry through

open infrastructures and accessible research results, making it easier for companies to engage in innovative activities (Audretsch & Keilbach 2007). This is of central importance, particularly for attracting investors and increasing a location’s attractiveness, and it fosters greater competition. In summary, these mechanisms imply a strategic complementary relationship between government and private R&D investments. By reducing uncertainties, information asymmetries, and risks, government R&D investments lower barriers to entry and act as a catalyst for private investment strategies, which result in technological development and productivity gains at the macroeconomic level (Aghion et al. 2015; Mazzucato 2018). Therefore, under appropriate institutional conditions, a complementary relationship can be assumed to give rise to a stable crowding-in effect that supports long-term growth and technological dynamism.

In order to place these theoretical principles in an empirical context, the analysis in this article is based on the evaluation of time series from statistical surveys conducted by the German Federal Statistical Office (Destatis). The underlying data sets contain government and private investment in R&D for the period from 2000 to 2023. The two-time series are compared and contrasted to illustrate the assumed dynamics and a possible complementary relationship. For visual orientation, these compared time series are presented graphically. The aim of this analysis is to examine in a descriptive manner whether volatile phases are reflected in both curves and to provide an indication of a connection in the context of the crowding-in effect. Nevertheless, it should be noted at this point that the empirical evaluation in this article, based on the Destatis survey, cannot claim to establish a causal relationship. This data basis is summarized and compared in Table 1.

*Table 1. Comparison of Public vs. Private R&D-Investment.
Own representation according to Destatis (2024).*

Year	Public R&D-Investment (in € thousand)	Private R&D-Investment (in € thousand)
2000	50.825	34.333
2001	53.500	35.095
2002	55.300	35.904
2003	56.100	38.060
2004	57.100	38.394
2005	55.897	39.569
2006	61.000	42.281
2007	63.800	43.768
2008	67.600	46.890
2009	69.700	46.019
2010	70.014	47.409
2011	75.569	51.448
2012	79.110	54.109
2013	79.730	54.569
2014	84.246	58.115
2015	88.782	60.940
2016	92.174	61.673
2017	99.554	69.066
2018	104.669	72.662
2019	110.025	75.288
2020	106.583	70.627
2021	113.184	77.601
2022	121.421	83.422
2023	129.676	88.707

A comparison of the time series for public and private R&D investment (see Table 1) already provides compelling arguments that support the theoretical assumptions. Across the time series, government spending had a stabilizing effect even during the crisis years 2007 to 2009 (global economic crisis) and 2020 to 2022 (COVID-19 pandemic and energy crisis). This is evident from the increase in spending on both sides, without any suggestion of crowding out. Based on the significant increases in private investment, it can be inferred that public spending has a positive impact on the return expectations of the other side. This fact confirms Romer's theory (1990). In addition, the graphical comparison of the time series examined illustrates the complementary relationship (see Figure 2).

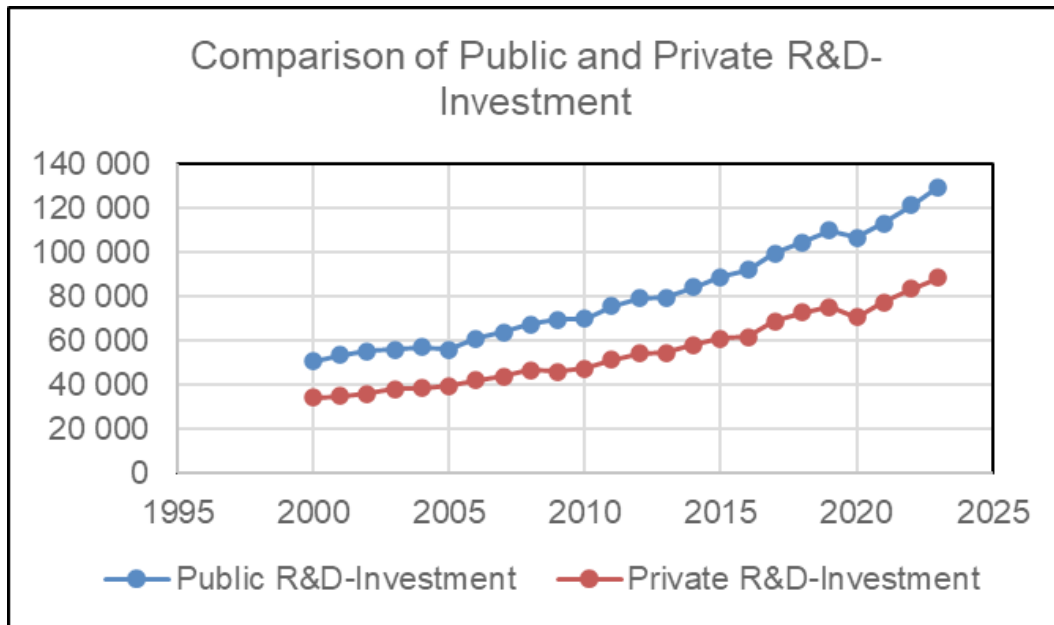


Fig. 2. Comparison of Public vs. Private R&D-Investment.
Own illustration according to Destatis (2024).

The graphical representation of these time series shows an almost identical trend in these investment volumes. Instead of displacement, this empirical analysis of investments between 2000 and 2023 shows that the increase in private investment is complementary to public spending in the area of R&D. This fact provides descriptive evidence to support the hypothesis of the existence of a crowding-in effect.

Based on the data, it can be assumed that the German funding structure for the research landscape fulfills the appropriate institutional conditions that provide a platform for further private capital commitment. Government investment in R&D does not replace private research funding, but rather expands it by providing or kick-starting research infrastructure and human capital. This empirical contextualization supports the theoretical considerations and provides a basis for assuming a crowding-in effect of government research investment.

Due to the heterogeneous nature of the German research landscape, a differentiated analysis of R&D investments is necessary for a comprehensive empirical classification of the underlying theoretical assumptions about the crowding-in effect. The structure of German research funding is characterized by a division of labor between basic research, which is predominantly funded by the government, and private investment in application-oriented research projects (BMBF 2022; OECD 2023). This innovation system is designed to generate knowledge and support it in a targeted manner through diffusion, so that government investment does not compete with private investment (Mazzucato 2013).

As the central channel for government R&D investment, knowledge transfer is the key mechanism for commercially exploiting knowledge generated through research collaborations, joint projects, spin-offs, and licenses. This multiplies the positive effect of this government spending in the overall economic context (Audretsch & Keilbach 2007). This transfer mechanism accelerates innovation cycles and improves investment conditions and returns expectations for private actors.

DISCUSSION

This article combines theoretical principles with empirical surveys on public and private research funding. By comparing the time series, the theoretical aspects can be reinforced, thereby consolidating the considerations on the connection between the crowding-in effect. However, the study in this article reaches the limits of its significance because the data series are heavily aggregated and individual funding structures remain unaffected by the heterogeneity of the German research landscape. The main finding is that no decline in private investment can be observed on the basis of rising government spending on R&D. Further studies comparing similar time series from different countries and periods and combining more advanced analytical approaches may demonstrate a causal relationship between the reciprocal effect of public R&D expenditure and private capital formation.

Nevertheless, the empirical analysis in this article contradicts the assumption that government investment in research systematically displaces private activity and supports the thesis of a complementary relationship between these actors. The central argument is based on the imperfection of financial markets, whereby further analysis of the structure of endogenous money creation by financial institutions in the context of debt-financed government spending on R&D can generate additional insights in this regard. Particularly exposed in this context is the government's ability to use public funding to achieve productivity gains in the context of technological development, which can be driven by research.

By examining the total factor productivity indicator in the context of the work of Bloom et al. (2019), it can be shown that the positive effects of government research funding on economic growth occur with a time lag. In addition to the level of public funding, the aspect of planning security is a decisive factor in the private sector's assessment, enabling it to derive its own investment strategies. This correlation must be internalized by political decision-makers in order to adopt funding strategies that not only generate short-term momentum but also pursue long-term growth and enable anticipation by the private sector.

In the overall context, the findings compared in this discussion confirm that the theoretical assumption of a complementary relationship between public and private investment in R&D corresponds to the crowding-in effect. Accordingly, a purely quantitative limitation of public decision-making in the context of R&D funding is an analytically simplified representation. In this context, the quality of institutional support, planning security, and the stability of support programs are of essential importance. This connection represents a key argument for the design of a productivity-oriented fiscal policy.

Based on the findings, far-reaching implications for the political design of fiscal decision-making can be derived. In the basic understanding of endogenous growth theory, government investment in research is not classified as consumptive expenditure, but as a form of productive capital commitment in the areas of knowledge, human capital, and (research) infrastructure. These government investments have long-term effects that have a positive impact on productivity (Romer 1990). Contrary to this logic, political decision-making on fiscal measures is restrictive. Furthermore, there is a debate within European countries about restricting productive investment through strict deficit limits and spending restrictions (Truger 2015). In this context, the lack of innovation and economic growth should also be quantified as opportunity costs in the context of political decision-making. Furthermore, the narrative in political discourse needs to be rethought, as the basic assumptions underlying fiscal strategy decision-making are often based on analytically simplistic assumptions and consider spending to be negative based on its volume.

The planning security and assessment of the stability of the government support structure by the private sector, as already described, goes hand in hand with return expectations and productivity gains. These premises are necessary for a crowding-in effect (Bloom et al. 2019). Governments should therefore design sound spending policies that are not only based on avoiding debt and declining expenditure but also convey certainty.

These implications are rounded off by the need for institutional quality on the part of the authorities (bureaucracy reduction) and transparency of processes, for example in the allocation of

funding programs. A credible innovation policy therefore requires stable funding commitments that extend beyond political election cycles. Multi-year budget frameworks, institutionally secured basic funding for public research institutions, and transparent funding mechanisms are key instruments for this (Edler & Fagerberg 2017; Rodrik 2008). Simply increasing spending without targeted use of funding through efficient institutional structures can distort the crowding-in effect. A reduction in public R&D funding can significantly impair long-term growth opportunities and weaken international competitiveness (Mazzucato 2013).

Finally, when considering the political implications of the findings in this article, it should be noted that government R&D investments should play a prominent role in fiscal policy. They should not be interpreted as expenditures that reduce success, but rather as strategic investments in technological development and productivity gains, which are the determinants of economic growth. The complementary relationship surrounding the existence of crowding-in effects should be internalized in the political debate in this context.

CONCLUSION

The aim of this article was to present the theoretical foundations of the mechanisms of action of government spending on R&D in relation to private investment and to analyze them empirically. The focus of this study is the question of whether government spending on R&D crowds out or stimulates private investment in this sector. The starting point for this discussion is the crowding-out or crowding-in effect. To answer this question, this article combines a presentation of the theoretical foundations with an analysis of empirical surveys conducted by the Federal Statistical Office. Based on neoclassical theory, rising government spending leads to a crowding out of private investment, while Keynesian models and endogenous growth theory open up an analytical framework in which public investment in productivity-enhancing areas can stimulate private engagement.

Analysis of the theoretical principles has shown that government spending on R&D plays a prominent role in the assessment of the crowding-out and crowding-in theorems, since the generation of knowledge as a factor of production is not rivalrous and cannot be fully internalized by private actors. Thus, under certain conditions, government spending does not constitute a substitute intervention in the market. Under certain circumstances, it merely serves to compensate for allocation problems that may result from market failure. In this context, the reduction of uncertainty and the provision of research infrastructure are of essential importance, creating a complementary relationship with private investment. They thus form a central channel for long-term productivity gains and technological progress.

The theoretical assumptions are confirmed by the analysis of data series on public and private R&D investment in Germany for the period from 2000 to 2023. The development trends of these two variables show a significant increase overall, and the almost parallel curves in the graphical representation (Figure 2) suggest a crowding-in relationship. Analysis of this empirical data points to a complementary relationship between public and private R&D investment, which rules out the crowding-out hypothesis in this area. Nevertheless, it should be noted that the underlying data does not describe a causal relationship, but it does contradict the assumption that rising public R&D spending crowds out private investment. From a broader perspective, the article makes it clear that restrictive spending should not be understood primarily as a quantitative limitation on government spending, but rather as a qualitative focus on productive and growth-promoting investments. Qualitative conditions such as institutional efficiency, planning security for the private sector, and the reduction of uncertainties are crucial for this complementary relationship.

In conclusion, it can be said that in the area of R&D investment, there is a complementary relationship between the state and private investors, which supports the crowding-in theory. This finding can serve to adjust fiscal policy strategy by being internalized in the decision-making process of political actors. Further investigation of data series and econometric analyses that can build on this point to provide evidence-based proof of a causal relationship would generate added value for the economic sciences.

REFERENCES

- AGHION et al., 2015. Innovation and Top Income Inequality. *Review of Economic Studies* 86 (1): 1–45.
- ARROW, K. J., 1962. Economic Welfare and the Allocation of Resources for Invention. In: *The Rate and Direction of Inventive Activity*, edited by Richard R. Nelson, 609–626. Princeton, NJ: Princeton University Press.
- AUDRETSCH, D. B.; KEILBACH, Max, 2007. The Theory of Knowledge Spillover Entrepreneurship. *Journal of Management Studies* 44 (7): 1242–1254.
- BARRO, R. J., 1974. Are Government Bonds Net Wealth? *Journal of Political Economy* 82 (6): 1095–1117.
- BARRO, R. J., 1989. The Ricardian Approach to Budget Deficits. *Journal of Economic Perspectives* 3 (2): 37–54.
- BARRO, R. J., 1990. Government Spending in a Simple Model of Endogenous Growth. *Journal of Political Economy* 98 (5): S103–S125.
- BLANCHARD, O., 2019. *Public Debt and Low Interest Rates*. American Economic Association Presidential Address.
- BLOOM, N.; Van REENEN, J.; WILLIAMS, H., 2019. A Toolkit of Policies to Promote Innovation. *Journal of Economic Perspectives* 33 (3): 163–184.
- Bundesministerium für Bildung und Forschung (BMBF), 2022. Bundesbericht Forschung und Innovation. Berlin.
- DeLONG, J.; SUMMERS, L. H., 2012. Fiscal Policy in a Depressed Economy. *Brookings Papers on Economic Activity* 2012 (Spring): 233–297.
- DIXIT, A. K.; PINDYCK, R. S., 1994. *Investment under Uncertainty*. Princeton, NJ: Princeton University Press.
- EDLER, J.; FAGERBERG, J., 2017. Innovation Policy: What, Why, and How. *Oxford Review of Economic Policy* 33 (1): 2–23.
- GRILICHES, Z., 1992. The Search for R&D Spillovers. *Scandinavian Journal of Economics* 94 (Supplement): S29–S47.
- JONES, C. I.; WILLIAMS, J. C., 1998. Measuring the Social Return to R&D. *Quarterly Journal of Economics* 113 (4): 1119–1135.
- KEYNES, J. M., 1936. *The General Theory of Employment, Interest and Money*. London: Macmillan.
- MANKIW, N., 2019. *Macroeconomics*. 10th ed. New York: Worth Publishers.
- MAZZUCATO, M., 2013. *The Entrepreneurial State*. London: Anthem Press.
- MAZZUCATO, M., 2018. *The Value of Everything*. London: Allen Lane.
- MODIGLIANI, F., 1961. Long-Run Implications of Alternative Fiscal Policies. *Economic Journal* 71 (284): 730–755.
- NELSON, R. R., 1959. The Simple Economics of Basic Scientific Research. *Journal of Political Economy* 67 (3): 297–306.
- OECD. 2023. *Main Science and Technology Indicators*. Paris.
- RODRIK, D., 2008. Industrial Policy: Don't Ask Why, Ask How. *Middle East Development Journal* 1 (1): 1–29.
- ROMER, P. M., 1990. Endogenous Technological Change. *Journal of Political Economy* 98 (5): S71–S102.
- Statistisches Bundesamt (Destatis). 2024. Private and Public Expenditure on Research and Development in Germany, 1999–2023. Wiesbaden.
- STIGLITZ, J. E., 1989. Markets, Market Failures, and Development. *American Economic Review* 79 (2): 197–203.
- TRUGER, A., 2015. Implementing the Golden Rule for Public Investment. *International Journal of Public Policy* 11 (1–2): 16–31.

УПРАВЛЕНИЕ НА ИНФОРМАЦИЯТА И ЗНАНИЯТА В ОБЛАСТТА НА ПУБЛИЧНИТЕ РАЗХОДИ ЗА НАУЧНИ ИЗСЛЕДВАНИЯ И РАЗВИТИЕ И ЧАСТНИТЕ ИНВЕСТИЦИИ

Резюме: В настоящата статия се разглежда дали държавните разходи за научноизследователска и развойна дейност (R&D) изместват, или стимулират частните инвестиции в Германия. Докато традиционните икономически подходи наблягат на ефектите на изместване, произтичащи от конкуренцията за финансиране, алтернативни теоретични модели сочат, че публичните R&D могат да допълват частните инвестиции, като намаляват несигурността, подобряват ефективността и разширяват технологичните възможности. По-конкретно, финансираните от държавата фундаментални научни изследвания, изглежда, подкрепят корпоративните иновации, като предоставят основополагащи знания, върху които могат да се надграждат частните инвестиции. Анализът съчетава концептуално обсъждане на механизмите на изместване и привличане с

описателно проучване на дългосрочните тенденции в публичните и частните разходи за R&D от 2000 до 2023 г. Отвъд макроикономическата си перспектива, изследването допринася за по-широк академичен дискурс относно създаването, разпространението и използването на знания. Чрез разглеждане на ролята на публичното финансиране на научните изследвания като катализатор за генериране на знания и иновации статията подчертава значението на институционалните рамки, които превръщат научните знания в икономическа и обществена стойност. Резултатите показват, че публичните инвестиции в научни изследвания функционират като капиталобразуване, стимулиращо растежа, а не като заместител на частната дейност.

Ключови думи: държавни разходи; научноизследователска дейност; развойна дейност; частни инвестиции; ефект на привличане; иновационна политика; ендогенен растеж

Нико Фриш, докторант

Researcher ID (ORCID: 0009-0009-1047-1352)

Университет по библиотекознание и информационни технологии

E-mail: nico.frisch@outlook.de

ОБЩЕСТВЕНИ КОМУНИКАЦИИ И ИНФОРМАЦИОННИ НАУКИ
PUBLIC COMMUNICATIONS AND INFORMATION SCIENCES

**IMPLEMENTING EFFECTIVE COMMUNICATION STRATEGIES
TO ADDRESS THE SHORTAGE OF NURSES**

Jale Yilmazer

University of Library Studies and Information Technologies

<https://doi.org/10.70300/YENE5700>

Abstract: *The ever-worsening shortage of nursing staff is presenting the German healthcare system with far-reaching structural, organizational and staffing challenges. Against this backdrop, the international recruitment of nursing staff is becoming increasingly important. The population is ageing and there is a sustained increase in the demand for care. Consequently, the German healthcare system must overcome further new challenges in order to integrate recruited nursing staff into care facilities (Kathy Krüger 2017). This paper examines effective communication strategies for addressing the shortage of skilled nursing staff. As part of the study, interviews conducted by the author are analyzed and evaluated on a scientific basis with regard to the professional integration of foreign nursing staff.*

Keywords: *communication; recruitment; integration; international nursing staff; intercultural competence; multifocus; intercultural diversity*

INTRODUCTION

The shortage of nursing staff is one of the key and, at the same time, most persistent challenges facing modern healthcare systems, and has been the subject of intensive debate in the health and nursing sciences literature for several years. Despite numerous political reform initiatives, structural adjustments and a wide range of programs aimed at recruiting and retaining staff, the staffing situation in many care settings has not stabilized in the long term. On the contrary, numerous analyses reveal a continuing – and in some cases worsening – discrepancy between the rising demand for care and the number of qualified nursing staff available. (Hradecky, Sander 2024)

This is due to multifactorial developments encompassing demographic, labor market-related and organizational structural dimensions.

Against this backdrop, people from overseas backgrounds are increasingly being integrated into the care sector in Germany, and international recruitment measures are also being implemented. Integrating foreign care professionals with a migrant background who are already living in Germany is often easier than recruiting skilled workers from abroad. (Press Release 21 2025)

It is now recognized that a sustainable solution to the shortage of skilled workers goes far beyond simply recruiting staff from abroad. In addition to recruitment, retaining staff within one's own organization or company in the long term plays a particularly crucial role.

The complex processes – ranging from international recruitment, through recognition procedures and language training, to structural and cultural integration – require systematic and holistic working processes. Only through a coordinated approach can successful integration, stable collaboration and the long-term retention of nursing staff be guaranteed.

Communication processes, intercultural diversity management and organizational support structures play a central role in this regard. Intensive induction programs and transparent mentoring structures can be established as accompanying measures. These measures certainly entail additional staffing and financial resources.

However, one short-term benefit is the stabilization of staffing levels. In the long term, these measures open up opportunities for innovation, diversity of perspectives and improved problem-solving capabilities within the organization.

Overall, it can be concluded that the professional integration of foreign nursing staff requires a multidimensional and interdisciplinary strategy.

Against this backdrop, the integration of international nursing staff into care settings should not be viewed solely as a short-term solution to existing staff shortages, but rather as a long-term development task. Integration forms a central building block for ensuring stable, high-quality and resilient care provision in the context of demographic change and increasing systemic complexity.

This publication, or academic study, addresses this issue directly by systematically analyzing the significance and role of effective communication strategies and structures in the context of the recruitment, integration and retention of international nursing staff. The focus of the study is on the extent to which communicative processes, as a strategic management tool, can contribute to successful integration.

Following a review of the current state of research, the paper concludes by analyzing the associated structural and organizational challenges within the healthcare sector. The aim is to provide a scholarly context for the topic, to identify existing challenges and to highlight the relevance of the study against the backdrop of current developments.

RESEARCH METHODOLOGY

This academic publication is based on a systematic analysis of the literature and relevant documents, in which existing academic findings and relevant information were evaluated.

In addition, legal and institutional frameworks are taken into account, particularly with regard to the recognition of foreign professional qualifications, provisions under migration law, and labor law requirements in the healthcare sector.

The analysis is supplemented by expert interviews to gain a deeper understanding of the findings from practical experience. The qualitative data collected is analyzed on the basis of four key aspects. The following categories have been identified:

1. Communication processes in the context of international recruitment,
2. Linguistic and intercultural barriers to integration,
3. Organizational support and information structures, and
4. Factors contributing to the long-term retention of international nursing staff.

The chosen methodology thus enables a plausible and comprehensible holistic examination of the research subject.

RESULTS

The international recruitment process for nursing staff requires, in particular, clearly structured, transparent, target-group-specific and legally binding information. The quality of this information is a key prerequisite for managing complex decision-making processes in the context of cross-border recruitment. In particular, the reliability and traceability of the information communicated – for example, regarding recognition procedures, the framework of employment law, remuneration structures, career development opportunities and integration support – have a significant influence on the decision-making of all stakeholders involved.

For healthcare institutions and their management, communication serves as a strategic management tool in human resources management. In this context, managers make far-reaching decisions regarding whether, and to what extent, potential international professionals can be recruited to work within the respective healthcare system. These decisions are closely linked to the quality of the available information and the clarity of the legal and organizational framework.

Without a clear, consistent and legally sound basis for communication – both in dealings with state institutions and regulatory decision-makers, and with external recruitment agencies – it is only possible to a limited extent to make well-founded, responsible and sustainable staffing decisions.

At the same time, this reliance on transparent and reliable communication also applies from the perspective of international nursing staff themselves. They, too, face far-reaching, often life-changing decisions as part of their professional migration, which have a lasting impact on their career, social integration and personal circumstances. In the absence of clear, comprehensible and legally sound information on working conditions, recognition processes, language requirements and in-

tegration structures, uncertainty increases significantly, which can impair decision-making ability and reduce the willingness to migrate.

Against this backdrop, it becomes clear that successful international recruitment processes depend to a large extent on a communication structure that is consistent, transparent and legally sound for both parties. Communication thus functions not merely as an accompanying channel of information, but as a central, constitutive element in the decision-making and integration process of international healthcare professionals.

Following the arrival of internationally recruited nursing staff, various challenges continue to arise, presenting an adjustment period for both the staff themselves and the host organizations. Measures such as language support, intercultural orientation and structured induction programs play a key role in reducing uncertainty and promoting sustainable professional integration.

Furthermore, the long-term retention of international nursing staff is closely linked to the quality of organizational communication. A supportive working environment, a culture of open communication and continuous feedback promote job satisfaction and reduce staff turnover.

DISCUSSION

Based on ten guided interviews with managers and experts, it becomes clear that the successful recruitment and integration of international skilled workers cannot be viewed as an isolated process, but is always linked to organizational, cultural, linguistic and legal frameworks. The analysis thus highlights that integration and retention must be viewed as multidimensional, long-term processes that need to take into account both structural and individual factors.

In the area of recruitment, the findings show that the respondents perceive the recruitment processes for international professionals as complex and multi-stage. Administrative and regulatory hurdles are mentioned particularly frequently, including recognition procedures, residence permit requirements and time-consuming bureaucratic processes. These factors not only prolong the recruitment process but also create uncertainty on the part of both the organizations and the applicants. Added to this are language requirements, which play a central role in the healthcare sector as they are directly linked to patient safety, inter-professional collaboration and documentation obligations.

At the same time, it is clear that language deficits should not be viewed solely as an individual problem for healthcare professionals; rather, institutions also bear a responsibility with regard to language support, induction and accompanying support measures. In this context, the high level of motivation among many international nursing professionals and the increasing professionalization of international recruitment structures – for example, through specialized recruitment agencies or state-funded programs – are highlighted as positive factors. According to the respondents, successful recruitment processes also depend to a large extent on good organizational preparation, in particular on clearly structured onboarding programs, designated points of contact and teams with an awareness of intercultural issues.

Analysis of the barriers to integration shows that language and communication difficulties are among the greatest challenges. In particular, communication using specialist terminology in everyday clinical practice is described as demanding, as it affects not only direct contact with patients but also teamwork and documentation processes. Inadequate language skills can lead to misunderstandings and thus impair both the organization of work and patient safety.

At the same time, linguistic integration is understood as an ongoing developmental process that can be accelerated through targeted training and support programs. In addition to linguistic aspects, organizational shortcomings are identified as a further key barrier. The lack of standardized induction and integration programs, unclear lines of responsibility and a shortage of time available for mentoring colleagues significantly hinder the integration of new staff. As a result, integration processes often depend on the resilience of individual teams or managers, rather than being systematically underpinned at an institutional level. Furthermore, social integration within the team is described as a key factor. Cultural differences in communication styles, attitudes to work or understandings of hierarchy can lead to friction and require a high level of intercultural competence on

the part of managers and teams. Furthermore, administrative and legal frameworks – in particular procedures for the recognition of foreign qualifications – are regarded as time-consuming and, in some cases, opaque and complicated, which further complicates the integration process.

Particular mention should be made of the mentoring programs in place at some institutions, which help staff navigate this phase by providing clear responsibilities, ongoing professional support and language guidance. This initial phase is regarded as crucial to the decision to remain with the organization in the long term. Furthermore, working conditions and the overall organizational framework play a central role. In particular, adequate staffing levels, reliable rota planning, family-friendly working time arrangements and fair remuneration structures are cited. These conditions have a direct impact on staff job satisfaction and their willingness to remain with the organization. Equally important is an appreciative organizational and leadership culture. Recognition, respectful communication and supportive leadership behavior are described as essential prerequisites for a stable employment relationship. A lack of appreciation or emotional support, by contrast, is regarded as a factor contributing to staff turnover.

In addition, the respondents did not regard the importance of further training and professional development opportunities as a priority. It was striking that several interviewees reported that foreign nursing staff initially show little interest in additional professional development measures.

According to the experts, this is linked, amongst other things, to the stressful experiences during the recruitment and recognition process.

Many nursing staff wish to focus initially on language acquisition upon their arrival and prefer to avoid the additional time commitment involved in further training.

An open, appreciative and diversity-oriented organizational culture facilitates social and professional integration, as diversity is perceived as a resource rather than a burden. By contrast, hierarchical or closed organizational structures in healthcare settings can reinforce existing barriers to integration. Managers play a key role here, as their behavior significantly influences the cultural character of an organization. They act as multipliers who shape the culture of integration through communication, attitude and by setting an example.

Furthermore, it is emphasized that not only formal structures but also informal social interactions in day-to-day working life are crucial for an inclusive atmosphere. A positive team atmosphere and actively encouraged social contacts foster a sense of belonging and help to break down reservations.

With regard to the political and legal framework, the picture is mixed. There have recently been several reforms designed to facilitate labor migration. Nevertheless, their practical implementation is often regarded as inadequate. Complex recognition and visa procedures are the subject of particular criticism.

All interviewees complained of a discrepancy between political objectives and administrative reality. The respondents therefore see a clear need to simplify, standardize and digitize procedures in order to make the recruitment of international skilled workers more effective.

The interviewees cited retention rates, staff turnover and length of employment as key indicators for measuring success. In addition, subjective factors such as job satisfaction, a sense of belonging, and social and cultural integration were cited as crucial indicators.

CONCLUSION

It can be inferred from the findings of this study that sustainable relief cannot be achieved through isolated recruitment measures. It requires a multifaceted, integrated interplay of several components and effective retention strategies.

In particular, the interviews highlight that communication acts as a key strategic factor at all levels and in all phases for all those involved in the recruitment and integration of skilled workers. Transparent information sharing, language support and interculturally sensitive communication structures are essential prerequisites for ensuring that international nursing staff are not only recruited but also successfully integrated into existing work contexts. Appreciative communication processes fulfil a multidimensional function at all levels and stages, and for all those involved: they

reduce uncertainties whilst simultaneously promoting growth, identification and the capacity for development among the people and systems involved.

Furthermore, the study makes it clear that the shortage of nursing staff in the German health-care system can only be addressed sustainably if the recruitment, integration and retention of international nursing staff are understood as a multidimensional process.

It is particularly worth emphasizing that successful international recruitment relies on transparent, reliable and target-group-specific information structures. At the same time, it is clear that language support, intercultural awareness and clear organizational processes are crucial prerequisites for successful integration. Without these elements, uncertainties persist which can hinder both professional integration and long-term retention.

The analysis also highlights that organizational conditions have a significant influence on the success of integration. An appreciative leadership culture, structured induction processes, ongoing professional development opportunities and an open corporate culture not only promote job satisfaction but also foster a sense of belonging among international professionals. This makes it clear that staff retention is determined not solely by individual motivation, but to a large extent by institutional and cultural conditions.

From a scientific perspective, this study helps to define communication within the international nursing context as a strategic factor for success. It demonstrates that communicative processes are closely linked to organizational development, intercultural competence and the quality of care. The study thus broadens the perspective on the shortage of nursing staff to include a communicative and organizational dimension, which should be given greater consideration in future strategies.

In conclusion, it can be stated that international nursing staff should be viewed not as a short-term stopgap solution, but as a permanent component of a sustainable healthcare system. Their successful integration requires a holistic action plan that systematically links recruitment, language training, cultural integration and long-term retention. Further research should therefore focus in particular on the effectiveness of specific communication and integration strategies, as well as taking greater account of the perspectives of the nursing professionals themselves.

REFERENCES

- AMELUNG, B., 2026. *Der Multifocus Effekt*. Offenbach: GABAL Verlag, pp. 54–79.
- BUNDESAGENTUR FÜR ARBEIT, 2025. *Neue Pflegekräfte kommen vor allem aus dem Ausland: Beschäftigungswachstum vor allem durch ausländische Beschäftigte*. Presse Info 21 [online]. Available from: <https://www.arbeitsagentur.de/presse/2025-21-tag-der-pflege-neue-pflegekraefte-kommen-vor-allem-aus-dem-ausland> [Accessed 3 May 2026].
- HANS-BÖCKLER-STIFTUNG, 2024. *Arbeitsbedingungen in der Pflege und im Krankenhaus* [online]. Available from: <https://www.boeckler.de/de/auf-einen-blick-17945-zahlen-und-studien-zum-pflegenotstand-und-wege-hin-aus-17962.htm> [Accessed 23 March 2026].
- HRADECKY, D. M., SANDER, G. G., 2024. *Internationale Pflegefachkräfte für kommunale Krankenhäuser gewinnen*. Wiesbaden: Springer Verlag, pp. 38–122.
- KRÜGER, K., 2017. *Herausforderung Fachkräftemangel*. Wiesbaden: Springer Verlag.
- SYED, M., 2021. *Rebel Ideas: The Power of Diverse Thinking*. London: John Murray Verlag, pp. 79–160.

ПРИЛАГАНЕ НА ЕФЕКТИВНИ КОМУНИКАЦИОННИ СТРАТЕГИИ ЗА СПРАВЯНЕ С НЕДОСТИГА НА МЕДИЦИНСКИ СЕСТРИ

Резюме: Все по-задълбочаващият се недостиг на медицински персонал поставя германската здравна система пред структурни, организационни и кадрови предизвикателства. На този фон международното набиране на медицински персонал придобива все по-голямо значение. Населението застарява и се наблюдава траен ръст на търсенето на грижи. Вследствие на това германската здравна система трябва да преодолее още нови предизвикателства, за да интегрира наетия медицински персонал в заведенията за грижи (Kathy Krüger 2017). Настоящата статия разглежда ефективни комуникационни стратегии за справяне с недостига на квалифициран медицински пер-

сонал. Като част от изследването интервютата, проведени от автора, се анализират и оценяват на научна основа по отношение на професионалната интеграция на чуждестранния медицински персонал.

Ключови думи: комуникация; набиране на персонал; интеграция; международен медицински персонал; межкултурна компетентност; многоаспектен подход; межкултурно многообразие

Яле Йълмацер, докторант

Университет по библиотекознание и информационни технологии

София, България

E-mail: jaleyilmazer@googlemail.com

ОБЩЕСТВЕНИ КОМУНИКАЦИИ И ИНФОРМАЦИОННИ НАУКИ
PUBLIC COMMUNICATIONS AND INFORMATION SCIENCES

**ORGANISATIONAL LEARNING AS A COMMUNICATION AND KNOWLEDGE
PROCESS: THE TRANSFORMATION OF THE LEADERSHIP ROLE**

Judith Marx

University of Library Studies and Information Technologies

<https://doi.org/10.70300/SIIT6864>

Abstract: *It is important for organizations to maintain and support the learning ability and willingness of their members. Leaders play a catalytic role in such organizational communication and knowledge processes. This article is based on a literature review of books, online articles and journals. It first examines the concept of learning in its general meaning and then goes on to discuss the relationship between individual and organizational learning. The interdependent knowledge processes underlying these forms of learning are highlighted and the findings of the three-level learning model according to Argyris/Schön are drawn upon. In this context, the focus is placed on the role of leadership, examining the changing image and understanding of leadership in terms of how it relates to organizational learning processes. Two diametrically opposed concepts of leadership are examined in detail. The question of how leadership can be shaped in times of change in such a way that organizational learning can be promoted and optimized is explored. It should be noted that a modern leadership approach can be considered particularly conducive to elaborate learning and knowledge processes.*

Keywords: *organizations; learning; communication; knowledge processes; leadership*

INTRODUCTION

Learning is a process that accompanies people from their school and training days and does not end when they complete their academic career. It is not without reason that there is frequent talk of ‘lifelong learning’ (Erpenbeck/Sauter/Sauter 2016, p. 1). Individual learning is also an essential prerequisite for organizations to be able to learn and thus realize collective information and knowledge processes (Behrmann 2010, p. 96). The dimensions in which learning can take place in organizations can be described using the popular three-level learning model according to Argyris/Schön (Moning/Petersen 2010, pp. 172–174). Since leaders have a special social relationship with the employees they lead (Wunderer 2007, p. 4), it is important to examine their significance for individual and organizational learning and knowledge processes. This requires contrasting the traditional understanding of leadership with a modern leadership approach and analyzing the interdependence of the respective leadership approach and organizational learning.

RESEARCH METHODOLOGY

This publication is based on a literature review that first examines the concept of learning in its general understanding and the relationship between individual and organizational learning. It then describes an existing model for learning in organizations. This is followed by an examination of the relationship between leadership, knowledge transfer, and learning processes, as well as an analysis of the characteristics of traditional and modern leadership. Based on this in-depth analysis, the three-level learning model described by Argyris/Schön is placed in the context of leadership. This literature review includes books, online sources and journals.

RESULTS

Learning – what does this mean?

To emphasise the importance and dynamics of the concept of learning in general, it is worth mentioning the following statement by the English composer Benjamin Britten (1913–1976):

‘Learning is like rowing against the current. As soon as you stop, you drift backwards’ (Woxikon 2026).

Even though most people are probably familiar with the concept of learning from their school and training days, it is nevertheless important to examine it from a scientific perspective:

‘LEARNING is a permanent change in behavior based on experience – that is the most general definition. A more recent definition understands LEARNING as the expansion of knowledge, abilities and skills for coping with life situations’ (Siebert 2010, p. 190).

The importance of this learning process, which can be observed in behavior, is made clear in the following: ‘LEARNING is considered a prerequisite for survival, because humans, due to their deficient instincts, are forced to constantly adapt to changes in their environment, but are also capable of shaping their environment’ (Siebert 2010, p. 190).

This means that learning is inextricably linked to (environmental) changes, to which humans respond by changing or adapting their behavior. As vividly described in the above quote, learning is not something static; rather, humans are constantly in motion, i.e. involved in learning processes that are of existential importance to them, as Siebert has already stated.

But what does this mean in the context of an organization, i.e. how is learning connected to this in such a way that we can speak of organizational learning?

At this point, we should first mention the organization that every person is confronted with sooner or later in the course of their life: the workplace.

‘LEARNING AT WORK is the oldest and most widespread form of professional qualification. It is a form of learning that relates to the specific subject of the work and takes place at work and through work’ (Dehnbostel 2010, p. 192).

According to Severing, ‘learning outside educational institutions is referred to as INFORMAL LEARNING’ (Severing 2010, p. 148). However, compared to formal education, this informal learning is not considered an inferior or secondary form of learning, but is regarded as equally important and indispensable (Severing 2010, p. 148).

The concept of learning is now applied not only to humans or ‘living beings’, ‘but also to other “systems”’, ‘e.g. “learning organizations”’. A distinction must be made here ‘between personal LEARNING and organizational LEARNING’ (Siebert 2010, p. 192).

In this respect, it should be noted that the above statements can be applied analogously to organizations. Here, too, it is said that ‘organizational learning ability is a decisive factor for survival [...]’ (Behrmann 1998, p. 143).

The relationship between individual and organizational learning based on a diagram with explanation

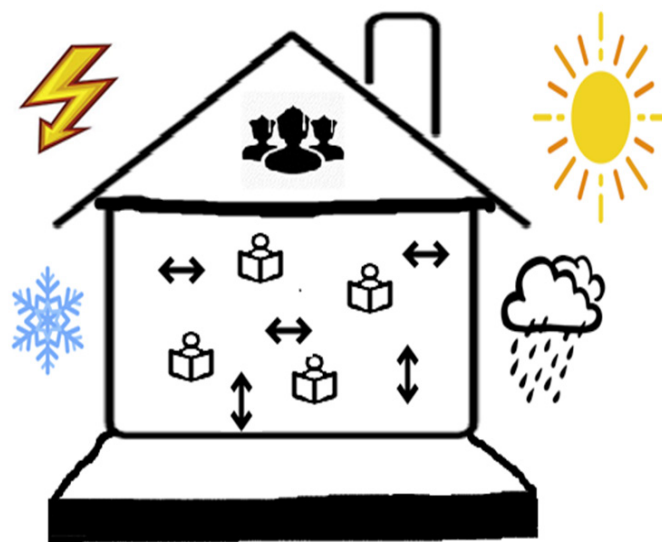


Fig. 1. Own diagram based on Behrmann 2010, 93–96

The diagram shows the two levels of individual and organizational learning as a metaphor.

The organization, symbolically represented as a house, is firmly anchored on solid ground, the foundation. Inside this house are the members of the organization, i.e. the individuals who symbolically hold a book in their hands to represent learning or the acquisition of education and knowledge. However, these individuals do not stand alone and independently in this space, but interact with each other and among themselves, as represented by the double-sided arrows. The roof and thus the top of the house consists of people wearing doctoral hats, symbolizing educational growth and learning progress. Around the house, the various weather conditions are depicted in the form of rain, sun, etc., i.e. this represents the environment of the organization, which, in addition to favorable times – proverbially sunny times – also has less favorable times in the form of rain or thunderstorms.

This makes it clear ‘that organizational learning, on the one hand, concerns changes in the thinking, actions and knowledge of individuals (organization members) and, on the other hand, describes changes in the framework of meaning and order within an organization, which provides knowledge about the organization and about how to manage actions and solve problems [...]’ (Behrmann 2010, p. 94).

It goes on to say that organizational learning initially relates to interaction processes between individuals. They perceive contradictions when there are deviations or disruptions in their usual processes. This irritation in turn results in revisions of interaction patterns, which are transferred to the organization and change its generative basis in the long term, thus highlighting the importance of communication. In other words, an organization changes or learns only indirectly, because it is always people who perceive the discrepancies in the organizational environment they experience and interpret these contradictions in relation to their role there and the interests associated with it. Essentially, this means that organizational learning is inextricably linked to the changes described above, whether these are made by individuals or groups, such as departments or teams within existing organizations (Faulstich 1998, p. 169).

Organizational adaptability to environmental changes, which are represented in the diagram as various weather conditions, is the fundamental prerequisite for the successful development of the key competence of learning ability (Reinhardt 1998, p. 253). As with the environmental influences depicted in the diagram, the organization has no influence on the external changes it faces, whether favorable or less favorable, so that – depending on the respective external circumstances – it is forced to reposition itself and thus initiate the learning processes mentioned above. However, this also means that this involves necessary structural adjustments that must be made by the organization itself, because the subjective will and learning of the people within the organization does not in itself create a changed or new organization (Zech/Ehse 1999, p. 7).

This increase in knowledge, which begins with individuals and must ultimately be transferred to the organization as a whole, leads to a transformation in the level of education of both individuals and the organization itself when the learning process is successful. As shown in the diagram, these development and learning processes enable the organization to adapt to changing environmental conditions, ensuring that the house or organization remains viable and maintains its balance in the future.

The three-level learning model according to Argyris/Schön

According to this model, there are three levels of learning in organizations:

- Single-loop learning
- Double-loop learning
- Deutero learning

Single-loop learning refers to a type of organizational learning that describes efficient error correction in purely rational and cognitive terms as a leadership strategy. The values and norms of the organization are not questioned, which means that only operational actions are taken. The individual responds to a specific situation with an action that they consider appropriate and likely to quickly achieve the desired goal.

In double-loop learning, on the other hand, norms and values are addressed and questioned in the context of the organization. Individual engagement also triggers collective learning processes which, unlike single-loop learning, enable fundamental behavioral change. At this level, therefore, the process goes beyond purely expedient and situational change, so that individuals and the collective are already at a higher level of reflection.

The learning stage of Deutero learning (also known as loop-reflecting learning) is a type of learning in which the learning processes themselves become the subject of learning. The focus here is on learning about learning, and at this level, the extent to which the learning processes from single-loop and double-loop learning were fruitful in terms of their usefulness and efficiency is examined (Moning/Petersen 2010, pp. 172–174).

Leadership and learning processes

In addition to the purely functional significance of leaders as individuals who interact with their employees and ensure that they perform their assigned tasks properly (Naumann 2010, p. 189), leaders also have an educational role to play. This is because the organization in which they are employed as leaders does not determine the tasks of leadership and thus the way in which leaders act, but merely specifies the external framework conditions for this. The leader therefore continues to play a key role in the specific design of leadership. In this context, leaders are the linchpin for learning in organizations, as they can initiate learning processes by providing impetus and thus make a decisive contribution to organizational learning.

It is therefore up to the leader to critically examine the structures and circumstances of the organization and communicate these in an open dialogue. They should not shy away from presenting controversial views. Only when leaders have the courage to resist entrenched structures and act as guides for what they consider to be a more suitable path can change be made possible. As discussed at the outset, such learning processes always begin with individuals, so that leaders can be seen as facilitators in this regard (Naumann 2010, p. 187).

Kühl aptly sums up the importance of change for organizations with his statement: ‘By making change a corporate goal, open internal conflict on the issue is prevented. The postulate of the learning, adaptable organization robs employees of the opportunity to justify being against change per se [...]’ (Kühl 2010, p. 62).

The motto ‘We’ve always done it this way!’ – often used by long-standing members of an organization to justify familiar behavior and antiquated structures – is likely to have become obsolete in modern organizational structures and management teams.

Even if leaders operate as fine-tuners of the system, adapting flexibly to unpredictable situational circumstances, this does not mean that ‘the organizational knowledge base has to be changed every time’. In this respect, they are also assigned a ‘coordination and stabilization function’ (Naumann 2010, p. 187).

Emotions play a major role in all these change processes initiated by leaders. Not only do they serve to strengthen and stabilize social relationships within the organization, they are also a prerequisite for employees to embrace change in the first place (Naumann 2010, p. 187).

In this respect, the overall communicative and psychological dimension of leaders’ actions is of great importance. It is therefore not enough for leaders to be highly capable on a rational level if they are unable to connect with the people they lead on an emotional level. Learning processes can only be successfully implemented if the changes introduced are emotionally anchored.

The personality structure of the respective leader is therefore a decisive factor. In particular, the willingness and ‘ability to engage in critical self-reflection’ are of crucial importance (Naumann 2010, p. 191).

Traditional leadership vs. modern leadership

Work 4.0, virtual and digital leadership, New Work – these are just a few of the terms associated with modern leadership. But what lies behind these modern leadership approaches with their sometimes glamorous-sounding names and, above all, what influence do they have on organisational learning and, consequently, on the way communication and knowledge transfer take place? Before this question can be explored, we must first take a brief detour to the early 20th century.

Max Weber, the founder of the bureaucracy model, had a very clear idea of what constituted good leadership. In his view, this was characterized by clear powers of instruction and control, a top-down hierarchy, fixed tasks and decision-making powers, and the application of objective, impersonal procedures (Althoff/Thielepape 1995, p. 159; Nerdinger 2019, pp. 53–55). It is clear from the characteristics mentioned that their rigidity cannot be reconciled with the modern understanding of leadership.

In the current century, globalization and technological progress are cited as ‘the key challenges for companies’ (Naumann 2010, p. 188). Other examples of the challenges facing companies and public authorities today include demographic change and the knowledge culture (Zukunftsinstitut GmbH 2025a).

In addition, a different self-image with regard to their role as employees and a general change in values can be observed, particularly among today’s younger generation. Individuality, the need for autonomy in performing work tasks, the opportunity to participate in organisational design and a generally flat hierarchy are becoming increasingly important for employees (Naumann 2010, p. 188).

For the design of communication and information processes, the shift towards leadership behavior based on equality means that both the people being led and the leaders make this mutual understanding a mandatory requirement in the context of the respective organization. As a result, leaders are increasingly compelled to ‘fall back on other resources of power and tend to establish a collegial and cooperative relationship with their employees’ (Naumann 2010, p. 191).

Another reason why the understanding of leadership from the age of the bureaucratic model is no longer considered promising is digital progress and the resulting development towards a new future of work, which is also fundamentally changing the nature of leadership: “This means that traditional leadership approaches are being replaced by models based on trust, results and self-organization. Leaders must be able to inspire teams while effectively using technological tools to promote collaboration and communication” (Zukunftsinstitut GmbH 2025b).

In connection with the increased use of digital and hybrid leadership, the former head of department at the Federal Ministry of Labor and Social Affairs, among others, considers the coronavirus pandemic that emerged in 2020 to be a catalyst: ‘The involuntary and unpredictable state of emergency is creating momentum for virtual collaboration, mobile working, home offices, agile forms of organization and new work’ (Borggräfe/Rump 2020, p. 40).

However, the increased use of new media by leaders, i.e. the shift from what was previously exclusively analogue leadership to digital leadership, also requires the creation of the necessary framework conditions ‘to resolve areas of tension between the demands placed on leaders and the reality of the company [...]. Only in this way can leaders seize the potential of the modern working world with the necessary energy and leadership motivation and strengthen their teams in self-organization’ (Bruch/Berenbold/Block 2019, p. 166).

In this respect, it can be said that organizational learning processes are absolutely essential at this point in order to meet the requirements of the digital working world and the challenges associated with it.

A healthy degree of tolerance for mistakes on the part of leaders is also conducive to a positive organizational learning environment: ‘[...] to create a “failure-friendly” learning environment where “failure” itself becomes a source of constructive feedback for the organization [...]’ (Lehnhoff/Kendall 2010, p. 165).

Furthermore, today’s understanding of leadership no longer requires leaders to perform all important tasks themselves. In this respect, experts also confirm that the digital working world 4.0 gives ‘individual employees more freedom, more creative opportunities and more responsibility’ (Gutmann 2021, p. 138).

However, giving employees more freedom, relinquishing control and assigning them high-quality tasks does not mean that leaders can completely dispense with instructions and controls (Dietz/Kracht 2016, p. 73), i.e. this must not lead to a state of anarchy or a lack of leadership.

After all, leaders also serve as role models for the employees they lead. This means that they

should also have the appropriate leadership skills, such as vision and persuasiveness, charisma and, last but not least, a sense of responsibility (Naumann 2010, p. 191).

This makes it clear that not all features of the traditional leadership approach can be discarded, because the basic principles for the role of a leader cited above are essential for stable and successful leadership.

In this respect, it can be said that the positive elements and values of traditional leadership can certainly also be applied in modern leadership approaches. Such successfully implemented leadership strengthens communication and knowledge processes and thus promotes organizational learning: both the people being led and the leader develop a higher level of reflective awareness and are thus prepared to actively participate in organizational thinking and learning processes, each in their own role.

The three-level learning model in the context of leadership

After comparing and examining the two characteristics of leadership approaches, i.e. traditional and modern leadership, these will be linked to the three-level learning model already described below. The aim is to show how these three loops promote organizational learning.

Single-loop learning

As already described, learning processes at the single-loop learning level take place in the sense of reactive adaptation to the respective situation. This means that there is a rapid response to changes in the environment (Seufert 2010, p. 107). As also already discussed, the values and norms of the organization are not questioned here, which is why this level of learning is suitable for operational actions, i.e. rather short-term problem solving (Moning/Petersen 2010, pp. 172–173).

Based on the bureaucratic model already described, such a symptom-oriented correction of errors and adjustments to the respective situation would correspond to the traditional leadership approach. This is because it is essential at the single-loop learning level that the framework conditions are accepted as such and that the associated norms are not questioned (Seufert 2010, p. 107). In this respect, this level corresponds to a strongly authoritarian attitude and the behavior is justified by its traditional nature.

Furthermore, the bureaucratic model and its application are characterized both by the standardization of processes and by clear chains of command (Nerdinger 2019, pp. 53–55). With such authoritarian leadership, it is therefore impossible from the outset to question the resulting framework conditions and thus the organizational structure when a problem or a changed situation suddenly confronts the members of the organization. In other words, at this level of learning, only ‘cosmetic symptoms’ are addressed, because the actual causes, which result, for example, from questionable normative conditions, are not taken into account. This level therefore does not appear to be suitable for problems that need to be solved in the long term or at their root cause, which is why it should be viewed critically if used too frequently and would be a sign that the organization is shying away from addressing and dealing with the actual causes.

Double-loop learning

In contrast to the level described above, the double-loop learning level is one in which norms and values are addressed (Moning/Petersen 2010, p. 173). It is therefore legitimate for individuals at this level to critically examine the circumstances of the organization and to reflect these back to their leaders. It can therefore be said that individuals and their leaders are already at a higher level of reflection. In this respect, this level could be classified as a modern leadership approach. As already explained, leaders and employees are regarded as equal sources of opinion (Moning/Petersen 2010, p. 176). Nevertheless, it should be noted at this point that, despite all the controversial discussions that take place between individuals and also between groups (Seufert 2010, p. 107), the leader is still present and intervenes when the principle of subsidiarity no longer allows these learning processes to be left to run their course (Naumann 2010, pp. 190–191), thus confirming the importance of communication as already described.

Another characteristic of this level of learning is that, unlike single-loop learning, it does not only take place at the individual level, but also incorporates the different abilities and skills of the members of the organisation. This is why it is also referred to as ‘joint learning’ (Moning/Petersen 2010, p. 173).

Deutero learning

This level of learning is the one with the highest level of reflection, as learning itself becomes the subject of learning (Seufert 2010, p. 107).

As with the level of double-loop learning, learning at this level can be attributed to a modern leadership approach. However, the opinion is held here that ‘only the ability of leaders to engage in dialogue can lead to learning processes of this quality’ (Moning/Petersen 2010, p. 175). It can therefore be assumed that this level of learning requires leaders who think holistically and analytically from the outset and that they must also be very sophisticated. This means that leaders analyze and reflect with the people they lead on the extent to which the learning processes from the two previous levels were successful. This also includes an assessment of effectiveness and efficiency. This involves examining what facilitated or inhibited learning (Argyris/Schön 1978; Moning/Petersen 2010, p. 174). At this point, at the latest, it becomes clear that leaders must be honest with themselves and their employees and that weaknesses must be openly addressed, as otherwise no lessons can be learned for future action. In this respect, actions that may have proved unwise or ineffective in retrospect should not be devalued, but rather seen as fruitful insights for the future. Only in this way is it possible ‘[...] for organizations to remain continuously open to learning [...]’ and thus ‘[...] to increase the organization’s ability to learn [...]’ (Seufert 2010, p. 107).

CONCLUSION

In summary, organizational learning is a complex process that manifests itself on three different levels according to the Argyris/Schön model. It should also be noted that the willingness and ability of individuals to learn has a decisive influence on the extent to which such communication and knowledge processes are driven forward. The role and understanding of the leaders are also linked to this, as they can act as a catalyst for organizational learning processes through their leadership style and the corresponding interaction and communication with their employees. The transformation of leadership role does not mean that all characteristics of a traditional understanding of leadership have to be thrown overboard. Rather, it is crucial that modern leadership retains the positive aspects that have always been associated with leadership, such as persuasiveness, charisma and role modelling, and combines them successfully with a progressive leadership role. In this case, the conditions are created for learning processes to be initiated at a high level of reflection among employees and for learning to take place at the second and third levels according to the Argyris/Schön model. Finally, it can be said that successful leadership is measured by the extent to which the leaders succeed in advancing individual and organizational learning with the help of their personality and existing key competencies.

REFERENCES

- ALTHOFF, K. and THIELEPAPE, M., 1995. *Psychologie in der Verwaltung*. 5th ed. Hamburg: Maximilian-Verlag.
- ARGYRIS, Ch. and SCHÖN, D. A., 1978. *Organizational Learning: A Theory of Action Perspective*. Boston: Addison-Wesley.
- BEHRMANN, D., 1998. *Handlungs-, subjekt- und dialogorientierte betriebliche Weiterbildung: Impulse zum Konzept arbeitsplatznahen Lernens*. Hamburg: Universität der Bundeswehr.
- BEHRMANN, D., 2010. Lernen in der Organisation – Rekonstruktionen zum Verhältnis von individuellem und organisationalem Lernen. In: *Organisationslernen im 21. Jahrhundert – Festschrift für Harald Geißler*, pp. 93–103. Frankfurt am Main: Peter Lang-Verlag.
- BORGGRÄFE, J. and RUMP, J., 2020. Der Corona-Effekt in der Führung. *Personalmagazin*, vol. 22, issue 10, pp. 38–42.
- BRUCH, H., BERENBOLD, S. and BLOCK, Ch., 2019. New Leadership: Führungsformen der Zukunft. In: *HR-Trends 2020: Agilität, Arbeit 4.0, Analytics, Prozesse*, pp. 159–168. Freiburg; München; Stuttgart: Haufe Group.
- DEHNBOSTEL, P., 2010. Lernen am Arbeitsplatz. In: *Wörterbuch Erwachsenenbildung*. 2nd ed., pp. 192–193. Bad Heilbrunn: Julius Klinkhardt Verlag.

- DIETZ, K. and KRACHT, Th., 2016. *Dialogische Führung: Grundlagen – Praxis – Fallbeispiel dm-drogerie markt*. 4th ed. Frankfurt am Main: Campus Verlag.
- ERPENBECK, J., SAUTER, S. and SAUTER, W., 2016. *Social Workplace Learning: Kompetenzentwicklung im Arbeitsprozess und im Netz in der Enterprise 2.0*. Wiesbaden: Springer Gabler.
- FAULSTICH, P., 1998. *Strategien der betrieblichen Weiterbildung: Kompetenz und Organisation*. München: Verlag Vahlen.
- GUTMANN, J., 2021. Was HR-Professionals aus der Krise mitnehmen. In: *New Normal: Führung – Kultur – Organisation – Gesundheit*, pp. 136–152. Freiburg; München; Stuttgart: Haufe Group.
- KÜHL, S., 2010. Die Irrationalität lernender Organisationen. In: *Organisationslernen im 21. Jahrhundert – Festschrift für Harald Geißler*, pp. 57–67. Frankfurt am Main: Peter Lang-Verlag.
- LEHNHOFF, A. and KENDALL, W., 2010. Second Hand Gold. In: *Organisationslernen im 21. Jahrhundert – Festschrift für Harald Geißler*, pp. 153–168. Frankfurt am Main: Peter Lang-Verlag.
- MONING, E. and PETERSEN, J., 2010. Organisationslernen und Dialogische Führung als Gestaltungsfelder betriebspädagogischer Professionalität. In: *Organisationslernen im 21. Jahrhundert – Festschrift für Harald Geißler*, pp. 169–182. Frankfurt am Main: Peter Lang-Verlag.
- NAUMANN, V., 2010. Zum Wandel von Führung im Kontext organisationalen Lernens. In: *Organisationslernen im 21. Jahrhundert – Festschrift für Harald Geißler*, pp. 183–193. Frankfurt am Main: Peter Lang-Verlag.
- NERDINGER, F. W., 2019. Organisationstheorien. In: *Arbeits- und Organisationspsychologie*, pp. 47–61. Berlin: Springer Verlag.
- REINHARDT, R., 1998. Wissensmanagement konkret. In: *Organisationslernen konkret*, pp. 233–273. Frankfurt am Main: Peter Lang-Verlag.
- SEUFERT, S., 2010. Organisationslernen: Die “Organisation des Informellen” als treibender Motor? In: *Organisationslernen im 21. Jahrhundert – Festschrift für Harald Geißler*, pp. 105–114. Frankfurt am Main: Peter Lang-Verlag.
- SEVERING, E., 2010. Informelles Lernen. In: *Wörterbuch Erwachsenenbildung*. 2nd ed., pp. 148–149. Bad Heilbrunn: Julius Klinkhardt Verlag.
- SIEBERT, H., 2010. Lernen. In: *Wörterbuch Erwachsenenbildung*. 2nd ed., pp. 190–192. Bad Heilbrunn: Julius Klinkhardt Verlag.
- WOXIKON, 2026. *Zitate*. [viewed 5 February 2026]. Available from: <https://zitate.woxikon.de/bildung/65-benjamin-britten-lernen-ist-wie-rudern-gegen-den-strom-sobald-man-aufhoert-treibt-man-zurueck>
- WUNDERER, R., 2007. *Führung und Zusammenarbeit: Eine unternehmerische Führungslehre*. 7th ed. Köln: Hermann Luchterhand Verlag.
- ZECH, R. and EHSES, Ch., 1999. *Organisation und Lernen*. Hannover: Expressum Verlag.
- ZUKUNFTSINSTITUT GMBH, 2025a. *Megatrends*. [viewed 5 February 2026]. Available from: <https://www.zukunftsinstitut.de/blog-megatrends>
- ZUKUNFTSINSTITUT GMBH, 2025b. *Der Megatrend Future of Work*. [viewed 5 February 2026]. Available from: <https://www.zukunftsinstitut.de/zukunftsthemen/megatrend-future-of-work>

ОРГАНИЗАЦИОННОТО УЧЕНЕ КАТО ПРОЦЕС НА КОМУНИКАЦИЯ И ПРИДОБИВАНЕ НА ЗНАНИЯ: ТРАНСФОРМАЦИЯ НА РОЛЯТА НА ЛИДЕРСТВОТО

Резюме: За организациите е важно да поддържат и насърчават способността и готовността за учене на своите членове. За такива организационни комуникационни и познавателни процеси на ръководителите се отнежда ролята на катализатори. Настоящата статия се основава на литературно проучване на източници от книги, онлайн статии и списания. Първо се разглежда понятието „учене“ в своя общ смисъл, а след това се разглежда връзката между индивидуалното и организационното учене. При това се показват взаимозависимите процеси на знанието, които стоят в основата на тези форми на учене, и се използват познанията от тристепенния модел на учене според Argyris/Schön. Във връзка с това акцентът се поставя върху ролята на лидерството и се разглеждат променящата се представа и разбиране за лидерството във връзка с организационните процеси на учене. При това се разглеждат подробно две диаметрално противоположни концепции за лидерството. Разглежда се въпросът как трансформацията на

ролята на лидерството може да насърчава и оптимизира организационното учене. При това се установява, че съвременната ориентация на лидерството може да се разглежда като особено благоприятна за сложни процеси на учене и придобиване на знание.

Ключови думи: организации; обучение; комуникация; процеси на знанието; лидерство

Юдит Маркс

Университет по библиотекознание и информационни технологии

София, България

E-mail: judithma@web.de

ОБЩЕСТВЕНИ КОМУНИКАЦИИ И ИНФОРМАЦИОННИ НАУКИ
PUBLIC COMMUNICATIONS AND INFORMATION SCIENCES

**IMPACT OF INTERNAL COMMUNICATION ON EMPLOYEES' STRESS
EXPERIENCE AND RESILIENCE**

Katharina Kastner

University of Library Studies and Information Technologies

<https://doi.org/10.70300/DJN19035>

Abstract: *Respectful, clear, and understandable internal communication is considered a key factor for the psychological well-being of employees in psychological research and communication science. Furthermore, high-quality communication is associated with fewer burnout symptoms and greater life satisfaction among employees. This article, based on a systematic literature review, aims to provide a theoretical overview of key aspects of stress perception and communication in the professional context, analyzing the essential factors of positively perceived internal communication. It also examines the impact of communication quality on stress perception and psychological resilience, addressing potential challenges such as information overload and communication deficits. The article highlights the high relevance of effective internal communication for employee mental health, employee satisfaction, and company success. Moreover, good internal communication is a crucial component of a health-promoting organizational structure. In addition to theoretical foundations, practical approaches to improving communication within companies are discussed.*

Keywords: *internal communication; stress experience; psychological resilience; employees; mental health*

INTRODUCTION

In light of rising job demands, increasing digitalization, and changing work patterns, the mental health of employees is gaining ever greater economic, social, and scientific importance. Work-related stress is among the most significant psychosocial burdens in the workplace. Numerous studies have shown that work-related stress can have long-term negative effects on the well-being, performance, and health of employees. Internal communication plays a crucial role in this context, influencing the perception of stress and the management of professional challenges. Nevertheless, research on communication has thus far primarily focused on business administration or management perspectives. The significance of internal communication for employees' stress experiences and resilience from a communication science perspective has received comparatively little systematic attention.

While the literature points to connections between communication quality and psychological well-being as well as business success, it lacks an integrative analysis of how different forms of internal communication affect employees' stress levels and resilience. This results in a research gap at the intersection of communication science, organizational communication, and health communication.

For this reason, this article focuses on internal communication within companies. The various forms and processes of communication, as well as the quality of communication within organizations, are the central focus. The subjects of this study are employees, whose experience of stress and their psychological resilience in the professional context are examined.

The aim of this article is to present, based on a systematic literature review, the current state of research on the effects of internal communication on employees' stress levels and resilience, and to contextualize this research within the field of communication science. The analysis will examine which communicative factors can promote or reduce stress, the role of communication processes in developing resilience, and the characteristics of health-promoting internal communication. This article thus contributes to the understanding of the interactions between internal communication, mental health, and workplace well-being from a communication science perspective.

RESEARCH METHODOLOGY

This article is based on a systematic literature review with the aim of summarizing the current state of research on the effects of internal communication on employees' stress levels and resilience, and classifying it from a communication science perspective.

The literature review was conducted between May and June 2026. Scientific publications from 2015 to 2026 were included to encompass both fundamental theoretical works and current research findings. Scientific databases and search platforms such as Google Scholar, PubMed, and Web of Science, as well as available library catalogues, were used for the search.

The search was conducted using various German and English search terms. Key search terms included, among others, "internal communication," "internal company communication," "organizational communication," "employee communication," "workplace communication," "stress," "occupational stress," "psychological well-being," "resilience," "employee resilience," and combinations of these terms using the Boolean operators AND and OR.

The analysis included only scientific articles, monographs, edited volume contributions, and reports from recognized scientific institutions that addressed internal communication, work-related stress, mental health, or resilience. German- and English-language publications were considered. Non-scientific sources, press reports, blog posts, and publications without a clear connection to the research question were excluded.

After identifying relevant literature, a content review of the titles, abstracts, and full texts was conducted. The sources were then analyzed and thematically categorized with regard to their theoretical approaches, key findings, and relevance to the research question. The evaluation took the form of a qualitative content analysis with the aim of identifying recurring correlations between communication quality, perceived stress, and employee resilience.

The analysis focused on communication science findings regarding internal corporate communication, as well as interdisciplinary research from the fields of work psychology, organizational research, and health communication. Based on this foundation, the key factors influencing internal communication on the psychological well-being of employees were systematically presented and discussed.

RESULTS

Why is it important to look at the stress levels of employees?

Mental health is an essential aspect of overall health and is far more complex than simply the absence of mental illness. Good mental health can be understood as a state of emotional equilibrium that enables people to cope with stress and challenges, maintain stable and fulfilling relationships, pursue their work, and reach their full potential (World Health Organization). Therefore, mental health can be seen as a cornerstone of a self-determined and happy life. Furthermore, it is an essential component of individual and collective well-being.

Surveys show that the burden of mental health problems is very high in the population and has even increased in recent years (World Health Organization 2022). Depression and anxiety disorders are the most common mental illnesses. In 2025, approximately 332 million people worldwide were affected by depressive disorders alone, representing about four percent of the total global population (World Health Organization 2025). Besides the suffering of those affected, mental illnesses also cause significant economic damage through sick leave or inability to work (OECD/European Union 2018). Persistent stress caused by unclear information, lack of transparency, missing feedback, or misunderstandings in internal communication can contribute to the development of mental health problems in employees (Ferreira et al. 2023; Kersten and Junghanns 2022). Inadequate communication is associated with increased stress, conflict, or insecurity in the workplace (Backhaus et al. 2024; Pavlista et al. 2024). Furthermore, poor communication structures can lead to a decrease in employee trust and motivation. This can negatively impact the mental health and resilience of employees and weaken job satisfaction and performance within companies.

Various findings highlight the importance of positive, appreciative and clear internal communication for the mental health of employees (EU-OSHA 2022; Qin and Men 2023). When inter-

nal communication is perceived positively by employees, it correlates with fewer burnout symptoms and higher life satisfaction (Gallup, 2026; Qin and Men 2023). Companies also benefit from high-quality communication. Various studies have shown that internal communication perceived as positive increases a company's likelihood of success (George and Jones 2006). Furthermore, employees who are satisfied with the communication within the company are less likely to want to end their employment (Duarte and Silva 2023).

What is internal communication

The literature uses a variety of terms for internal communication, i.e., communication with internal target groups, such as employee communication, corporate communication, internal PR, or internal public relations. These terms are sometimes used synonymously and originate from various communication and business administration disciplines (Buchholz 2015). Regardless of the term used, it essentially refers to how information is exchanged or passed on within organizations or companies, or how communication generally takes place within the organization or company (Mast 2019; Schmid and Lyczek 2006).

Forms of internal communication

Internal communication processes can take place *top-down*, *bottom-up*, or *in-between* (Mast, 2014; Szyszka and Malczok 2016). *Top-down* communication involves the transfer of information from higher to lower hierarchical levels. For example, managers communicate decisions, instructions, or strategic goals to employees (Urbancová et al. 2023). Conversely, *bottom-up* communication describes the flow of information from employees to management. This direction of communication is primarily used for sharing experiences or providing feedback (Miller et al. 2025). *In-between* communication refers to communication between individuals or departments at the same hierarchical level. It primarily serves the purpose of coordination, cooperation, or the exchange of information (Robbins and Judge 2024).

Furthermore, internal communication processes can be formal, informal, or instrumental in nature (Mast 2014; Szyszka and Malczok 2016). Formal internal communication takes place via defined channels, adheres to hierarchies and institutional rules, and encompasses all official and organizationally defined communication processes within an organization or company. Typical examples of this form of communication include official emails, employee information, circulars, and annual reports (Cornelissen 2023). Informal communication, on the other hand, usually develops spontaneously in the daily work routine and arises outside of official communication structures. It often serves as a means of personal exchange between employees or the rapid dissemination of information. Conversations during breaks are a common form of informal communication (Cornelissen 2023; Miller et al. 2025). Instrumental internal communication refers to the targeted use of communication measures for the efficient dissemination of information or corporate goals. Its purpose is to support organizational objectives. Newsletters, intranets, feedback systems, or employee apps are typically used for this purpose (Cornelissen 2023; Men and Bowen 2016).

The different forms of communication influence both the way information is shared and the experience of organizational support and security. Therefore, the various forms of internal communication have a key impact on employees' stress levels and psychological well-being.

Advantages and disadvantages of different forms of communication

Clear and transparent formal communication can create role clarity, orientation, and security, thereby minimizing employee stress levels. Karasek (1979), in his Job Demand-Control model, points out that stress for employees arises primarily when high demands are placed on them, coupled with uncertainty and low control. According to this model, structured communication can alleviate stress and reduce strain.

However, in addition to the positive effects of structured, formal communication, this one-sided and hierarchical communication can also generate psychological pressure. The lack of opportunities for participation or information overload can lead to a feeling of insufficient autonomy among employees, which in turn promotes stress (Maslach and Leiter 2016).

Informal communication is based on social interactions and usually takes place outside of formal communication structures. These mostly casual and informal conversations can promote

knowledge sharing and strengthen the working atmosphere. This type of communication fosters a sense of belonging and contributes to a stronger company culture. Since social support is an important protective factor for mental health, informal communication can reduce perceived stress. Studies have shown that emotional support and positively perceived collegial relationships contribute to coping with work-related stress. Furthermore, they reduce the perception of job demands, act as a resource for dealing with stress, and promote emotional recovery (Gerhardt et al., 2021; Pauli and Lang 2021).

However, informal communication, often referred to as “the grapevine,” can also give rise to rumors, spread misunderstandings, or simply lead to miscommunication. Especially during times of change, restructuring, or downsizing, uncontrolled informal communication can cause stress and anxiety (Backhaus et al. 2024; Miller et al. 2025).

Instrumental communication can facilitate work processes and reduce stress for employees through quick and easy access to information. However, there is evidence that digital communication, with its high communication density, constant availability, and information overload, can promote persistent stress, mental exhaustion, or an *information overload* effect (Ferreira et al. 2023; Kersten and Junghanns 2022).

When considering the advantages and disadvantages of different communication methods, it becomes clear that they offer both opportunities and risks for employees. While well-structured, clear, and respectful communication facilitates work processes and can provide orientation and security for people within the company, inadequate or poor-quality communication structures can lead to stress, uncertainty, a lack of autonomy, and psychological strain. Since the way people communicate within a company has a significant impact on the development of stress and the level of psychological resilience among employees, the following chapters will define the terms stress and resilience more precisely and examine their significance in the work context in greater detail.

Stress – a definition

The term “stress” originally referred to the testing of materials for their physical resilience. Biochemist Hans Selye transferred the term to medicine and psychology. In his research, he discovered that the human organism reacts to strong environmental stressors, such as cold or heat, with a non-specific alarm response. Accordingly, Selye defined stress as an activation of the body in response to a stimulus. This stimulus can be perceived as either positive or negative (Selye 1974).

In scientific literature, the term eustress is used for positively perceived stress. This occurs when activation is triggered by a pleasurable event, such as the anticipation of a trip or solving a tricky but exciting problem. In contrast, negative stress, termed distress, is perceived as overwhelming, threatening, or burdensome. Distress arises, for example, from time pressure, constant digital availability, or conflicts. If sufficient recovery periods are lacking, this type of stress can lead to mental and physical illnesses (Kaluza 2023; Selye 1974).

Stress management through internal communication

Lazarus and Folkman (1984) define stress management as “a constantly changing cognitive and behavioral effort to cope with external or intrapsychic challenges which are assessed by the individual as challenging or exceeding their own resources” (Lazarus and Folkman 1984, p. 141).

In addition to individual stress management skills and the ability to cope with challenging situations, the way communication takes place within a company can significantly influence employees’ stress management. Social support from colleagues and managers, in particular, is an important protective factor against work-related stress. Several research studies have shown that good social relationships and emotional support in the workplace have a beneficial effect on reducing work-related stress. These factors have both a direct stress-reducing effect and an indirect one, as they serve as a resource for coping with stress. Furthermore, they reduce emotional exhaustion (Garmendia et al. 2023; Gerhardt et al. 2021).

Besides coping with stress, internal communication can also contribute to strengthening the psychological resilience of employees.

Resilience and internal communication

The term resilience is used in the literature to describe pronounced psychological resilience. It

refers to the ability to successfully cope with stressful situations, burdens, and crises, and to remain psychologically healthy despite adverse circumstances or difficult events (Bonanno 2021; Kaluza 2023). In the workplace, resilience is considered an important factor for the performance and long-term mental health of employees. Transparent, reliable, and open communication can foster the development of both individual and collective resilience. Qin and Men (2023) concluded that supportive communication among colleagues was associated with greater psychological well-being among employees. Furthermore, the authors found that employees who feel informed, valued, and involved in organizational processes exhibited greater resilience to stress.

The preceding discussion highlights the influence of internal communication on stress management, resilience, and the mental health of employees. The following paragraph addresses the question of which aspects constitute successful internal communication and which measures are suitable for improving communication within companies.

Aspects of successful internal communication and practical input for improving communication in companies

In light of the economic, political, and social developments of recent years, such as increasing digitalization, rising job demands, and the rise of hybrid work arrangements, the demands placed on employees have increased significantly. In this context, appreciation has proven to be a key socio-emotional resource. Those who feel valued at work experience more positive emotions and perceive themselves as part of the company. Furthermore, employees who frequently experience appreciation are more engaged at work. Stranzl and Ruppel (2025) demonstrated in their study that employees place particular value on forms of appreciation. Above all, employees want to be seen and taken seriously by managers and company leadership. Experiencing appreciation is fostered when employees perceive that their manager or the company is genuinely striving to recognize and treat them as indispensable and valuable employees. Crucially, employee performance must be acknowledged. Furthermore, when employees feel valued, this strengthens their self-efficacy and self-esteem in performing their professional roles.

Besides appreciation, transparency and clarity of information are essential aspects of successful internal communication. Consistent information, clear responsibilities, and comprehensible decisions can prevent stress and uncertainty among employees. Particularly in crisis situations, it has been shown that transparent communication can reduce the emotional burden on employees and thereby strengthen trust in the company. The quality and credibility of the communication are more important than the quantity (Hamid et al. 2024; Liu-Lastres et al. 2024).

Another key aspect of internal communication is social support. Both within teams and through management, social support contributes to well-being and reduces stress. Studies have shown that, especially in digital and hybrid work environments, regular communication and emotional support are important for reducing workloads and technology-related stress (Kräft et al. 2024; Marsh et al. 2024; Wahl et al. 2024).

When employees are more involved in communication and decision-making processes, they feel heard and valued, which has a positive effect on their resilience. This also increases their identification with the company. Furthermore, respectful communication and opportunities for participation foster a positive work environment (Roeder and Bisel 2024; Stranzl and Ruppel 2025).

Another noteworthy aspect of successful internal communication is the targeted optimization of digital communication structures within companies. On the one hand, the increasing use of digital information and communication technologies can facilitate collaboration, but on the other hand, it can also lead to constant availability and information overload. This so-called technostress can be minimized through clear communication guidelines and transparent digital processes (Kräft et al. 2024; Marsh et al., 2024; Rigotti et al. 2024).

CONCLUSIONS/DISCUSSION

Mental health is increasingly becoming the focus of social and economic discussions, as the number of people with mental illnesses has risen steadily in recent years. This leads not only to the personal suffering of those affected but also to economic problems. Internal communication plays

a significant role in maintaining the mental health of employees, as opaque or inadequate communication can contribute to stress, conflict, or uncertainty in the workplace. Conversely, studies have shown that clear, respectful, and supportive communication promotes job satisfaction, motivation, and psychological stability. Furthermore, internal communication perceived as positive fosters both employee retention and company success.

The stress levels of employees are influenced in different ways by the various forms of communication. Formal communication, with its clear structure, can provide orientation; however, the lack of opportunities for participation can also lead to a feeling of insufficient autonomy. A clear advantage of informal communication is social exchange. This increases the sense of belonging and can help cope with stress. However, uncontrolled exchange also promotes the emergence of misunderstandings and rumors. Instrumental communication can help make processes more efficient, but at the same time, it also carries the risk of digital overload.

Considering the advantages and disadvantages of different communication methods, it is beneficial for companies to ensure a balanced communication system. For the sake of employees' mental health, transparency, participation, and social support should be given equal consideration, because a lack of these can promote the development of negative stress.

In short, the term stress describes the physical and psychological reaction to a stimulus. Stress can be perceived as either positive or negative. Negative stress arises primarily when demands are perceived as too high and one's own resources are considered insufficient to meet these demands. In everyday work life, unclear information, a lack of support, and an overall negative perception of internal communication can be stressors that negatively impact employees. Transparent, open, and appreciative communication, on the other hand, can help employees cope with work-related stress and strengthen their resilience.

Open, transparent, and supportive internal communication proves crucial for reducing employee stress and increasing resilience and job satisfaction. Companies that strategically develop their communication structures and promote social support and participatory processes create a healthy work environment in the long term, which sustainably supports performance. For this reason, companies should prioritize high-quality internal communication, both for their own benefit and for the mental health of their employees.

REFERENCES

- BACKHAUS, I., LOHMANN-HAISLAH, A., BURR, H., NIELSEN, K., DI TECCO, C. and DRAGANO, N., 2024. Organizational change: Challenges for workplace psychosocial risks and employee mental health. *BMC Public Health*, vol. 24, issue 1, Article 2477.
- BONANNO, G. A., 2021. The resilience paradox. *European Journal of Psychotraumatology*, vol. 12, issue 1, Article 1942642.
- BUCHHOLZ, U., 2015. Interne Unternehmenskommunikation. In: FRÖHLICH, R., SZYSZKA, P. and BENTELE, G. (eds.). *Handbuch der Public Relations: Wissenschaftliche Grundlagen und berufliches Handeln: Mit Lexikon*. 3rd ed., p. 832. Wiesbaden: Springer Fachmedien.
- CORNELISSEN, J., 2023. *Corporate Communication: A Guide to Theory & Practice*. London; Thousand Oaks, CA; New Delhi; Singapore: SAGE.
- DUARTE, A. P. and SILVA, V. H., 2023. Satisfaction with Internal Communication and Hospitality Employees' Turnover Intention: Exploring the Mediating Role of Organizational Support and Job Satisfaction. *Administrative Sciences*, vol. 13, issue 10, Article 216.
- EU-OSHA – EUROPEAN AGENCY FOR SAFETY AND HEALTH AT WORK, 2022. *Psychosocial Risks and Stress at Work*. [viewed 27 May 2026]. Available from: <https://osha.europa.eu/en/themes/psychosocial-risks-and-mental-health>
- FERREIRA, Y., AYGÜN, M., VOGT, J. and ZWECK, B. M., 2023. Informationsmenge als Indikator psychischer Belastung. *Zeitschrift für Arbeitswissenschaft*, vol. 77, issue 2, pp. 170–187.
- GALLUP, 2026. *State of the Global Workplace 2024 Report*. [viewed 26 May 2026]. Available from: <https://www.gallup.com/workplace/349484/state-of-the-global-workplace.aspx>
- GARMENDIA, P., FERNÁNDEZ-SALINERO, S., HOLGUERAS GONZÁLEZ, A. I. and TOPA, G., 2023. Social

- Support and Its Impact on Job Satisfaction and Emotional Exhaustion. *European Journal of Investigation in Health, Psychology and Education*, vol. 13, issue 12, pp. 2827–2840.
- GEORGE, J. M. and JONES, G. R., 2006. *Contemporary Management: Creating Value in Organizations*. [viewed 20 May 2026]. Available from: <https://www.semanticscholar.org/paper/Contemporary-management-%3A-creating-value-in-George-Jones/ecb0eabe01e7260d90cda1e693342d82c985a02e>
- GERHARDT, C., SEMMER, N. K., SAUTER, S., WALKER, A., WIJN, N., KÄLIN, W., KOTTWITZ, M. U., KERSTEN, B., ULRICH, B. and ELFERING, A., 2021. How are social stressors at work related to well-being and health? A systematic review and meta-analysis. *BMC Public Health*, vol. 21, issue 1, Article 890.
- HAMID, A. S., MOHAMAD, B. and ISMAIL, A., 2024. Internal crisis communication: Exploring antecedents and consequences from a managerial viewpoint. *Frontiers in Communication*, vol. 9.
- KALUZA, G., 2023. *Stressbewältigung*. Berlin; Heidelberg: Springer Berlin Heidelberg.
- KARASEK, R. A., 1979. Job Demands, Job Decision Latitude, and Mental Strain: Implications for Job Redesign. *Administrative Science Quarterly*, vol. 24, issue 2, p. 285.
- KERSTEN, N. and JUNGHANN, G., 2022. Informationsüberflutung am Arbeitsplatz. *Zentralblatt für Arbeitsmedizin, Arbeitsschutz und Ergonomie*, vol. 72, issue 5, pp. 206–218.
- KRÄFT, J., WIRTH, T., HARTH, V. and MACHE, S., 2024. Digital stress perception among German hospital nurses and associations with health-oriented leadership, emotional exhaustion and work-privacy conflict: A cross-sectional study. *BMC Nursing*, vol. 23, issue 1, Article 213.
- LAZARUS, R. and FOLKMAN, S., 1984. *Stress, Appraisal, and Coping*. New York: Springer.
- LIU-LASTRES, B., WEN, H. and OKUMUS, F., 2024. Exploring the impacts of internal crisis communication on tourism employees: Insights from a mixed-methods study. *Tourism Management*, vol. 100, Article 104796.
- MARSH, E., PEREZ VALLEJOS, E. and SPENCE, A., 2024. Mindfully and confidently digital: A mixed methods study on personal resources to mitigate the dark side of digital working. *PLOS ONE*, vol. 19, issue 2, e0295631.
- MASLACH, C. and LEITER, M. P., 2016. Understanding the burnout experience: Recent research and its implications for psychiatry. *World Psychiatry*, vol. 15, issue 2, pp. 103–111.
- MAST, C., 2014. Interne Unternehmenskommunikation. In: ZERFAB, A. and PIWINGER, M. (eds.). *Handbuch Unternehmenskommunikation: Strategie. Management. Wertschöpfung*. 2nd ed., p. 1127. Wiesbaden: Springer Gabler.
- MAST, C., 2019. *Unternehmenskommunikation*. 7th ed. München: UVK Verlag.
- MEN, L. R. and BOWEN, S. A., 2016. *Excellence in Internal Communication Management*. New York: Business Expert Press.
- MILLER, K., BARBOUR, J. and WOO, D., 2025. *Organizational Communication: Approaches and Processes*. Cengage Learning. Available from: <https://permalink.obvsg.at/>
- OECD/EUROPEAN UNION, 2018. *Health at a Glance: Europe 2018 – State of Health in the EU Cycle*. Available from: https://www.oecd.org/en/publications/health-at-a-glance-europe-2018_health_glance_eur-2018-en.html
- PAULI, R. and LANG, J., 2021. Collective resources for individual recovery: The moderating role of social climate on the relationship between job stressors and work-related rumination – A multilevel approach. *German Journal of Human Resource Management: Zeitschrift für Personalforschung*, vol. 35, issue 2, pp. 152–175.
- PAVLISTA, V., ANGERER, P. and DIEBIG, M., 2024. Challenges of modern work environments and means of overcoming them in the context of psychosocial risk assessments. *BMC Public Health*, vol. 24, issue 1, Article 3394.
- QIN, Y. S. and MEN, L. R., 2023. Exploring the Impact of Internal Communication on Employee Psychological Well-Being During the COVID-19 Pandemic: The Mediating Role of Employee Organizational Trust. *International Journal of Business Communication*, vol. 60, issue 4, pp. 1197–1219.
- RIGOTTI, T., SCHILBACH, M. and KERN, M., 2024. Sometimes here, sometimes there—Differential effects of social challenge and hindrance stressors depending on the work location. *Frontiers in Organizational Psychology*, vol. 2.
- ROBBINS, S. P. and JUDGE, T. A., 2024. *Organizational Behavior*. 19th ed. Harlow: Pearson.
- ROEDER, A. C. and BISEL, R. S., 2024. Managing disruption(s) at work: A longitudinal study of communicative resilience and high-reliability organizing. *Communication Monographs*, vol. 91, issue 1, pp. 56–78.
- SCHMID, B. F. and LYCZEK, B., 2006. *Unternehmenskommunikation*. Wiesbaden: Gabler.
- SELYE, H., 1974. *Stress without Distress*. Philadelphia: J. B. Lippincott Company.
- STRANZL, J. and RUPPEL, C., 2025. Co-creating an appreciative working climate: Discussing reasons for appreciation, forms and roles from a communication perspective. *Journal of Communication Management*, vol. 29, issue 2, pp. 274–296.

- SZYSZKA, P. and MALCZOK, M., 2016. Interne Kommunikation: Ein Begriff revisited. In: HUCK-SANDHU, S. (ed.). *Interne Kommunikation im Wandel*, p. 34. Wiesbaden: Springer Fachmedien.
- URBANCOVÁ, H., VRABCOVÁ, P., PACÁKOVÁ, Z. and JANKŮ, Š., 2023. Top-down internal communication and its importance for the sustainability of agricultural organizations from the perspective of Tomas Bata's management philosophy. *PLOS ONE*, vol. 18, issue 9, e0291087.
- WAHL, I., WOLFGRUBER, D. and EINWILLER, S., 2024. Mitigating teleworkers' perceived technological complexity and work strains through supportive team communication. *Corporate Communications: An International Journal*, vol. 29, issue 3, pp. 329–345.
- WORLD HEALTH ORGANIZATION. *Mental Health*. [viewed 23 May 2026]. Available from: https://www.who.int/en/health-topics/mental-health#tab=tab_1
- WORLD HEALTH ORGANIZATION, 2022. *World Mental Health Report: Transforming Mental Health for All*. Geneva: World Health Organization. Available from: <https://ebookcentral.proquest.com/lib/kxp/detail.action?docID=30480025>
- WORLD HEALTH ORGANIZATION, 2025. *Depressive Disorder (Depression)*. [viewed 20 May 2026]. Available from: <https://www.who.int/news-room/fact-sheets/detail/depression>

ВЛИЯНИЕ НА ВЪТРЕШНОФИРМЕНАТА КОМУНИКАЦИЯ ВЪРХУ ПРЕЖИВЯВАНЕТО НА СТРЕС И ПСИХОЛОГИЧЕСКАТА УСТОЙЧИВОСТ НА СЛУЖИТЕЛИТЕ

Резюме: В психологическите изследвания и науката за комуникацията уважителната, ясна и разбираема вътрешнофирмена комуникация се счита за ключов фактор за психологическото благополучие на служителите. Освен това висококачествената комуникация се свързва с по-малко симптоми на прегаряне и по-голяма удовлетвореност от живота сред служителите. Настоящата статия, основана на систематичен литературен преглед, има за цел да предостави теоретичен преглед на ключовите аспекти на възприемането на стреса и комуникацията в професионалния контекст, като анализира основните фактори за положително възприемана вътрешна комуникация. Тя разглежда също така влиянието на качеството на комуникацията върху възприемането на стреса и психологическата устойчивост, като обръща внимание на потенциални предизвикателства, като информационно претоварване и комуникационни дефицити. Статията подчертава голямата значимост на ефективната вътрешнофирмена комуникация за психичното здраве на служителите, удовлетвореността на служителите и успеха на компанията. Добрата вътрешнофирмена комуникация е ключов компонент на организационна структура, насърчаваща здравето. В допълнение, се обсъждат и практически подходи за подобряване на комуникацията в рамките на компаниите.

Ключови думи: вътрешнофирмена комуникация; преживяване на стреса; психологическа устойчивост; служители; психично здраве

Катарина Кастнер, докторант
Университет по библиотекознание и информационни технологии
София, България
E-mail: kastner-katharina@gmx.at

ОБЩЕСТВЕНИ КОМУНИКАЦИИ И ИНФОРМАЦИОННИ НАУКИ
PUBLIC COMMUNICATIONS AND INFORMATION SCIENCES

**GLOBALIZATION, ENERGY AND INFORMATION PROCESSES:
GEOPOLITICAL POWER, INEQUALITY AND COOPERATION
IN THE GLOBAL ENERGY SYSTEM**

Lisa Pauline Krohm

University of Library Studies and Information Technologies

<https://doi.org/10.70300/UGIB3163>

Abstract: *Global energy supply is at the heart of current geopolitical, economic, and social transformation processes. Historically, energy has been a crucial foundation for industrial expansion and the development of state power; today, it is also a central prerequisite for economic development, social stability, and environmental sustainability. The publication assumes that, in the context of global interconnectedness, state action in the energy sector no longer functions primarily through traditional interventions. Instead, the focus is shifting to the collection, processing, and strategic use of information, making political control appear increasingly as a knowledge- and data-driven process. Based on a systematic literature analysis, the article examines the interactions between geopolitical power relations, global energy inequalities, and information processes. In addition to historical developments and established concepts of energy security, analytical tools for global energy flows are used. The focus is on the importance of exchange, information, and communication mechanisms for cooperation between countries in the energy sector – especially with regard to the emerging hydrogen market. The study concludes that shared knowledge, transparent decision-making processes, and firmly established communication channels are not mere side effects. Rather, they form the fundamental basis for international reliability, stable orders, and a balanced, fair transformation of energy systems.*

Keywords: *global energy governance; globalization and energy systems; hydrogen economy; power asymmetry in global energy policy; socio-technical energy systems*

INTRODUCTION

Energy is a fundamental prerequisite for modern societies and, at the same time, one of the key political resources for conflicts in the 21st century. It forms the material basis for economic production, military capabilities, and social development. However, with advancing globalization, its political significance has shifted: national energy systems are increasingly integrated into transnational supply and information networks, creating new dependencies, power asymmetries, and political risks.

Against this backdrop, this article examines the role of energy in the complex interplay of globalization, geopolitical power, and information processes. The central question is how global energy flows and information-based control mechanisms structure geopolitical power relations while simultaneously influencing the possibilities and limitations of international cooperation in the context of current energy crises.

This article takes a qualitative-theoretical approach and combines perspectives from energy policy, geopolitics, and information science. The aim is to analyze global energy systems as complex socio-technical orders that are shaped by both material infrastructures and knowledge, data, and communication processes. Methodologically, the dissertation is based on a theory-driven, analytically condensed synthesis of political science, interdisciplinary, and policy-related literature. The aim is not merely to compile existing research findings, but to systematically reconstruct and theoretically reconnect them. Different strands of debate are brought together in an integrative manner in order to reveal structural gaps at the interface of energy policy, global interdependence, and information governance.

The interdisciplinary bundling of fragmented research approaches creates a coherent analyt-

ical framework that reveals conceptual breaks and highlights previously under-theorized interactions between material energy infrastructure, geopolitical order formation, and information-related power structures.

This article explicitly does not aim to provide an empirical mapping of global energy systems, but rather a theoretical reconceptualization of the role of information processes within energy policy power and governance structures.

THEORETICAL FOUNDATIONS AND STATE OF RESEARCH

The increasing interconnectedness of the global economy and rising global energy demand mark a fundamental shift in the relationship between energy, the economy, and political power. With industrialization, energy evolved from a primarily locally used technical resource to a strategic prerequisite for state action. Today, the availability and control of energy decisively determine a state's ability to generate economic growth, develop industrial capacities, and ensure social stability (Smil 2004; Weissenbacher 2009). Energy has thus become a strategic resource whose significance extends far beyond economic aspects.

Researchers largely agree that energy has played a key role in global power structures since the 19th century. Access to energy resources influences not only industrial development but also foreign policy options and military capabilities (Yergin 2006). Energy is therefore closely linked to issues of state sovereignty, geopolitical stability, and international dependencies.

This article expands this perspective by adding a globalization-theoretical and information-science dimension. Energy is no longer understood merely as a physical resource used to exert political influence. Instead, it appears as deeply embedded in global value chains, trade networks, and digital information systems. The focus is on the movement of energy across borders, unequal structural starting conditions, and knowledge advantages and deficits that emerge as global interconnections intensify.

Unlike many theoretical approaches that consider either past energy regimes or specific raw materials in isolation, this study examines the current development phase of highly networked energy systems. In particular, it analyzes how these systems are shaped and controlled today by data, communication processes, and knowledge-based coordination mechanisms. Hydrogen serves not as an isolated object of study, but as an analytical example within a broader consideration of global energy governance.

In summary, while energy has been extensively studied as a geopolitical power factor, the systematic link between energy, globalization, and information governance has so far only been addressed sporadically. This article focuses on this analytical intersection.

Energy as a geopolitical power factor

Numerous studies demonstrate that energy has been a key geopolitical resource since industrialization. Access to coal, oil, and industrial raw materials enabled states to build economic strength and project military power (Weissenbacher 2009, p. 19; Hobsbawm 1989, pp. 56–57). Energy functioned not only as a factor of production but also as a strategic instrument that structured imperialist expansion, industrial dominance, and political influence.

This dynamic became particularly evident in the 20th century. In both World Wars, industrial production capacity and a secure energy supply proved to be decisive factors (Hayward 1995, pp. 94–135; Scott 2019, pp. 136–161). Decisions regarding energy sources, transportation routes, and industrial infrastructure influenced both military strategies and political alliances. Energy thus became an integral component of national security concepts.

Even after 1945, energy remained a geopolitical focal point. The emergence of global oil markets, the development of transnational energy infrastructures, and the institutionalization of energy policy interests, for example through OPEC, led to lasting shifts in the international balance of power (Yergin, 2011, pp. 1–820, Yergin, 2009, pp. 1–982). Energy dependencies became political levers, while price fluctuations and supply shortages repeatedly triggered global economic and political instabilities.

Globalization, energy inequality and energy security

Globalization describes the intensification of cross-border economic, political, and social relations, which has led to a widespread international division of labor (Dreher, Gaston, Martens 2008, p. 1). In the energy sector, this process manifests itself in highly interconnected systems where energy production, transport, and consumption are spatially decoupled. Energy is often produced where resources are available, while the majority of consumption takes place in other regions of the world.

This structure is accompanied by significant inequalities in global energy consumption. Wealthy, highly industrialized states claim a disproportionately large share of the globally available energy and drive consumption to particularly high levels. At the same time, many regions of the Global South continue to lack reliable and sufficient access to energy, leaving millions of people there facing basic energy scarcity (Smil 2004, p. 557; Chen 2011). Energy-intensive production processes and environmental impacts are often outsourced to the Global South, exacerbating existing socioeconomic inequalities.

Against this backdrop, the understanding of energy security has also broadened. While earlier concepts focused primarily on the physical availability of energy, energy security today also encompasses aspects such as affordability, environmental sustainability, political stability, and social acceptance (Ang, Choong, Ng 2015, pp. 1081–1082; Sovacool, Brown 2010). Energy poverty remains a central global problem, closely linked to development issues and global justice. These inequalities are not solely attributable to market dynamics but are also shaped by the political and institutional frameworks of global energy policy. In this context, transparency, regulation, and data availability are of particular importance.

Information processes and global energy governance

Recent research increasingly underscores the importance of information processes for the functioning of global energy systems. Energy infrastructures are not merely physical networks, but complex socio-technical systems whose stability depends on data, knowledge, communication, and institutional coordination (Crossland 2017, p. 460). The planning, control, and monitoring of modern energy systems require the continuous processing and exchange of energy-related information.

Against this backdrop, a conceptual distinction between data, information, and knowledge is analytically useful. Data initially refers to raw, unordered measurements, for example, regarding energy production, transmission capacities, or consumption patterns. Information only emerges through the contextualization and interpretation of this data, while knowledge additionally encompasses the ability to use information politically, institutionally, or strategically. This distinction is of central importance for global energy systems, as political governance depends less on the mere availability of data than on its institutional processing and accessibility.

In the context of energy policy, therefore, it is not only the collection of data on production volumes or emissions that is crucial, but rather who controls this information, how it is interpreted, and in which decision-making processes it has an impact. Information processes are therefore not neutral, but always embedded in existing power and governance structures. This perspective allows us to understand energy policy not only as a matter of material control, but also as a knowledge-based negotiation of political agency.

Cross-border cooperation in the energy sector, especially in the development and networking of hydrogen infrastructures, can only function if reliable data are openly shared, technical and regulatory standards are aligned, and political and economic actors continuously and in a coordinated manner align their strategies (Chen et al. 2024, pp. 436–458; European Hydrogen Backbone 2025). Information processes build trust, increase investment security, and enable political coordination.

Conversely, a lack of transparency and insufficient knowledge sharing can delay or undermine cooperation projects. Information asymmetries represent a key challenge in this context. Differences in access to data, technological knowledge, and institutional capacities, particularly between the Global North and South, exacerbate existing power imbalances and hinder a just energy transition. Energy crises can therefore increasingly be understood as information and governance crises in which the organization, availability, and political use of knowledge play a crucial role.

Information-based power, governance and resilience of global energy systems

Global energy systems are not defined solely by physical infrastructure, but increasingly by institutional frameworks that structure access to information, its interpretation, and its political use (Roehrkasten 2015; Crossland 2017).

In the context of globalized energy flows, information-based control mechanisms are therefore gaining increasing strategic importance. Actors who possess comprehensive and reliable data on energy production, transmission, and consumption, or who define technical standards, reporting systems, and classifications, can exert political influence and actively shape the framework for cooperation (Yergin 2011; Heffron, Sokołowski 2024). In this context, information functions not only as a reflection of existing power relations, but also as a resource with which these relations can be stabilized or altered.

In contrast, some energy policy and geopolitical publications argue that information-based control mechanisms are subordinate to physical factors such as physical infrastructure, territorial control, or the military security of supply routes. They maintain that energy supply remains based on physical foundations and cannot be guaranteed without functioning infrastructure.

However, reducing information-related aspects to mere technical support functions falls short. Particularly in globalized energy systems, where production, transport, and consumption structures are spatially decoupled, information processes acquire independent political significance. The ability to visualize energy flows, communicate risks early, and define standards significantly influences which actors are capable of action and which forms of cooperation are considered legitimate. Information-based governance thus does not replace material energy resources but rather complements and structures their political effectiveness.

At the same time, the literature on global energy policy makes it clear that the resilience of energy systems depends significantly on the quality of information-related governance. In crisis situations such as supply shortages, price shocks, or geopolitical conflicts, transparent information flows, robust early warning systems, and coordinated communication structures are crucial for maintaining collective capacity to act (International Energy Agency 2023; Sovacool, Martiskainen, Hook, Baker 2019). Conversely, missing, fragmented, or politically distorted information structures can increase uncertainty and promote escalation dynamics.

Furthermore, information-based governance is closely linked to issues of global justice. Unequal access to data, technical knowledge, and institutional resources contributes to the reproduction of existing power asymmetries between the Global North and South (Sadik-Zada 2021). Against this backdrop, it can be argued that a sustainable and equitable energy transition depends not only on technological innovations but also on the conscious design of inclusive, transparent, and accessible knowledge and information structures.

Overall, it becomes clear that information processes do not merely fulfill supporting functions but constitute an independent political dimension of global energy systems. They influence power relations, the capacity for cooperation, and crisis resilience and are thus an integral component of modern energy policy.

METHODOLOGY

This publication is based on a qualitative literature review. The analysis encompassed scholarly articles, monographs, reports from international organizations, and policy-oriented studies in the fields of energy policy, geopolitics, and information science. The evaluation was conducted using a theme-centered content analysis that systematically linked key concepts such as energy security, global energy flows, information asymmetries, and international cooperation. The aim was to identify recurring patterns of argumentation and to situate them theoretically.

RESULTS

The analysis shows that energy functions as a structural power factor that not only reflects historical and current geopolitical patterns but also actively shapes them. Access to, control over, and regulation of energy flows influence the political agency of states and international power

relations. Energy thus proves to be not merely an economic resource but a central element of geopolitical stability as well as potential conflict dynamics.

Globally organized energy flows reproduce and, in some cases, exacerbate existing inequalities. The energy-intensive consumption of industrialized regions is often based on production and environmental costs that are geographically displaced. This asymmetric distribution of benefits and burdens creates structural dependencies and reinforces global disparities between energy-producing and energy-consuming societies.

Affordability, sustainability, social acceptance, and institutional control are integral components of modern energy security concepts and require analytical approaches that go beyond purely technical or market-oriented perspectives. The independent influence of information-based governance mechanisms on the stability and resilience of global energy systems is particularly noteworthy. Not only material energy flows, but also control over energy-related data, knowledge, and technical standards shape geopolitical power relations. Fragmented or opaque information structures act as systemic risk factors, while transparent and coordinated governance structures foster trust and facilitate international cooperation.

DISCUSSION

The results show that energy policy in the context of globalized energy systems cannot be understood as a purely technical or economic sphere of control. Rather, it is a complex governance process in which material resources, political power, and information-based control mechanisms are inextricably linked. This article expands existing energy policy approaches by analyzing information not only as a supporting factor but also as an independent dimension of geopolitical power.

From this perspective, further implications arise for the analysis of global energy governance. If information processes are understood as an independent power resource, questions of data accessibility, standard-setting, and institutional transparency move more sharply into focus for energy policy research. Governance structures can then no longer be grasped solely through formal institutions or material resources but must be analyzed as knowledge-based orders in which political authority and legitimacy are increasingly mediated through information control.

For international cooperation, this means that successful energy cooperation depends less on technical compatibility alone than on the ability to establish shared information and communication structures. Particularly in conflict-ridden or asymmetric contexts, access to reliable information determines whether trust can develop or whether existing power imbalances are further entrenched.

The perspective developed here also differs from approaches that primarily view energy policy as a problem of technical efficiency or economic optimization. While such approaches make an important contribution to the analysis of cost structures, innovation pathways, and infrastructure issues, they often neglect the power- and knowledge-related prerequisites for political governance. In contrast, an information-centered perspective shows that political action does not result solely from technological performance or market design, but depends significantly on the organization, accessibility, and political use of knowledge. This contribution thus opens up an analytical perspective that does not replace technological and economic approaches, but rather complements them with a power- and governance-oriented dimension.

Actors with privileged access to data, knowledge, and institutional decision-making processes have greater opportunities to determine the energy policy agenda and shape the framework for cooperation. Without transparent and inclusive information structures, there is therefore a risk that future energy systems will reproduce existing power structures.

CONCLUSION

This article demonstrates that the global energy crisis cannot be understood solely as a technological or economic challenge, but rather has profound political, social, and informational dimensions. Energy simultaneously functions as a material resource, a geopolitical power factor, and a subject of communicative negotiations. A successful energy transition therefore requires not only

technological innovations, but also robust information processes, institutional transparency, and resilient forms of international cooperation.

Information-based governance mechanisms play a central, yet hitherto underestimated, role in global energy systems. Issues of data access, the definition of standards, and knowledge organization significantly influence power relations, the capacity for cooperation, and crisis resilience. Without the conscious design of inclusive information and governance structures, there is a risk that future energy systems will reproduce existing global inequalities.

In light of increasing geopolitical fragmentation, the question of how information-based energy policy can be sustainably implemented even under conflict-ridden conditions is gaining particular importance.

Since this article is based exclusively on an evaluation of existing literature and does not conduct any original data collection, it also serves as a starting point for further research. In particular, empirically based case studies, for example on cross-border hydrogen projects or on unequally distributed knowledge in regional energy markets, could help to further develop, refine and substantiate the theses formulated here with concrete examples.

REFERENCES

- ANG, B. W., CHOONG, W. L., NG, T. S., 2015. Energy security: Definitions, dimensions and indexes. *Renewable and Sustainable Energy Reviews*, 2015, Vol. 42, pp. 1077–1093. DOI: <https://doi.org/10.1016/j.rser.2014.10.064>
- CHEN, P. S.-L., H. FAN, H. ENSHAEI, W. ZHANG, W. SHI, N. ABDUSSAMIE, T. MIWA, Z. QU and Z. YANG. Opportunities and Challenges of Hydrogen Ports: An Empirical Study in Australia and Japan. *Hydrogen*, 2024, Vol. 5, No. 3, pp. 436–458. DOI: <https://doi.org/10.3390/hydrogen5030025>
- CHEN, Z. M. and G. Q. CHEN. An overview of energy consumption of the globalized world economy. *Energy Policy*, 2011, Vol. 39, No. 10, pp. 5920–5928. DOI: <https://doi.org/10.1016/j.enpol.2011.06.046>
- CROSSLAND, M. D., ed. *Decision Support Systems*. Switzerland: Springer Nature, 2017.
- DREHER, A., N. GASTON and P. MARTENS. *Measuring Globalisation*. New York, NY: Springer, 2008.
- EUROPEAN HYDROGEN BACKBONE. *Official website of the European Hydrogen Backbone project* [online]. 2025. Available from: <https://ehb.eu/>
- HAYWARD, J. Hitler's quest for oil: The impact of economic considerations on military strategy, 1941–42. *Journal of Strategic Studies*, 1995, Vol. 18, No. 4, pp. 94–135. DOI: <https://doi.org/10.1080/01402399508437621>
- HEFFRON, R. J. and M. M. SOKOŁOWSKI. Resolving energy policy failure: Introducing energy justice as the solution to achieve a just transition. *Energy Policy*, 2024, Vol. 187, 114042. DOI: <https://doi.org/10.1016/j.enpol.2024.114042>
- HOBBSAWM, E. J. *The Age of Empire, 1875–1914*. First Vintage Books ed. New York: Vintage Books, 1989.
- INTERNATIONAL ENERGY AGENCY. *World Energy Outlook 2023*. Paris: International Energy Agency, 2023.
- ROEHRKASTEN, S. Global Governance on Renewable Energy. In: S. Roehrkasten, ed. *Global Governance on Renewable Energy*. Wiesbaden: Springer Fachmedien Wiesbaden, 2015, pp. 73–116.
- SADIK-ZADA, E. R. Political Economy of Green Hydrogen Rollout: A Global Perspective. *Sustainability*, 2021, Vol. 13, No. 23, 13464. DOI: <https://doi.org/10.3390/su132313464>
- SCOTT, D. The Geoeconomics and Geopolitics of Japan's 'Indo-Pacific' Strategy. *Journal of Asian Security and International Affairs*, 2019, Vol. 6, No. 2, pp. 136–161. DOI: <https://doi.org/10.1177/2347797019842440>
- SMIL, V. World history and energy. *Encyclopedia of Energy*, 2004, Vol. 6, pp. 549–561.
- SOVACOOOL, B. K. and M. A. BROWN. Competing Dimensions of Energy Security: An International Perspective. *Annual Review of Environment and Resources*, 2010, Vol. 35, No. 1, pp. 77–108. DOI: <https://doi.org/10.1146/annurev-environ-042509-143035>
- SOVACOOOL, B. K., M. MARTISKAINEN, A. HOOK and L. BAKER. Decarbonization and its discontents: A critical energy justice perspective on four low-carbon transitions. *Climatic Change*, 2019, Vol. 155, No. 4, pp. 581–619. DOI: <https://doi.org/10.1007/s10584-019-02521-7>
- WEISSENBACHER, M. *Sources of Power: How Energy Forges Human History*. Santa Barbara: ABC-CLIO, 2009.
- YERGIN, D. Ensuring Energy Security. *Foreign Affairs*, 2006, Vol. 85, No. 2, pp. 69–80. DOI: <https://doi.org/10.2307/20031912>
- YERGIN, D. *The Prize: The Epic Quest for Oil, Money and Power*. London: Simon & Schuster, 2009.
- YERGIN, D. *The Quest: Energy, Security and the Remaking of the Modern World*. London: Penguin, 2011.

ГЛОБАЛИЗАЦИЯ, ЕНЕРГЕТИКА И ИНФОРМАЦИОННИ ПРОЦЕСИ: ГЕОПОЛИТИЧЕСКА ВЛАСТ, НЕРАВЕНСТВО И СЪТРУДНИЧЕСТВО В ГЛОБАЛНАТА ЕНЕРГИЙНА СИСТЕМА

Резюме: Глобалното енергоснабдяване е в центъра на настоящите геополитически, икономически и социални трансформационни процеси. Исторически, енергията е била решаваща основа за индустриалната експанзия и развитието на държавната власт; днес тя е и централна предпоставка за икономическото развитие, социалната стабилност и екологичната устойчивост. Публикацията изхожда от предпоставката, че в контекста на глобалната взаимосвързаност държавните действия в енергийния сектор вече не функционират предимно чрез традиционни интервенции. Вместо това фокусът се измества към събирането, обработката и стратегическото използване на информация, което прави политическия контрол все повече процес, ръководен от знания и данни. Въз основа на систематичен анализ на литературата статията разглежда взаимодействията между геополитическите властови отношения, глобалните енергийни неравенства и информационните процеси. В допълнение към историческото развитие и утвърдените концепции за енергийна сигурност се използват аналитични инструменти за глобалните енергийни потоци. Акцентът е върху значението на механизмите за обмен, информация и комуникация за сътрудничеството между държавите в енергийния сектор – особено по отношение на възникващия пазар на водород. Проучването заключава, че споделяното знание, прозрачните процеси на вземане на решения и твърдо установените канали за комуникация не са просто странични ефекти. По-скоро те формират фундаменталната основа за международна надеждност, стабилни порядки и балансирана, справедлива трансформация на енергийните системи.

Ключови думи: глобално енергийно управление; глобализация и енергийни системи; водородна икономика; асиметрия на силите в глобалната енергийна политика; социално-технически енергийни системи

Лиза Паулине Кром, докторант
Университет по библиотекознание и информационни технологии
София, България
E-mail: lisapaulinemeier@gmail.com

ОБЩЕСТВЕНИ КОМУНИКАЦИИ И ИНФОРМАЦИОННИ НАУКИ
PUBLIC COMMUNICATIONS AND INFORMATION SCIENCES

**PHASE-RELATED LEADERSHIP IN PROJECTS: A LITERATURE-BASED
PERSPECTIVE ON LEADERSHIP IN THE COURSE OF A PROJECT**

Timo Zimenga

University of Library Studies and Information Technologies

<https://doi.org/10.70300/TMIK2747>

Abstract: *This study examines whether the project manager's leadership style differs across the individual project phases. The focus is on the balanced leadership approach and a split in leadership responsibility between the project manager (vertical leadership) and the project team (horizontal leadership). A theoretical analysis and combination of project phases and leadership approaches was carried out using a literature review. The results of the analysis and combination show that leadership is not a static style, but a dynamic process of influence. At the beginning of the project life cycle, leadership responsibility lies primarily with the project manager. In the planning and definition phase of the project, the degree of responsibility assumed by the project team increases, while in the execution phase, situational change is most effective. In the final phase, it also makes sense to shift leadership responsibility between the project manager and the project team. In conclusion, it is clear that balanced leadership is a useful leadership approach in project phases.*

Keywords: *Balanced Leadership; Projekt phases; Project management; Situational leadership; Phase-related Leadership*

INTRODUCTION

The effectiveness of leadership in project management depends on the project manager's ability to adapt their leadership style to the specific situation and requirements of each project phase (Pretorius/Steyn/Bond-Barnard 2017). This is proven by Ćwiąkała et al. (2025): their study shows that leadership styles have a significant impact on project efficiency. 92% of respondents are convinced that leadership directly influences efficiency (Ćwiąkała et al. 2025). Ghafory and Sahnosh (2024) emphasize the importance of the project manager's leadership style and conclude that the project manager's leadership style determines the success or failure of the project. However, as projects are becoming increasingly complex, partly due to digitalization (Hafseld/Hussein/Rauzy 2021), the project manager alone can no longer cover all areas completely and act as the sole responsible point of contact for all issues. In addition, due to the varying content in the different phases, projects are characterized by frequent personnel changes in the project team (Drouin et al. 2018). By choosing a suitable leadership approach, this complexity can be effectively managed, teamwork improved, and thus a successful project ensured. Choosing the right leadership style is crucial for achieving project goals and maximizing teamwork (Ghafory/Sahnosh 2024). However, the question arises as to how project teams can be managed efficiently in dynamic project structures. Müller and Turner (2007), as well as Joslin and Müller (2015), say that no single leadership style is suitable for all conditions and situations in a project. Rather, according to Müller and Turner (2007) and Müller and Jugdev (2012), the project manager must choose the leadership style depending on the type of project and other project characteristics and adapt it to the situation. According to Azman, Mohamed, and Odzaly (2020), current research emphasizes the need for project managers to switch flexibly between leadership styles in order to respond appropriately to the situation. This statement is supported by Pretorius et al. (2017), who say that a flexible approach that integrates different leadership styles depending on the project phase is essential for project success. This contrasts with traditional approaches, which focus on a single leadership style throughout the entire project life cycle and ignore the specific characteristics of the individual phases (Hasenzagl/Jung/Jung 2021). As Rifky (2025) as well as Ghafory and Sahnosh (2024) have pointed out, the key is to choose the right leadership style for the right situation, as this has a

significant impact on team performance and project success.

This paper examines the extent to which the adaptation of leadership style depends on the individual phases of a project. The following research question will be answered: **Does employee leadership differ in the different phases of a project?**

RESEARCH METHODOLOGY

This study is based on a literature review that examines the project phases and analyzes leadership in these project phases. This literature review primarily includes current scientific journals and scientific books to establish a solid theoretical basis. First, the issue is presented in the introduction. Then, the individual project phases and leadership models are presented. Finally, the project phases are described separately and linked to the leadership approaches recommended in the literature.

RESULTS

The project phases are first presented and explained below, followed by a discussion of leadership in project management.

Project phases

The definition of project phases refers to the activities related to the value creation process within the project, i.e., the project content. Project management phases, on the other hand, refer to project management and form the logical sequence of project management processes over the project life cycle (GPM 2017). This clarification is important because this study examines the relationship between leadership and project management phases, but the literature often only uses the synonym “project phases.” For the purposes of simplicity, this study uses the synonym “project phases,” but this refers to the project management phases.

A well-known classification of the phases in the project life cycle in Germany is that of DIN 69901:2009 (DIN 2009). Here, the project management phases are divided into initiating, definition, planning, control, and closing (DIN 2009), as can be seen in Figure 1 below.

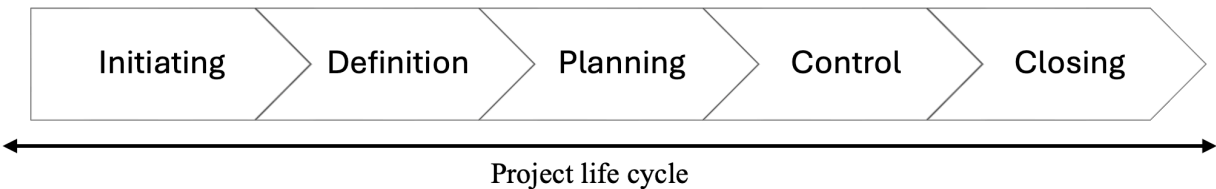


Fig. 1. Overview of project management phases according to DIN 2009

The German Project Management Association (GPM) has used the phases defined in DIN 2009 to outline a project process, which is described in the following: The project idea is defined in the initiation phase. This idea is analyzed and used to define a mission that sets out how the project is to be planned in order to meet the requirements. The mission is developed into a rough preliminary project plan, which must be approved by the client. In the definition phase, this project plan is further detailed and the project team is formed. The focus of this phase is on precisely formulating the objectives and coordinating them with the client. Furthermore, milestones are set and the costs are roughly estimated in this phase. Once the client has given their approval, the planning phase begins, during which it is determined in detail who will perform which tasks and by when. In the planning phase, the project structure plan is created in a high degree of detail. Based on this plan, deadlines, resources, and costs are scheduled. Since this phase is of great importance for the course of the project, it is characterized by frequent feedback. For this reason, the planning phase is often iterative. Once this plan has been approved by the client, the project moves into the control phase. Here, the planned tasks are implemented and continuously monitored. This phase often begins with a kick-off event to clarify the content, objectives, and tasks of the project to all project participants. Once the project objective has been achieved, the result is handed over to the client

for acceptance. This is followed by the transition to the closing phase. The closing phase serves as a process for the formally ending and final preparation of the project. In addition to securing the project documentation, this also includes events that serve to promote continuous development. The insights gained from lessons learned events are intended to improve future projects by avoiding mistakes. Finally, the project team is dismissed and the project manager is formally relieved of responsibility for the project. This marks the end of the project (GPM 2017; DIN 2009).

Other institutions also follow this structure of project management phases. The Project Management Institute also describes a five-phase plan. The phases described in the PMBoK are: Initiating, Planning, Executing, Monitoring & Controlling, and Closing (PMI 2021). At first glance, it is clear that these phases are identical to those of the GPM. Other institutions also specify five phases as the project life cycle. The Government Functional Standard for Project Delivery describes the five phases of Feasibility, Appraisal, Definition, Delivery, and Operation (Gov. UK 2025). Even though the phases differ slightly in some cases, they all follow the same structure: First, the project impulse is triggered, the project is planned and defined, then executed, and finally closed. The following table (Table 1) serves to illustrate and compare the phases according to the respective institution.

Table 1. Comparison of project management phases

Contents of the project phase	Phases according to DIN (DIN 2009)	Phases according to PMI (PMI 2021)	Phases according to Gov. UK (Gov. UK 2025)
Project impulse	Initiating	Initiating	Feasibility, Appraisal
Project planning	Definition	Planning	Definition
Project definition	Planning	Planning	Definition
Project execution	Control	Executing, Monitoring & Control	Delivery
Project closing	Closing	Closing	Operation

Dividing a project into different phases raises the question of how project teams can be effectively led in each phase.

Leadership in project management

According to Müller, Drouin, and Sankaran (2021b), there are few concepts “that have as many different definitions and are as widespread as leadership. Therefore, the use of the term should always refer to a specific context.” In this study, leadership refers to the context of projects, the project manager, the project team, and the leadership of this project team. To illustrate the influencing factors of leadership, it was transferred to theoretical models from which the well-known leadership theories emerged (Zaccaro et al. 2018; Weitlaner/Ellmann 2019). A division was made between classic and newer approaches (Jung 2017; Lippold 2019). Rieder (2014) and Weitlaner and Ellmann (2019) describe a further subdivision of classical leadership approaches into person-centered, behavior-oriented, and situation-dependent leadership theories, and a further subdivision of newer leadership approaches into relationship-oriented and system-oriented leadership theories. Person-centered leadership approaches focus on situation-independent personality traits of the leader and mostly ignore other factors (Mahlmann 2011; Rieder 2014; Blessin/Wick 2017). Behavior-oriented leadership theories consider the relationship between the leader and the led. Well-known leadership styles here are the authoritarian, democratic, and laissez-faire leadership styles, which describe the relationship to varying degrees (Stippler et al. 2011; Hungenberg/Wulf 2011). In their work, Blessin and Wick (2017) describe that situational theories were developed because neither the characteristics nor the behavior of the leader alone are crucial for leadership success. Situation theories include contingency theory, which links a task- or relationship-oriented leadership style with individual situational characteristics (Jung 2017; Lippold 2019; Staehle 2014).

Relationship-oriented leadership styles, which are among the newer approaches, focus on the

relationships between the leader and the led (Weitlaner/Ellmann 2019). Well-known leadership styles here include the Full Range of Leadership Model, which divides leadership into transformational or transactional leadership (Bass/Riggio 2006). System-oriented leadership theories focus on viewing the organization as a system that can regulate itself and does not require external control (Weitlaner/Ellmann 2019; Stippler et al. 2011). This preliminary development of leadership theories shows that the relationship between the led and the leader is the focus of attention due to the development of work structures towards a digital environment (Antoni/Syrek 2017).

Mango (2018) and Schulze and Pinkow (2020) describe that, to date, there is no leadership theory that can fully capture the diverse content of leadership. Rieder (2014) expands on this statement, describing that there is no universally valid leadership style and that leaders should be familiar with different approaches in order to be able to respond in the best possible way in any given situation. Müller, Drouin, and Sankaran (2022) add that the leadership approaches described must complement each other. They add that situational use and timely switching between leadership approaches in dynamic structures is crucial and that this combination is collectively referred to as balanced leadership. Project management temporarily adapts its leadership style so that either the project manager or suitable team members take on the leadership role as needed. According to Drouin et al. (2021), the temporary change in leadership style in projects is considered the basis for success. The use of balanced leadership as a leadership practice allows for the flexibility to temporarily define the best leader for a given situation (Müller/Drouin/Sankaran 2021a). Balanced leadership is not a newly developed leadership theory. This leadership practice originated from a further development of contingency theory, which, as already mentioned, is one of the situation-dependent leadership theories and focuses on adapting the leadership approach to the respective conditions of the situation (Drouin et al. 2021). Balanced leadership describes the process when leadership responsibility shifts between the project manager and the project team (Müller/Drouin/Sankaran 2021a). According to Müller et al. (2021b), balanced leadership includes vertical leadership, horizontal leadership, and team-based leadership, the last of which refers to leadership from within the team. Müller, Packendorff, and Sankaran (2017) define horizontal leadership as a social process in which one or more members of the project team influence the other members of the project team, as well as the project manager, to perform certain tasks in accordance with the project plan. Vertical leadership is defined by the authors as the social influence process in which the project manager influences the project team or individual members of that team. According to Müller et al. (2021a), balanced leadership is an important leadership style for dynamic projects due to its potential flexibility. This view is also supported by Müller et al. (2022) and Rifky (2025). Rifky (2025) conducted a comprehensive literature analysis and concluded that success in projects depends largely on choosing the right leadership style. The author states that a situational leadership style is appropriate in order to obtain the necessary scope for action to be able to respond adequately to the dynamics during a project. Rifky (2025) does not refer directly to balanced leadership in his literature analysis. However, it becomes clear in his paper that his remarks are aimed at the content of balanced leadership. Drouin et al. (2018) support these statements with empirical research. In summary, their findings can be described as a situational interaction between the project manager and project team members: while vertical leadership sets the strategic framework and business guidelines, the team takes the lead in technical and operational situations, provided there is a basis of trust and proven competence.

DISCUSSION

The following section examines how balanced leadership is applied in the five project management phases: project initiation, project planning, project definition, project execution, and project closure. According to Pretorius et al. (2017), a flexible approach depending on the situation and project phase is crucial for project success.

In the project initiation phase, i.e., the start of the project, the project idea is adopted and work begins on specifying the project idea and planning the next steps. The focus in this phase is on setting up the project. In this phase, the project manager usually plays a more prominent role

in transforming the project idea into a project, convincing stakeholders, and ultimately obtaining approval for the project (GPM 2017; DIN 2009). Pretorius et al. (2017) recommend that, despite the strong focus on the project manager in this phase, leadership should not be exercised exclusively top-down, but should specifically involve the team and stakeholders. Müller et al. (2021b) support this and also state that leadership in this phase should remain within the team. In addition to the positive aspects of involving technical experts in the project initiation process, this early involvement increases the trust and commitment of the team. Team members thus showed greater commitment to the project, which is supported by empirical studies (Korsgaard/Schweiger/Sapienza 1995). Pretorius et al. (2019) also highlight the importance of early involvement of both the project team and key stakeholders. The rationale behind this recommendation is that, especially in this planning-intensive phase, collective intelligence and cooperative decision-making should be at the top of the agenda (Pretorius et al. 2019). At the same time, however, the visionary leadership role of the project manager remains highly important in the project initiation phase. Especially in this uncertain phase, when the project is still only a plan and the final details are still open, strong leadership by the project manager is crucial (Müller/Drouin/Sankaran 2018; Guan et al. 2023).

The project is worked out in detail during the project planning phase. The first step is to define a project team and finalize the project goal. These project goals are then specified in greater detail, formulated in measurable terms, and transferred to project documentation. In addition, the tasks and time required are roughly estimated and milestones are defined during this phase (GPM 2017; DIN 2009). Building on this, the tasks, schedules, and resources are defined in the project definition phase and mapped in a project structure plan. Dates, resources, and costs are then planned on this basis. Since there is always a need for coordination in practical implementation, this is an iterative process. Finally, the project plan is created, which combines the individual plans (e.g., project structure, resources, schedule, etc.) and must be approved by the stakeholders before the next phase can begin (GPM 2017; DIN 2009). Balanced leadership can contribute to project success in both project planning and project definition, as planning and detailing tasks can be specifically divided between project management and the team in both phases. According to Drouin et al. (2018) and Müller et al. (2021b), the project manager sets the framework and actively involves the project team members in the decision-making process based on their expertise. This is supported by Turner (1999), who said that in a phase where project planning is the main focus, space must be created for creative approaches and responsibility must be shared within the team. This division of responsibility early on in project planning and project definition supports the success of the project by promoting project planning, knowledge exchange, and team cohesion from the very beginning of the project (Ahmed/Khan/Philbin 2025).

During the project execution phase, the activities defined in advance are carried out according to the plan (GPM 2017; DIN 2009). Here, too, several authors recommend the use of balanced leadership. Müller et al. (2018; 2021b) recommend balanced leadership in this phase because project execution requires frequent and dynamic changes in leadership responsibility. Other studies describe that the focus in project execution is on task-oriented leadership. Specifically, this means that the project manager maintains an overview and intervenes when it comes to critical decisions or conflict resolution. The technical tasks are led by temporary managers from the project team (Müller et al. 2018). According to Müller et al. (2017), the use of balanced leadership in the execution phase of the project enables an efficient way of working, as the technical expertise of the project team members is used optimally and leadership lies where the greatest technical competence lies. In terms of content, project execution also includes monitoring and control functions (PMI 2021). The monitoring and control functions focus on measuring project progress, identifying deviations from the project plan, and intervening if necessary (Vučinić/Luburić 2023). According to Pretorius et al. (2017), at first glance this appears to be a leaders task for which a vertical leadership style is more appropriate. However, it should not be underestimated that dividing control tasks between the project manager and team members can be successful and efficient. This could, for example, take the form of self-monitoring by team members as they work on their tasks, with the project manager merely exercising overall control (Müller et al. 2018). According to Vučinić and Luburić (2023), however, it is crucial that the project manager's leading role in monitoring

and control remains essential. Turner (1999) agrees: in his view, leadership in this phase should lie with the project manager, who monitors the schedule, goals, and costs and must intervene appropriately. These statements are supported by Pretorius et al. (2017), who also recommend a vertical leadership style in this phase. According to them, balanced leadership in this phase means finding the right balance between areas where it makes sense to delegate leadership responsibility and those where it does not (Vučinić/Luburić 2023). According to Drouin et al. (2018) and Zwikael and Smyrk (2015), it makes sense to delegate technical decisions, detailed monitoring of work packages, and problem-solving decisions to the team members who have the highest technical expertise in these areas. The project manager should remain responsible for overall responsibility for achieving objectives, prioritizing changes, and reporting to stakeholders.

Finally, the project is formally closed during the project closure phase. This involves handing over the project results, reflecting on the project, and preparing the findings. At the end of this phase, the project team is dismissed and the project manager is released from their responsibilities (GPM 2017; DIN 2009). In this phase, too, the focus should be on a switched leadership between the project manager as the executive and the project team. This phase often involves reflection, the exchange of lessons learned, and the evaluation of project results, which can be better achieved through a cooperative leadership approach than through top-down leadership (Pretorius et al. 2019). Müller et al. (2021b) see this differently. They recommend vertical leadership for the final phase of the project and, accordingly, responsibility for the project manager.

CONCLUSION

This study addresses the research question of whether employee leadership needs to be adapted throughout the project phases. The literature review has shown that leadership does not remain static throughout all project phases. Rather, leadership is a dynamic process of influence and must be adapted to the respective situation. The assumption, repeatedly mentioned in the literature, that no single leadership style is suitable for all conditions and situations (Turner/Müller, 2005; Turner 1999; Adetola/Adetola 2023; Pretorius et al. 2019) is also supported by the consideration of different leadership styles in the project phases. In the course of this study, it was shown that project phases generally have an identical structure. A project starts with a project impulse, is then planned, defined, implemented/executed, and completed. On this basis, a recommendation was made for the leadership style of each phase, taking balanced leadership into account.

The literature review has shown that during the project initiation phase, the focus is on the project manager. However, it is important to involve the team at an early stage in order to increase trust and quality in the decision-making process. In the planning and definition phase of the project, leadership aims to set the framework for the project. The project manager's leadership responsibility lies in the areas of goal orientation and logical organization of the project, while the team's leadership responsibility lies in the quality of planning and knowledge exchange. For the project execution phase, the literature review shows that leadership responsibility often has to shift between the project manager and the project team. The project manager is responsible for the overall overview, makes and moderates decisions, while the project team assumes technical and primarily operational responsibility. A vertical leadership style is recommended for monitoring and controlling, but a useful division of tasks between the project manager and the project team can be efficient. Leadership in the final phase of the project should also be based on a divided but cooperative approach between the project manager and the project team. The project manager is responsible for formal tasks, such as completing the project or presenting the project results, while the team takes on leadership responsibility for tasks related to securing experience, such as lessons learned events. Studies have shown that a targeted change in leadership responsibility makes sense and is efficient for the content of this phase. Based on this analysis, the answer to the research question is: Yes, leadership differs within the various project phases. Balanced leadership can serve as a structural framework here because it does not prescribe a fixed leadership style, but rather enables the situational shift of leadership responsibility between the project manager and the project team.

It can therefore be concluded that a phase-based and flexible application of balanced leadership is beneficial. It enables the project manager to assume leadership responsibility for topics that require focused attention and to delegate responsibility for other topics to team members when appropriate. According to Müller (2024), this is precisely the goal of balanced leadership: to find the most suitable leadership style. When using balanced leadership, it is crucial that the project manager retains overall responsibility and that team members only take on individual leadership tasks from the overall structure.

REFERENCES

- ADETOLA, A. and ADETOLA, O., 2023. Impact of Leadership Styles and Qualities on Project Lifecycle. *International Journal of Innovative Business Strategies*, vol. 9, issue 2, pp. 615–623. DOI: <https://doi.org/10.20533/ijibs.2046.3626.2023.0077>
- AHMED, R., KHAN, A. and PHILBIN, S., 2025. Unveiling the power of shared leadership in project realms: A synergy of planning, knowledge, cohesion, and trust. *International Journal of Business Process Integration and Management*, vol. 12, issue 1, pp. 46–63. DOI: <https://doi.org/10.1504/IJBPM.2024.10067726>
- AZMAN, M., MOHAMED, A. and ODZALY, E., 2020. A Theoretical Study on Project Delivery and Leadership Style. In: AHMED, M. and BOUDHIR, A. A. (eds.). *Proceedings of the 3rd International Conference on Networking, Information Systems & Security (NISS'20)*, pp. 1–8. New York: Association for Computing Machinery. DOI: <https://doi.org/10.1145/3386723.3387842>
- BASS, B. and RIGGIO, R., 2006. *Transformational Leadership*. New York: Taylor & Francis Group. DOI: <https://doi.org/10.4324/9781410617095>
- BLESSIN, B. and WICK, A., 2017. *Führen und führen lassen: Ansätze, Ergebnisse und Kritik der Führungsforschung*. 8th ed. München: UVK. DOI: <https://doi.org/10.36198/9783838587042>
- DEUTSCHES INSTITUT FÜR NORMUNG E. V. (DIN), 2009. *DIN 69901-2:2009-01 Projektmanagement – Projektmanagementsysteme – Teil 2: Prozesse, Prozessmodell*. Berlin: DIN Media. DOI: <https://doi.org/10.31030/1498907>
- DROUIN, N., MÜLLER, R., SANKARAN, S. and VAAGAASAR, A., 2018. Balancing vertical and horizontal leadership in projects: Empirical studies from Australia, Canada, Norway and Sweden. *International Journal of Managing Projects in Business*, vol. 11, issue 4, pp. 986–1006. DOI: <https://doi.org/10.1108/IJMPB-01-2018-0002>
- DROUIN, N., VAN MARREWIJK, A., SANKARAN, S. and MÜLLER, R., 2021. What is done through the lens of megaproject leaders' life stories. In: DROUIN, N., VAN MARREWIJK, A., SANKARAN, S. and MÜLLER, R. (eds.). *Megaproject Leaders*, pp. 2–11. Cheltenham: Edward Elgar Publishing Limited. DOI: <https://doi.org/10.4337/9781789902976.00010>
- GHAFOREY, H. and SAHNOSH, F., 2024. The Role of Leadership Styles in Project Management: Systematic Literature Review. *Jurnal Ekonomi dan Manajemen Teknologi*, vol. 8, issue 4, pp. 1579–1585. DOI: <https://doi.org/10.35870/emt.v8i4.3284>
- GOV UK, 2025. *Government Project Delivery*, Part D, Chapter 14. [viewed 30 December 2025]. Available from: <https://projectdelivery.gov.uk>
- GPM DEUTSCHE GESELLSCHAFT FÜR PROJEKTMANAGEMENT E. V., 2017. *Individual Competence Baseline für Projektmanagement – Version 4.0*. Nürnberg: GPM Deutsche Gesellschaft für Projektmanagement e. V.
- GUAN, Y., WANG, Y., ZHANG, J. and CAO, Y., 2023. Overcome social anxiety disorder and develop visionary leadership in uncertain environments: The important role of psychological resilience. *Frontiers in Psychology*, vol. 13, Article 1106993. DOI: <https://doi.org/10.3389/fpsyg.2022.1106993>
- HAFSELD, K., HUSSEIN, B. and RAUZY, A., 2021. An attempt to understand complexity in a government digital transformation project. *International Journal of Information Systems and Project Management*, vol. 9, issue 3, pp. 70–91. DOI: <https://doi.org/10.12821/ijispm090304>
- HASENZAGL, R., JUNG, H. and JUNG, T., 2021. Führung in Veränderungsprojekten. *Austrian Management Review*, vol. 11, pp. 30–47. DOI: <https://doi.org/10.5771/9783957104014-30>
- HUNGERBERG, H. and WULF, T., 2011. *Grundlagen der Unternehmensführung*. 4th ed. Heidelberg: Springer.
- JOSLIN, R. and MÜLLER, R., 2015. Relations between a project management methodology and project success in different project governance contexts. *International Journal of Project Management*, vol. 33, issue 6, pp. 1377–1392. DOI: <https://doi.org/10.1016/j.ijproman.2015.03.005>
- JUNG, H., 2017. *Personalwirtschaft*. 10th ed. Berlin: De Gruyter.

- KORSGAARD, M., SCHWEIGER, D. and SAPIENZA, H., 1995. Building Commitment, Attachment, and Trust in Strategic Decision-Making Teams: The Role of Procedural Justice. *The Academy of Management Journal*, vol. 38, issue 1, pp. 60–84. DOI: <https://doi.org/10.2307/256728>
- LIPPOLD, D., 2019. *Führungskultur im Wandel: Klassische und moderne Führungsansätze im Zeitalter der Digitalisierung*. Wiesbaden: Springer. DOI: <https://doi.org/10.1007/978-3-658-25855-9>
- MAHLMANN, R., 2011. *Führungsstile gezielt einsetzen*. Weinheim: Beltz.
- MANGO, E., 2018. Rethinking Leadership Theories. *Open Journal of Leadership*, vol. 7, issue 1, pp. 57–88. DOI: <https://doi.org/10.4236/ojl.2018.71005>
- MÜLLER, R. and TURNER, R., 2007. The Influence of Project Managers on Project Success Criteria and Project Success by Type of Project. *European Management Journal*, vol. 25, issue 4, pp. 298–309. DOI: <https://doi.org/10.1016/j.emj.2007.06.003>
- MÜLLER, R. and JUGDEV, K., 2012. Critical success factors in projects: Pinto, Slevin, and Prescott – the elucidation of project success. *International Journal of Managing Projects in Business*, vol. 5, issue 4, pp. 757–775. DOI: <https://doi.org/10.1108/17538371211269040>
- MÜLLER, R., PACKENDORFF, J. and SANKARAN, S., 2017. Balanced Leadership: A New Perspective for Leadership in Organizational Project Management. In: SANKARAN, S., MÜLLER, R. and DROUIN, N. (eds.). *Cambridge Handbook of Organizational Project Management*, pp. 186–199. Cambridge: Cambridge University Press.
- MÜLLER, R., DROUIN, N. and SANKARAN, S., 2018. *Balancing Person-Centric and Team-Centric Leadership in Projects*. PMI Sponsored Research. [viewed 2 January 2026]. Available from: <https://www.pmi.org/learning/library/balancing-person-team-centric-leadership-11692>
- MÜLLER, R., DROUIN, N. and SANKARAN, S., 2021a. A Theory of Balanced Leadership. In: MÜLLER, R., DROUIN, N. and SANKARAN, S. (eds.). *Balanced Leadership: Making the Best Use of Personal and Team Leadership in Projects*, pp. 25–47. New York: Oxford University Press. DOI: <https://doi.org/10.1093/oso/9780190076122.003.0003>
- MÜLLER, R., DROUIN, N. and SANKARAN, S., 2021b. Introduction. In: MÜLLER, R., DROUIN, N. and SANKARAN, S. (eds.). *Balanced Leadership: Making the Best Use of Personal and Team Leadership in Projects*, pp. 1–8. New York: Oxford University Press. DOI: <https://doi.org/10.1093/oso/9780190076122.003.0001>
- MÜLLER, R., DROUIN, N. and SANKARAN, S., 2022. *Balanced Leadership*. New York: Oxford University Press.
- MÜLLER, R., 2024. Balanced Leadership. In: HUEMANN, M. and TURNER, R. (eds.). *The Handbook of Project Management*. 6th ed., pp. 404–415. London: Routledge. DOI: <https://doi.org/10.4324/9781003274179-33>
- PROJECT MANAGEMENT INSTITUTE (PMI), 2021. *A Guide to the Project Management Body of Knowledge (PMBOK Guide)*. 7th ed. Newtown Square, PA: Project Management Institute.
- PRETORIUS, S., STEYN, H. and BOND-BARNARD, T. J., 2017. Exploring project-related factors that influence leadership styles and their effect on project performance: A conceptual framework. *The South African Journal of Industrial Engineering*, vol. 28, issue 4, pp. 95–108. DOI: <https://doi.org/10.7166/28-4-1778>
- PRETORIUS, S., STEYN, H., BOND-BARNARD, T. and CRONJÉ, T., 2019. Balancing leadership styles based on project type and life cycle phases: A model. In: *SAIIEneXXXt Proceedings, 30 September–2 October 2019*. Port Elizabeth, South Africa.
- RIEDER, A., 2014. Führungsstile – Reflexion und Erörterung wesentlicher Führungstheorien. *Perspektive Bibliothek*, vol. 3, issue 2, pp. 144–164. DOI: <https://doi.org/10.11588/pb.2014.2.16810>
- RIFKY, S., 2025. Effective Leadership Styles in Project Management: A Literature Analysis of Their Impact on Project Success. *International Journal of Multidisciplinary Approach Research and Science*, vol. 3, issue 2, pp. 652–665. DOI: <https://doi.org/10.59653/ijmars.v3i02.1544>
- SCHULZE, J. and PINKOW, F., 2020. Leadership for Organisational Adaptability: How Enabling Leaders Create Adaptive Space. *Administrative Sciences*, vol. 10, issue 3, Article 37. DOI: <https://doi.org/10.3390/admsci10030037>
- STAEHLE, W., 2014. *Management: Eine verhaltenswissenschaftliche Perspektive*. 8th ed. München: Vahlen.
- STIPPLER, M., MOORE, S., ROSENTHAL, S. and DÖRFFER, T., 2011. *Führung – Überblick über Ansätze, Entwicklungen, Trends*. Gütersloh: Bertelsmann Stiftung.
- TURNER, R., 1999. *The Handbook of Project-Based Management: Improving the Processes for Achieving Strategic Objectives*. London: McGraw-Hill.
- TURNER, R. and MÜLLER, R., 2005. The Project Manager's Leadership Style as a Success Factor on Projects: A Literature Review. *Project Management Journal*, vol. 36, issue 1, pp. 49–61. DOI: <https://doi.org/10.1177/875697280503600206>

- VUČINIĆ, M. and LUBURIĆ, R., 2023. Project Management in Central Banks. *Journal of Central Banking Theory and Practice*, vol. 12, issue 2, pp. 5–31. DOI: <https://doi.org/10.2478/jcbtp-2023-0012>
- WEITLANER, E. and ELLMANN, S., 2019. Führung. In: GPM DEUTSCHE GESELLSCHAFT FÜR PROJEKT-MANAGEMENT E. V. (ed.). *Kompetenzbasiertes Projektmanagement (PM4): Handbuch für Praxis und Weiterbildung im Projektmanagement*, pp. 689–733. München: GPM Deutsche Gesellschaft für Projektmanagement e. V.
- ZACCARO, S., GREEN, J., DUBROW, S. and KOLZE, M., 2018. Leader individual differences, situational parameters, and leadership outcomes: A comprehensive review and integration. *The Leadership Quarterly*, vol. 29, issue 1, pp. 2–43. DOI: <https://doi.org/10.1016/j.leaqua.2017.10.003>
- ZWIKAEEL, O. and SMYRK, J., 2015. Project governance: Balancing control and trust in dealing with risk. *International Journal of Project Management*, vol. 33, issue 4, pp. 852–862. DOI: <https://doi.org/10.1016/j.ijpro-man.2014.10.012>

ЛИДЕРСТВО СПОРЕД ФАЗИТЕ НА ПРОЕКТА: БАЗИРАНА НА ЛИТЕРАТУРАТА ПЕРСПЕКТИВА ЗА ЛИДЕРСТВОТО В ПРОЦЕСА НА ИЗПЪЛНЕНИЕ НА ПРОЕКТ

Резюме: Настоящото проучване разглежда дали управлението на персонала от страна на проектния мениджър се различава в отделните фази на проекта. Акцентът е поставен върху подхода на балансирано лидерство и разпределението на отговорностите между проектния мениджър (вертикално лидерство) и проектния екип (хоризонтално лидерство). Чрез преглед на литературата са проведени анализ и комбинация на фазите на проекта и подходите за лидерство. Резултатите от анализа и комбинацията показват, че лидерството не е статичен стил, а динамичен процес на влияние. В началото на жизнения цикъл на проекта отговорността за лидерството се носи предимно от проектния мениджър. В етапа на планиране и дефиниране на проекта степента на поемане на отговорност от проектния екип се увеличава, докато в етапа на изпълнение ситуационната промяна е най-ефективна. В заключителната фаза също е целесъобразно да се промени ръководната отговорност между проектния мениджър и проектния екип. В заключение може да се каже, че балансираното лидерство в проектните фази е целесъобразен подход към ръководството.

Ключови думи: балансирано лидерство; проектни фази; проектно управление; ситуативно лидерство; фазово лидерство

Тимо Цименга, докторант
ORCID ID: 0009-0004-8149-6163

Университет по библиотекознание и информационни технологии
София, България
E-mail: t.zimenga@gmail.com

**НАЦИОНАЛНА СИГУРНОСТ
NATIONAL SECURITY**

**КОНФЛИКТЪТ В УКРАИНА КАТО СТРАТЕГИЧЕСКИ ШОК
ЗА ЕВРОПЕЙСКИЯ СЪЮЗ: ЕВОЛЮЦИЯ НА ПОЛИТИКАТА
ЗА СИГУРНОСТ И ОТБРАНА И ОГРАНИЧЕНИЯТА ПРЕД ЕВРОПЕЙСКАТА
СТРАТЕГИЧЕСКА АВТОНОМИЯ**

Матрица за оценка на европейската стратегическа автономия (ESAAM)

Даниел Делчев

Университет по библиотекознание и информационни технологии

<https://doi.org/10.70300/NNXD7559>

Резюме: Пълномащабната военна инвазия, предприета от Руската федерация срещу Украйна на 24 февруари 2022 г., представлява най-сериозното предизвикателство пред европейската архитектура за сигурност след края на Студената война. Този конфликт не само промени баланса на силите в Европа, но и постави под съмнение редица основополагащи предпоставки, върху които се основават политиките на Европейския съюз в областта на сигурността и отбраната, изградени през последните три десетилетия. В качеството си на катализатор войната ускори институционалните, политическите, военните и индустриалните трансформации, като постепенно предефинира мястото на ЕС в глобалния ред.

Настоящото изследване анализира войната в Украйна като стратегически шок, предизвикал качествена трансформация на европейската среда за сигурност. Основната теза е, че макар конфликтът да ускори геополитическата ориентация на ЕС и да засили неговите способности като фактор в сферата на сигурността, той не доведе до формирането на напълно автономен Европейски отбранителен съюз. Вместо това се очертава модел на стратегическа взаимозависимост, при който ЕС укрепва своите способности чрез тясно сътрудничество с НАТО и трансатлантическите съюзници.

Ключови думи: конфликтът в Украйна; европейска сигурност; стратегически шок; стратегическа автономия; хибридни заплахи

ВЪВЕДЕНИЕ

Първите десетилетия след края на Студената война формираха преобладаващото схващане, че европейският континент постепенно навлиза в период, в който широкомащабните междудържавни войни ще останат в миналото. Разширяването на Европейския съюз (ЕС) и НАТО, задълбочаването на икономическата взаимозависимост и утвърждаването на междуправноправни механизми за уреждане на конфликти съвместно допринесоха за възприемането на относително стабилна архитектура на сигурността. В този контекст ЕС съсредоточи усилията си върху укрепването на своето нормативно влияние, насърчаването на икономическата интеграция и управлението на кризи извън непосредственото си съседство.

Военната агресия, предприета от Руската федерация срещу Украйна през 2022 г., обаче постави под фундаментално съмнение тези предпоставки. За първи път след Втората световна война Европа се изправи пред продължителен конвенционален военен конфликт с висока интензивност, характеризиращ се с широкомащабно използване на артилерия, ракетни системи, безпилотни платформи, кибероперации и информационна война. Това развитие наложи цялостно преосмисляне на европейските политики в областта на сигурността и отбраната и постави въпроса дали ЕС разполага с необходимите способности, за да функционира като автономен стратегически актьор.

В този контекст конфликтът в Украйна надхвърля рамките на регионален спор, като се утвърждава като стратегически шок с многопластови последици за институциите, политиките и стратегическата култура на ЕС.

Въпреки че е налице значителен обем научна литература, посветена на войната в Украйна, повечето изследвания се съсредоточават върху отделни аспекти на европейския отговор, като санкционните режими, военната помощ, развитието на отбранителната индустрия или отношенията между ЕС и НАТО. Недостатъчно разработена остава цялостна аналитична рамка, която да изследва трансформацията на европейската политика за сигурност като интегриран процес, обхващащ институционалните, военните, индустриалните, технологичните и когнитивните измерения на сигурността.

Изследователска теза

Настоящото изследване изхожда от тезата, че войната в Украйна представлява стратегически шок, който ускори геополитизацията на ЕС и катализира значими трансформации в неговата политика за сигурност и отбрана. Анализът обаче показва, че тази трансформация не доведе до изграждането на напълно автономна европейска отбранителна система. Вместо това тя формира модел на стратегическа взаимозависимост, при който ЕС укрепва собствените си способности, без да измества ролята на НАТО като основен гарант на колективната отбрана.

Обект и предмет на изследването

Обект на настоящото изследване е европейската система за сигурност след началото на пълномащабната война в Украйна.

Предмет на изследването е трансформацията на политиката на ЕС в областта на сигурността и отбраната и нейното отражение върху развитието на европейската стратегическа автономия.

Цел и задачи на изследването

Основната цел на изследването е да анализира въздействието на войната в Украйна върху развитието на ЕС като стратегически актьор в областта на сигурността и отбраната. За постигането на тази цел са формулирани следните изследователски задачи:

- да се анализират промените в европейската среда за сигурност;
- да се изследва институционалната трансформация в рамките на ЕС;
- да се оцени развитието на европейската отбранително-индустриална база;
- да се анализира променящата се динамика в отношенията между ЕС и НАТО;
- да се разработи Матрица за оценка на европейската стратегическа автономия (ESAAM)

като аналитичен инструмент;

- да се оценят ограниченията и предизвикателствата пред европейската стратегическа автономия.

ТЕОРЕТИЧНА РАМКА

1. Концепцията за стратегически шок

Настоящото изследване възприема следната операционална дефиниция: *стратегическият шок представлява внезапно външно събитие с висока степен на въздействие, което едновременно променя възприятията за заплахите, институционалните приоритети и разпределението на ресурсите в системата за сигурност, като по този начин ускорява процесите на стратегическа адаптация.* Тази концептуализация служи като аналитична основа за изследване на реакцията на ЕС спрямо конфликта в Украйна след 2022 г.

2. Неореализъм

Неореализмът обяснява редица последици от войната, сред които значително увеличаване на разходите за отбрана, ускорена модернизация на въоръжените сили, възобновен акцент върху стратегиите за възпиране, укрепване на стратегическата роля на НАТО (Waltz 1979).

Въпреки това тази теоретична перспектива не предлага достатъчно обяснение защо значителна част от тези процеси се реализират именно чрез институционалните механизми на ЕС.

3. Неофункционализъм

Неофункционализмът предоставя полезна аналитична перспектива за разбиране на войната като катализатор на интеграционни процеси в нова политическа област – отбраната. След 2022 г. ЕС значително разшири своите механизми за съвместно финансиране, сътрудничество в областта на отбранителната индустрия, военната мобилност, производството на боеприпаси, иновациите в отбраната (Fiott 2023).

Това развитие илюстрира ефекта на преливане (spillover effect), при който интеграционните процеси се разширяват към нови секторни политики под въздействието на външни кризи.

4. Теория на стратегическата култура

Конфликтът ускори сближаването на стратегическите възприятия между държавите – членки на ЕС. Въпреки че националните различия продължават да съществуват, постепенно се формира по-широк консенсус относно необходимостта от увеличаване на разходите за отбрана, укрепване на европейската отбранителна технологична и индустриална база, противодействие на хибридните заплахи, повишаване на обществената устойчивост (Blockmans et al. 2022; Wendt 1999).

5. Концепцията за стратегическа автономия

В рамките на настоящото изследване стратегическата автономия не се разглежда като независимост от НАТО. Тя се концептуализира като способността на ЕС да формулира самостоятелни стратегически решения, да поддържа надеждни военни способности, да развива устойчива отбранителна индустриална база, да разработва критични и нововъзникващи технологии и да гарантира устойчивост срещу сложни и многопластови заплахи (Grevi 2020).

Следователно стратегическата автономия се разглежда като многомерна аналитична концепция, а не просто като политически лозунг.

КОНФЛИКТЪТ В УКРАИНА КАТО СТРАТЕГИЧЕСКИ ШОК ЗА ЕВРОПЕЙСКАТА АРХИТЕКТУРА ЗА СИГУРНОСТ

1. Крахът на модела на сигурност след Студената война

В продължение на повече от три десетилетия европейската архитектура за сигурност функционираше въз основа на предпоставката, че вероятността от широкомащабен междудържавен военен конфликт в Европа е минимална. След разпадането на Съветския съюз политическата логика на европейската интеграция постепенно измести традиционното разбиране за сигурността като сфера, основана предимно на военната мощ. Вместо това ЕС се стремеше да утвърди международната си роля чрез механизми като икономическа интеграция, нормативно влияние, дипломатическа ангажираност и управление на кризи.

Този модел се основаваше на три взаимносвързани предпоставки:

- първо, че икономическата взаимозависимост ще намали вероятността от военни конфронтации;
- второ, че разширяването на европейските институции постепенно ще стабилизира съседните на ЕС региони;
- трето, че НАТО ще продължи да бъде основният гарант за военната сигурност, докато ЕС ще съсредоточава усилията си предимно върху политическите и икономическите инструменти.

Пълномащабната инвазия на Русия в Украйна постави под фундаментално съмнение и трите предпоставки. За първи път след края на Студената война европейските държави се изправиха пред продължителен конвенционален военен конфликт с висока интензивност, характеризиращ се с широкомащабно използване на конвенционални въоръжени сили, високоточни боеприпаси, безпилотни системи, кибероперации и информационна война.

В резултат на това сигурността отново започна да се определя преди всичко от военните способности, капацитета на отбранителната индустрия и обществената устойчивост.

Тази промяна не свидетелства за провал на европейската интеграция. Напротив, тя раз-

кри ограниченията на модел, основан на предположението, че икономическата интеграция сама по себе си е достатъчна, за да компенсира недостатъчните отбранителни способности. Следователно войната не отслаби европейския проект, а доведе до дълбоко преориентиране на неговите стратегически приоритети.

2. Войната като стратегически шок: концептуализация и последици

В научната литература понятието „стратегически шок“ обикновено обозначава събития, които предизвикват внезапна промяна във възприятията за заплахите и ускоряват процесите на институционална адаптация. Настоящото изследване предлага по-широка концептуализация на това понятие (Freedman 2013).

Войната в Украйна представлява стратегически шок, тъй като едновременно трансформира политическите приоритети, военните способности, политиките в областта на отбранителната индустрия, направленията на технологичното развитие и обществените възприятия за сигурността (Fiott 2023).

След 2022 г. ЕС предприе в изключително кратък период редица мерки, които дотогава се разглеждаха като политически трудно осъществими, сред които:

- предоставяне на военна помощ чрез Европейския механизъм за подкрепа на мира (EPF);
- ускоряване на инициативите за съвместно придобиване на отбранителни способности;
- предоставяне на финансова подкрепа за увеличаване на производството на боеприпаси;
- създаване на нови механизми за финансиране на отбраната;
- интегриране на отбранителната индустрия в по-широката рамка на индустриалната политика на ЕС (Fiott 2023).

Тази стратегическа трансформация намира ясно отражение в Бялата книга за европейската отбрана – Готовност 2030, която определя като непосредствени приоритети на европейската отбранителна политика продължаващата подкрепа за Украйна и преодоляването на критичните дефицити в отбранителните способности.

3. Еволюция на възприятията за заплахите

Преди 2022 г. стратегическите документи на ЕС поставяха акцент върху заплахи като тероризма, незаконната миграция, изменението на климата, енергийната сигурност и киберсигурността.

След началото на войната обаче йерархията на заплахите претърпя съществена трансформация. Конвенционалната военна агресия, интегрираната противовъздушна и противоракетна отбрана, производството на боеприпаси, военната мобилност, защитата на критичната инфраструктура, укрепването на европейската отбранителна технологична и индустриална база и стратегическата устойчивост се превърнаха във водещи приоритети (Blockmans et al. 2022).

Тази промяна не означава, че предишните рискове са изгубили своето значение. По-скоро тя отразява фундаментална промяна в тяхната относителна тежест в рамките на европейския дневен ред в областта на сигурността.

ТРАНСФОРМАЦИЯ НА ПОЛИТИКАТА НА ЕС В ОБЛАСТТА НА СИГУРНОСТТА И ОТБРАНАТА

1. От нормативна към геополитическа сила

След 2022 г. се наблюдава съществена еволюция в ролята на ЕС, който постепенно преминава от предимно нормативен актьор към субект, все по-активно използващ инструментите на политиката за сигурност и отбрана. Концепцията за „Нормативна сила Европа“ (Normative Power Europe), развита в началото на XXI век, разглежда влиянието на ЕС като произтичащо основно от способността му да формира международни норми и стандарти. Конфликтът в Украйна не обезсили тази концепция, а разшири нейния обхват. Днес ЕС съчетава икономическа мощ, нормативно влияние, индустриална политика, отбранителни способности и стратегическа комуникация. Това съчетание свидетелства за процес на геополитизация, а не просто на милитаризация на ЕС.

2. Институционална адаптация

В последните няколко години ЕС значително ускори развитието на своите инициативи в областта на сигурността и отбраната. Сред най-важните от тях са Стратегическият компас (Strategic Compass), Европейският механизъм за подкрепа на мира (EPF), Постоянното структурирано сътрудничество (PESCO), Европейският фонд за отбрана (EDF), Регламентът за подкрепа на производството на боеприпаси (ASAP), Регламентът за укрепване на европейската отбранителна индустрия чрез съвместно възлагане на обществени поръчки (EDIRPA), Действието за сигурност за Европа (SAFE) и Бялата книга за европейската отбрана – Готовност 2030 (White Paper for European Defence – Readiness 2030) (Blockmans et al. 2022; Fiott 2023).

Тези инициативи се основават на последователна стратегическа логика, при която Европейската комисия постепенно изгражда механизми, интегриращи отбранителната индустрия, финансирането, иновациите, обществените поръчки и развитието на отбранителните способности в единна политическа рамка. Това развитие обаче не означава федерализиране на европейската отбрана, тъй като процесът на вземане на решения продължава да зависи от политическата воля на държавите членки. Следователно институционалната интеграция остава ограничена от необходимостта за постигане на политически консенсус между националните правителства.

3. Европейската отбранителна технологична и индустриална база

Един от най-съществените изводи, произтичащи от войната, е възстановяването на разбирането за отбранителния индустриален сектор като стратегически ресурс. Първоначалните затруднения при доставките на боеприпаси за Украйна показаха, че европейската отбранителна индустриална база не е подготвена за продължителен конфликт с висока интензивност.

В отговор ЕС предприе мерки за увеличаване на производствения капацитет, насърчаване на съвместните обществени поръчки и подкрепа на инвестициите в критично важни отбранителни способности.

4. ЕС и НАТО: конкуренция или взаимно допълване?

Един от основните дебати в научната литература е дали укрепването на европейските отбранителни способности неизбежно поражда конкуренция с НАТО.

Настоящият анализ защитава различна теза. След 2022 г. сътрудничеството между ЕС и НАТО се задълбочи значително. Докато НАТО продължава да носи основната отговорност за колективната отбрана, ЕС развива политически инструменти, които допълват, а не дублират функциите на Алианса. Сред тях са индустриалната политика, регулаторните механизми, финансовите инструменти, координацията на вътрешния пазар, както и подкрепата за иновациите в отбраната и развитието на отбранителното производство (Grevi 2020).

Следователно отношенията между двете организации все по-ясно се характеризират с функционална взаимна допълняемост, а не с институционално съперничество.

МАТРИЦА ЗА ОЦЕНКА НА ЕВРОПЕЙСКАТА СТРАТЕГИЧЕСКА АВТОНОМИЯ (ESAAM)

1. Обосновка на необходимостта от нова аналитична рамка

Съвременните научни изследвания, посветени на европейската стратегическа автономия, се фокусират предимно върху отделни нейни аспекти, като военните способности, институционалното развитие или отбранителната индустриална база. Подобни едноизмерни подходи не позволяват цялостна оценка на трансформацията на ЕС в резултат на конфликта в Украйна.

Настоящото изследване изхожда от разбирането, че стратегическата автономия следва да се разглежда като многомерна характеристика на европейската архитектура за сигурност, формирана от динамичното взаимодействие между множество взаимносвързани подсистеми. За да преодолее ограниченията на съществуващите аналитични подходи, настоящото изследване предлага Матрица за оценка на европейската стратегическа автономия (ESAAM).

ESAAM не е алтернативна теория на международните отношения. Тя представлява аналитичен инструмент, предназначен за систематична оценка на развитието на европейската политика в областта на сигурността и отбраната след 2022 г.

2. Концептуална структура на модела

Рамката ESAAM е организирана в три последователни аналитични равнища:

- първото равнище определя основните измерения на стратегическата автономия;
- второто равнище установява критериите за оценка, приложими към всяко от тези измерения;
- третото равнище позволява синтезирането на интегрирана оценка на степента на стратегическа трансформация на Европа.

Тази тристепенна структура преодолява ограниченията на преобладаващите аналитични модели, които разглеждат стратегическата автономия предимно като политическа декларация или я свеждат до количествени показатели, като например размера на разходите за отбрана.

Таблица 1. Оценка на европейската стратегическа автономия чрез Матрицата за оценка на европейската стратегическа автономия (European Strategic Autonomy Assessment Matrix – ESAAM)

Измерение	Капацитет	Кохерентност	Устойчивост	Обща оценка
Военно	Висок	Средна	Висока	Средна към висока
Институционално	Висок	Средна	Висока	Средна към висока
Индустриално	Среден	Средна	Средна	Средна
Технологично	Среден	Средна	Висока	Средна към висока
Когнитивно	Висок	Висока	Висока	Висока

Анализ на рамката ESAAM

Прилагането на ESAAM разкрива ясно изразена неравномерност в развитието на различните измерения на европейската стратегическа автономия.

Военното измерение отбелязва най-съществен напредък, обусловен от увеличените разходи за отбрана, ускорената модернизация на въоръжените сили и стартирането на нови европейски отбранителни програми.

Съществено развитие се наблюдава и в институционалното измерение, което намира израз в приемането на Стратегическия компас (Strategic Compass), създаването на Европейския механизъм за подкрепа на мира (EPF), Европейския фонд за отбрана (EDF) и редица други инициативи в областта на европейската политика за сигурност и отбрана (Blockmans et al. 2022; Fiott 2023).

За разлика от тях индустриалното измерение остава най-слаборазвито. Независимо от увеличените финансови инвестиции Европейската отбранителна технологична и индустриална база (EDTIB) продължава да се характеризира със значителна фрагментираност, което ограничава способността на ЕС да поддържа широкомащабно отбранително производство.

Същевременно технологичното измерение демонстрира устойчиво развитие, подкрепено от бързия напредък в областта на безпилотните системи, изкуствения интелект, космическите способности и киберотбраната.

Оригинална концептуална рамка: стратегическа взаимозависимост

Проведеният в настоящото изследване анализ води до разработването на нова концептуална рамка. Европейската стратегическа автономия не следва да се тълкува като процес на дистанциране от НАТО. Напротив, тя представлява постепенно укрепване на европейските способности в рамките на по-широката трансатлантическа архитектура за сигурност (Anghel and Damen 2025; Grevi 2020).

Емпиричните резултати показват, че вместо да се развива към модел на пълна стратегическа автономия, европейският ред в областта на сигурността постепенно се насочва

към парадигма на стратегическа взаимозависимост. В рамките на този модел ЕС поетапно укрепва собствените си способности, докато НАТО запазва ролята си на основен гарант на колективната отбрана.

ЗАКЛЮЧЕНИЕ

Пълномащабният военен конфликт, започнат от Руската федерация срещу Украйна, представлява най-сериозното предизвикателство пред европейската сигурност след края на Студената война. Настоящият анализ показва, че войната не само промени възприятията за заплахите пред сигурността, но и трансформира основополагащата логика, определяща развитието на ЕС като стратегически актьор.

Резултатите от изследването потвърждават основната изследователска теза, че конфликтът действа като стратегически шок, ускорил процеса на геополитизация на ЕС и катализи-рал съществени трансформации в неговата политика в областта на сигурността и отбраната. Анализът обаче не потвърждава тезата, че ЕС се развива към напълно автономен отбранителен съюз. Напротив, емпиричните данни свидетелстват за формирането на нова парадигма на сигурността, основана на стратегическа взаимозависимост между ЕС и НАТО.

Предложената в настоящото изследване Матрица за оценка на европейската стратегическа автономия (ESAAM) показва, че развитието на ЕС се характеризира със значителна неравномерност между отделните измерения на стратегическата автономия. Най-съществен напредък се наблюдава в институционалното, военното и когнитивното измерение, докато интеграцията в индустриалната сфера остава сравнително ограничена.

Следователно оценката на европейската стратегическа автономия не следва да се основава на един-единствен показател, а трябва да отчита динамичното взаимодействие между институционалното, военното, индустриалното, технологичното и когнитивното измерение.

В обобщение, резултатите от изследването показват, че бъдещото развитие на европейската архитектура за сигурност най-вероятно няма да бъде белязано от едностранно постигане на стратегическа независимост, а от изграждането на по-задълбочена и по-структурирана стратегическа взаимозависимост между ЕС и НАТО.

REFERENCES

- ANGHEL, S. E. and DAMEN, M. G. H., 2025. *The Future European Security Architecture: Dilemmas for EU Strategic Autonomy*. Brussels: European Parliamentary Research Service.
- BLOCKMANS, S., CROSSON, D. M. and PAIKIN, Z., 2022. *The EU's Strategic Compass: A Guide to Reverse Strategic Shrinkage?* CEPS Policy Insights, March 2022. Brussels: Centre for European Policy Studies.
- FIOTT, D., 2023. In Every Crisis an Opportunity? European Union Integration in Defence and the War on Ukraine. *Journal of European Integration*, 2023, Vol. 45, No. 3, pp. 447–462.
- FREEDMAN, L., 2013. *Strategy: A History*. Oxford: Oxford University Press.
- GREVI, G., 2020. *Fostering Europe's Strategic Autonomy: A Question of Purpose and Action*. Brussels: European Policy Centre.
- WALTZ, K. N., 1979. *Theory of International Politics*. Reading, MA: Addison-Wesley.
- WENDT, A., 1999. *Social Theory of International Politics*. Cambridge: Cambridge University Press, 1999.

THE CONFLICT IN UKRAINE AS A STRATEGIC DISRUPTION TO THE EUROPEAN UNION: EVOLUTION OF SECURITY AND DEFENCE POLICY AND THE CONSTRAINTS ON EUROPEAN STRATEGIC AUTONOMY European Strategic Autonomy Assessment Matrix (ESAAM)

Abstract: *The large-scale military invasion initiated by the Russian Federation against Ukraine on 24 February 2022 constitutes the most profound challenge to the European security framework since the conclusion of the Cold War. This conflict has not only shifted the power dynamics within Europe but has also undermined several foundational premises underpinning the European Union's security and defence policies developed over the last thirty years. Serving as a catalyst, the war has accelerated institutional, political,*

military, and industrial transformations, progressively redefining the EU's position within the global order. This paper analyzes the war in Ukraine as a strategic shock that has precipitated a qualitative change in the European security landscape. The principal thesis posits that while the conflict has expedited the EU's geopolitical orientation and enhanced its capabilities as a security actor, it has not culminated in the establishment of a fully autonomous European defence union. Rather, a paradigm of strategic interdependence is emerging, wherein the EU augments its capacities through close collaboration with NATO and transatlantic allies.

Keywords: *Ukraine conflict; European security; strategic shock; strategic autonomy; hybrid threats*

Daniel Delchev, PhD Student

ORCID: 0009-0006-2983-035X

University of Library Studies and Information Technologies

Sofia, Bulgaria

E-mail: d.delchev@bfgroup.eu

**НАЦИОНАЛНА СИГУРНОСТ
NATIONAL SECURITY**

**REALISM FIRST? REALIST AND LIBERAL LOGICS IN THE 2025
U.S. NATIONAL SECURITY STRATEGY**

Daniel Rutkowski Graf von Schweinitz und Krain Freiherr von Kauder

University of Library Studies and Information Technologies

<https://doi.org/10.70300/ULMP9904>

Abstract: *The United States National Security Strategy (NSS), published in November 2025, outlines the US assessment of the international security environment and its strategic priorities. This article analyzes how realist and liberal theories are reflected in the document. Using qualitative document analysis, the NSS is viewed as a political text carrying assumptions about power, sovereignty, cooperation and norms. Realism and liberalism are applied across four analytical categories: (1) threat perception, (2) the role of the state and sovereignty, (3) cooperation and institutions and (4) norms and values. The findings indicate that these theoretical logics are used hierarchically rather than symmetrically. Realist assumptions about power, strategic competition and national interest are the foundation of the NSS, while liberal elements such as cooperation, institutions and norms are employed instrumentally. Overall, the strategy reflects a realist orientation with selectively applied liberal elements.*

Keywords: *US National Security Strategy; Strategic Competition; Realism and Liberalism; Alliances and Institutions; Security Policy Analysis*

INTRODUCTION

Published in November 2025, the United States National Security Strategy (NSS) provides an authoritative assessment of the international security environment from the US perspective. It determines the strategic priorities and directs the US security policy as its core doctrinal document. The NSS has two functions: on the one hand, it performs an internal coordinating role as a guideline and on the other hand, it has an external signaling function. It communicates threat perceptions and strategic intentions, makes normative claims to domestic institutions and shapes expectations about US behavior in the international system, which is especially interesting for allies and potential adversaries (NSS 2025, pp. 3–4).

The 2025 NSS is developed in the context of intensified geopolitical rivalries, expanding economic and technological competition and increased levels of skepticism towards international institutions and arrangements. Responding to these developments, the strategy places strong emphasis on national resilience, state power and strategic autonomy. Nonetheless, it simultaneously reaffirms US commitments to alliances, partnerships and international norms (NSS 2025, p. 5 and 17). This dual approach shows the field of tension in the current US security discourse between the poles of competition and cooperation, as well as between sovereignty and interdependence.

National security strategies in general can be understood as states' condensed responses to perceived systemic pressures and tensions. These responses form their strategic principles. Instead of being neutral descriptions of reality, national security strategies construct narratives and often implicitly showcase underlying theoretical and practical assumptions about international politics. Therefore, the NSS provides an insightful empirical basis to examine how different theoretical logics in the field of International Relations are used and combined in an official strategy paper.

Hence, this article examines how realist and liberal theories are used in the November 2025 NSS and which of these ultimately represents its strategic core. This paper does not treat realism and liberalism as incompatible theoretical frameworks, but utilizes them as heuristic lenses to identify dominant patterns in threat perception, sovereignty, normative framing and cooperation. The focus on a single strategy document ensures a concentrated and policy-relevant assessment of the theoretical orientation of the 2025 NSS, without engaging in lengthy theoretical discussions or extended comparisons.

RESEARCH METHODOLOGY

This article makes use of a qualitative document analysis to examine the 2025 NSS. This is an appropriate method for the study of strategic policy texts, as these documents are intentionally used by states to communicate priorities, legitimize policy choices and influence interpretations and perceptions of the international security environment.

Accordingly, this analysis approaches the NSS as a purposeful political document that contains underlying assumptions about international order, power relations, threat perception and cooperation. Hence, it uses an interpretive approach which focuses on reoccurring themes, argumentative structures, patterns of justification and implicit hierarchies of ideas and not quantitative coding techniques. This approach makes it possible to identify dominant theoretical logics within the NSS, while deliberately avoiding strong empirical claims.

The analytical framework consists of the two main traditions of International Relations theory: realism and liberalism (Gold and McGlinchey 2017, pp. 46–49). Realism emphasizes that states' priorities are power, survival and security in an anarchic system (Savu 2021, pp. 22–24). International politics is viewed as a competition between self-interested states (Donnelly 2005, pp. 30–32). Therefore, the more relative power a state has, the higher its hierarchy in the international order: enforcing demands or ensuring national security becomes easier (Jensen 2023, pp. 18–19). By contrast, liberalism's core assumption is that state behavior is shaped and controlled through interdependence (Saaïda 2024, pp. 4–5). It is seen as a result of shared norms and values, economic ties and international cooperation via supranational institutions (Burchill 2005, pp. 57–61 and 64). This interdependence increases the cost of aggression and therefore stabilizes state relations: the higher the level of integration and cooperation, the higher the security in the international order (Navari 2023, pp. 37, 42 and 48).

On this basis, four analytical categories are developed and used to structure the analysis of the NSS: (1) threat perception and strategic competition, (2) the role of the state, sovereignty and national interest, (3) cooperation and international institutions and (4) norms and values. These categories aim to summarize realist and liberal theories. The NSS and its relevant passages were analyzed considering how these categories are framed, discussed and prioritized within the overall strategic narrative. The analysis primarily relies on close reading and interpretation of the context. It does not test hypotheses or assess policy outcomes.

RESULTS

The qualitative analysis of the 2025 NSS reveals a clear and consistent pattern in how elements of realism and liberalism are combined. They are integrated in a clearly prioritized way and do not compete with each other on the same level. This hierarchy is not presented explicitly in the NSS, yet it becomes apparent when the document's language, priorities, and justifications are read in relation to one another rather than in isolation. Across all four defined analytical categories, realist assumptions are the foundation and give strategic direction in the document. This is most notable in assumptions related to power, competition, sovereignty and national interest (NSS 2025, p. 3–4, 23–24). Liberal concepts like cooperation, institutions and norms are present and often emphasized, but used in a way to support the competitive logic of the strategy: liberal ideas are incorporated, yet they do not shape the realist argument (NSS 2025, p. 5). Overall, the NSS appears to integrate theoretical approaches in a structured and deliberate way, instead of reflecting a contradictory mix of ideas. The following paragraphs dig deeper into the four defined analytical categories.

(1) Threat perception and strategic competition

The NSS describes the international security environment primarily as one that is defined by intensified strategic competition. Rival states are viewed as the main sources of insecurity. The strategy emphasizes the competition in the fields of military, technology and economy (NSS 2025, pp. 20, 23, 26). Global politics is presented as being shaped by fights over influence and relative advantage, not by cooperative problem-solving (NSS 2025, pp. 24, 27). Trans-national challenges, like cyber threats, emerging technologies, and supply chain vulnerabilities, are interpreted through

a state-centered perspective and are linked to larger patterns of geopolitical rivalries (NSS 2025, pp. 13–14). This framing reflects a realist view of international politics as a competitive arena, which is driven by power relations, deterrence, and strategic positioning.

(2) The role of the state, sovereignty and national interest

A second central finding is the strong emphasis on the state and national sovereignty in the NSS. It identifies the United States as the primary and ultimate guarantor of its national security (NSS 2025, pp. 3, 6–7). Protecting the US population, territory, and national interests is presented as the core responsibility of the government (NSS 2025, pp. 8–11). Therefore, national interest is the foundation and guideline of the US strategic decision-making. Although cooperation with partners is encouraged, international commitments are viewed as conditional and instrumental. They are not viewed as binding constraints (NSS 2025, pp. 10, 17). As a consequence, unilateral action from the US is justified when their national interests are at stake.

(3) Cooperation and international institutions

Alliances, partnerships and international institutions play a prominent role in the NSS. Long-standing alliances like NATO are reaffirmed as key elements of US security policy, but often with demand for adjustments (NSS 2025, pp. 6, 10, 12). Cooperation with allies needs to benefit the US, for example through military deterrence, balanced trade and increased collective resilience (NSS 2025, pp. 17–19). Therefore, cooperation is mostly interpreted as instrumental instead of having inherent value. Institutions are viewed as vehicles for states to increase their political influence: the focus is deterrence, burden-sharing and an increased US influence. Institutions are not regarded as independent authorities that are able to restrict state behavior (NSS 2025, pp. 12, 22). Cooperation appears as a tool for ensuring national power within a competitive international environment, rather than alternative to competition itself.

(4) Norms and values

Norms and values like democracy, human or civil rights, and a rules-based international order are mentioned and indeed emphasized throughout the NSS. These values are presented as central to US identity and foreign policy. Nonetheless, the US is not interested in “exporting” democratic values to states with different viewpoints. In this way, norms and values are mainly a strategic asset to attract foreign investments or to further the US interests. They are not constraints that can override considerations of power and national interest (NSS 2025, pp. 9, 12, 16, 26–27, 29).

Summary of findings

Across all analytical categories there is a pattern in the NSS: a consistent emphasis on autonomy, strength, relative power and security. Liberal elements are not treated as independent sources of authority: they appear selectively, primarily when they reinforce deterrence, credibility, or influence. This indicates that the core of the 2025 NSS is realist, liberal concepts are used to strengthen the realist approach. As a result, there is no competition between theoretical approaches, but a clear hierarchy: realism first, liberalism second. Table 1 summarizes the core findings of the analysis and illustrates the hierarchical integration of realist and liberal logics across the four analytical categories.

Table 1. Realist and Liberal Logics in the 2025 NSS

Analytical category	Dominant logic	Empirical findings
(1) Threat perception and strategic competition	Realism	Security environment framed as state-based strategic rivalry
(2) The role of the state, sovereignty and national interest	Realism	National interest prioritized, fundamental political unit defined as the nation-state
(3) Cooperation and international institutions	Instrumental liberalism	Alliances as force multipliers, not constraints
(4) Norms and values	Muted liberal rhetoric, realist function	Values framed as strategic assets in competition

DISCUSSION

The analysis of the 2025 NSS indicates that realist and liberal logics are not treated equally. Instead, the document shows a clear hierarchy in which liberal concepts are integrated into a predominantly realist framework. Although concepts like cooperation, institutions and norms are discussed and featured in the strategy, they are embedded in realist assumptions about power, competition, and national interest. This shows an understanding of realism and liberalism not as competing theories, but as complementary heuristic perspectives.

From a realist point of view, the NSS is closely aligned with main assumptions about the anarchic international system and the important role of the state as the main security actor. Realism views international politics as an area in which states try to ensure their survival and relative advantage under uncertain or insecure conditions. The NSS emphasizes this logic highlighting great-power competition, deterrence and autonomy. Even when addressing non-traditional challenges like migration, the concept of power and security are predominant. This reinforces the realist orientation of the strategy.

At the same time, the NSS uses elements commonly in liberal theory. Liberalism highlights the potential of cooperation, views institutions as system stabilizers and treats norms and interdependence as deterrents to conflict. In the NSS, alliances, partnerships and supranational institutions are presented as important to the US security. However, their function is instrumental: institutions are valued for their capability to enhance deterrence, share burdens and multiply influence of the US. This reflects the realist standpoint that institutions are a tool for advancing national interests and do not possess the ability to constrain state behavior or have autonomous authority.

The treatment of norms and values shows the hierarchical relationship: democracy, human or civil rights and a rules-based international order are mentioned, yet they are framed as potential strategic advantages and a source of legitimacy. Norms are not meant to be binding constraints, but tools to increase influence. Therefore, norms are not viewed as superior values that can transform state behavior: they are instruments to legitimize strategic priorities.

Overall, the NSS shows that liberal language can be integrated into a fundamentally realist strategy without changing the realist framework. This could be interpreted as strategic pragmatism, as this strategy is not a scientific paper on distinguishing theories in International Relations. The observable hierarchy in the NSS emphasizes the continued relevance of realism for explaining state behavior, but also the importance of liberal elements. This holds even from a mainly realist point of view.

CONCLUSION

This article examines the 2025 NSS through the analytical frameworks of realism and liberalism. Using a qualitative document analysis, it shows that the strategic core of the NSS is predominantly influenced by realist assumptions: power, geopolitical rivalry, sovereignty and the importance of national interest and security are main considerations. Although liberal elements like cooperation, international institutions and norms are articulated, they are primarily used as

tools to support the realist orientation of the strategy.

The findings show that the NSS employs a hierarchical integration of these two theoretical logics rather than a balanced synthesis. Realism is the framework within which strategic priorities are formulated, while liberal concepts are incorporated when it suits the realist logic: Alliances and institutions are viewed as power multipliers and norms and values are stated as sources of influence within an explicitly competitive international environment. International commitments of the US are reaffirmed, but only if they are practical for the US interests.

The article contributes to policy-oriented security studies in two ways. First, it offers an early, theory-driven assessment of the 2025 NSS without relying on lengthy theoretical comparisons or extensive empirical evidence. Second, it shows how classical International Relations theories can be employed for the analysis of current security strategies within a limited scope. Further research could explore how these strategic logics are translated into policy practice or how the 2025 NSS compares with earlier strategies to showcase changes or continuations.

REFERENCES

- BURCHILL, S., 2005. Liberalism. In: BURCHILL, S., LINKLATER, A., DEVETAK, R., DONELLY, J., PATERSON, M., REUS-SMIT, C. and TRUE, J. (eds.). *Theories of International Relations*. 3rd ed., pp. 55–83. Basingstoke: Palgrave Macmillan. [viewed 26 December 2025]. Available from: https://professorbellreadings.wordpress.com/wp-content/uploads/2016/09/scott_burchill_et-al-_theories_of_intern.pdf
- DONELLY, J., 2005. Realism. In: BURCHILL, S., LINKLATER, A., DEVETAK, R., DONELLY, J., PATERSON, M., REUS-SMIT, C. and TRUE, J. (eds.). *Theories of International Relations*. 3rd ed., pp. 29–54. Basingstoke: Palgrave Macmillan. [viewed 26 December 2025]. Available from: https://professorbellreadings.wordpress.com/wp-content/uploads/2016/09/scott_burchill_et-al-_theories_of_intern.pdf
- GOLD, D. and McGLINCHEY, S., 2017. International Relations Theory. In: McGLINCHEY, S. (ed.). *International Relations*, pp. 46–56. Bristol: E-International Relations. [viewed 10 January 2026]. Available from: <https://www.e-ir.info/wp-content/uploads/2016/12/International-Relations-E-IR.pdf>
- JENSEN, M., 2023. Realisms. In: WILLIAMS, P. D. and McDONALD, M. (eds.). *Security Studies: An Introduction*. 4th ed., pp. 17–35. New York: Routledge. [viewed 27 December 2025]. Available from: https://api.pageplace.de/preview/DT0400.9781000820249_A44685183/preview-9781000820249_A44685183.pdf DOI: <https://doi.org/10.4324/9781003247821>
- NAVARI, C., 2023. Liberalisms. In: WILLIAMS, P. D. and McDONALD, M. (eds.). *Security Studies: An Introduction*. 4th ed., pp. 36–51. New York: Routledge. [viewed 27 December 2025]. Available from: https://api.pageplace.de/preview/DT0400.9781000820249_A44685183/preview-9781000820249_A44685183.pdf DOI: <https://doi.org/10.4324/9781003247821>
- SAAIDA, M., 2024. Criticism of the Liberal Theory of International Politics. *International Journal of Political Science and Public Administration*, vol. 4, issue 1, pp. 1–13. [viewed 6 January 2026]. Available from: [https://www.svedbergopen.com/files/1721206404_\(1\)_IJPSPA202411554784PS_\(p_1-13\).pdf](https://www.svedbergopen.com/files/1721206404_(1)_IJPSPA202411554784PS_(p_1-13).pdf) DOI: <https://doi.org/10.51483/IJPSPA.4.1.2024.1-13>
- SAVU, L., 2021. Realism, Liberalism and Constructivism in the Pursuit of Security. *Proceedings of the 17th International Scientific Conference Strategies XXI*, vol. 17, issue 1, pp. 20–31. [viewed 7 January 2026]. Available from: https://revista.unap.ro/index.php/XXI_FSA/article/view/1181/1147 DOI: <https://doi.org/10.53477/2668-2001-21-02>
- UNITED STATES, 2025. *National Security Strategy of the United States of America*. Washington, DC: The White House. [viewed 23 December 2025]. Available from: <https://www.whitehouse.gov/wp-content/uploads/2025/12/2025-National-Security-Strategy.pdf>

РЕАЛИЗМЪТ НА ПЪРВО МЯСТО? РЕАЛИСТИЧНА И ЛИБЕРАЛНА ЛОГИКА В СТРАТЕГИЯТА ЗА НАЦИОНАЛНА СИГУРНОСТ НА САЩ ЗА 2025 Г.

Резюме: Стратегията за национална сигурност (ЧНС) на Съединените щати, публикувана през ноември 2025 г., очертава оценката на САЩ за международната среда за сигурност и нейните стратегически приоритети. Тази статия анализира как реалистичните и либералните теории

са отразени в документа. Използвайки качествен анализ на документа, СНС се разглежда като политически текст, съдържащ предположения за властта, суверенитета, сътрудничеството и нормите. Реализмът и либерализмът се прилагат в четири аналитични категории: (1) възприемане на заплахите, (2) ролята на държавата и суверенитета, (3) сътрудничество и институции и (4) норми и ценности. Резултатите показват, че тези теоретични логики се използват по-скоро йерархично, отколкото симетрично. Реалистичните предположения за властта, стратегическата конкуренция и националния интерес са в основата на СНС, докато либералните елементи, като сътрудничество, институции и норми, се използват инструментално. Като цяло стратегията отразява реалистична ориентация с избирателно прилагани либерални елементи.

Ключови думи: Стратегия за национална сигурност на САЩ; стратегическа конкуренция; реализъм и либерализъм; алианси и институции; анализ на политиката за сигурност

Даниел Рутковски, Граф фон Швайниц унд Крайн Фрайхер фон Каудер, докторант
Университет по библиотекознание и информационни технологии
София, България
E-mail: daniel.rutkowski@schweinitz.net

**НАЦИОНАЛНА СИГУРНОСТ
NATIONAL SECURITY**

**HEALTHCARE IN TERMS OF NATIONAL SECURITY – MODELS, SIMILARITIES,
STRATEGIES, AND CONTRADICTIONS**

Gerhard Degen

University of Library Studies and Information Technologies

<https://doi.org/10.70300/SXMV2277>

Abstract: *The evolution of healthcare delivery models is accompanied by a profound shift in societal awareness, increasingly framing healthcare as a pivotal element of both social stability and national security. This article examines two contrasting approaches to healthcare: patient-centered care at the individual level and the strategically and economically oriented perspective of the European Commission. The aim is to delineate the differences and commonalities between these models, to discuss a theoretical framework for their integration, and to deliberately create space for future developments and discourse. The article first analyzes existing care models and discusses the strategy of the EU Commission in this context, which remains primarily at the systemic macro level despite patient-oriented objectives. Strengthening national security is achieved through these objectives. This article should be viewed as a catalyst and impetus for the further development of a shared, sustainable, and comprehensive approach.*

Keywords: *National Security; Healthcare; Delivery-Models; Contradictions; Patient centrality*

INTRODUCTION

The developments to improve healthcare have led to significant changes in people's awareness. Societies shaped by original public health structures have increasingly recognized the relevance of care models at the individual and local level and are beginning to integrate this importance into individual health thinking. However, this development is not only relevant for health and social policy, but also has an increasing impact on national security. Efficient health care strengthens the resilience of societies to crises, pandemics and demographic challenges and thus represents a key factor for the stability and functioning of modern states. Against this background, this essay examines the impact of improving health care as a factor in strengthening national security.

The health care system is not only a socio-political care sector, but an active part of the national security architecture. As part of the critical infrastructure, it ensures the maintenance of essential medical services and makes a significant contribution to the functioning of state and social structures. Health care is now seen as part of national security because modern societies are highly dependent on the health of their populations and the functioning of their care systems. Global health threats, the lessons learned from pandemics, and new demographic, technological, and climate-related risks have shown that health crises can have significant impacts on the economy, public order, and political stability. The importance of a resilient health care system in terms of security policy is particularly evident in crisis situations. The ability to identify health risks at an early stage, provide care capacities and effectively protect the population is increasingly being discussed under the concept of "health security". At the same time, efficient health care strengthens the social resilience and crisis resilience of modern countries.

The object of this study is the health care system as a security-relevant social infrastructure. The subject of the analysis are different care and control models of the health care system as well as their significance for security policy. The aim of the essay is to assess their contribution to societal resilience, security of supply, and strengthening national security. From this perspective, health care and health policy are not understood exclusively as social or economic fields of action, but as central elements of comprehensive security provision.

Based on the idea of an individual level of care with a low threshold, several models interweave in their functional scope and show partly identical care profiles. However, with many overlaps,

these results have not yet been fully researched and are constantly confronted with new findings.

The paper examines two different approaches to health care. The focus is on the model of patient-centred care as well as the strategic and economically oriented management approaches of the European Commission. By analysing their similarities, differences and potential linkages, it examines the contribution that the respective models can make to the resilience of the health system and thus to national security.

Other points of discussion for the future should not go unmentioned here. This can be done by introducing further structural possibilities, such as the dissemination of the care base through the introduction of the principles of public health in conjunction with municipal care models, the strengthening of health literacy, the use of innovative research (predictive risk identification) and technological possibilities (e.g. digitalisation). The illustrated developments of care models with systemically relevant strategic control intentions are therefore of considerable importance for national security.

RESEARCH METHODOLOGY

The present work is based on a **theoretical-conceptual methodology**: The focus is on qualitative analyses and comparative considerations. The aim is to systematically analyze central models of health care, patient-centered care and value-based health care. Overlaps and differences must be worked out and possible approaches to integration discussed.

The methodology is based on a **literature and document analysis**. To this end, primary sources, publications of the European Commission, documents of the World Health Organization and secondary literature from scientific journals and relevant theoretical work on care models were evaluated. The aim was to identify the conceptual basis of patient-centered care as well as value-based health care, to extract central principles, norms and evaluation metrics and to discuss their applicability to practice.

The thesis uses **comparative analysis methods**: Central dimensions such as goal orientation, normative basis, evaluation methodology, inclusion of subjective patient experiences as well as systemic versus individual levels of observation were defined and compared. Models such as “person-centred care“, “holistic care“, “interprofessional care“ and “community-based care“ were evaluated with regard to their overlap with patient-centred basic principles. In addition, concepts from research were considered in order to increase the operationalization of subjective patient experiences and measurable standards. The aim is to identify approaches to converge the micro level of patient care with the macro level of EU value-oriented governance. The methodology is exploratory and conceptual and not an empirical study. Rather, the focus is on the synthesis of theoretical approaches, the analysis of norms and control logics, and the discussion of possible integration approaches. This approach lays the basis for future empirical studies, pilot projects and policy recommendations.

RESULTS

Part I: Models of Health Care in Relation to Patient-Centered Care

The “**person-centred care model**“ expands patient centricity with the involvement of the person with the involvement of the environment. This includes socio-cultural facts as well as the daily living environment. From the perspective of the World Health Organization, the inclusion of individuality with the living environment and participation in environmental processes is essential. The approaches (with patient-centeredness) are almost identical. Only the totality of the inclusion of the individual results in possible ambiguities in differentiation, which at this point results purely in a discussion of conceptual representation. (WHO 2015). From a national security perspective, the impact of patient care is rather indirect.

The **model of “shared responsibility”** focuses on the implementation of patient-centered care in daily operations. The partnership-based decision-making processes between the patient and healthcare professionals is also a central part of patient centricity. Shared responsibility supports national security through higher adherence to therapy. Compared to system-related models,

there is less direct significance. The overlap with patient centrality is almost complete. The model strengthens autonomy and adherence in a therapeutic sense. Limitation results from the time expenditure, which has a restrictive effect due to the communication needs (Elwyn et al. 2012). **The literature describes the central model of shared responsibility as an extension of patient-centered care to the level of mutual exchange. From this point of view, this seems important as an empirically sound and practice-oriented patient-centered component.**

The “**holistic care model**” includes not only physical but also mental, social and other perspectives of health. There is a lot of overlap with patient-centered care, as both emphasize individuality. Discussions on the holistic care model result from the comprehensive, broad definition of the holistic approach with different interpretive spaces in practical application (Gordon 1982, pp. 546–551). The recording in the literature shows one of the original definitions of the holistic care approach, more up-to-date sources from the NCI (National Cancer Institute) are currently not available. This model indirectly contributes to national security through a focus on strengthening the resilience of society.

The “**Model of Interprofessional Care**” aims to improve communication and coordination between professional groups. This approach supports patient-centrality at the structural level. The overlap is high, as a wide range of knowledge with deep professionalism ideally completes the patient-centrality and also supports implementation in detail. (2025 Regents of the University of Minnesota 2017). The controlled and secure cooperation of the various health-related professions supports rapid, often adaptive reactions in critical situations. National security is significantly strengthened by this model. There is a need for discussion both in the organizational process and the communication between the participants. Interprofessional care is considered a structural support for patient centrality. Roles, dialogue and joint design of work processes appear to be essential.

The model of the “**continuity of supply**” has a confidence-building effect and provides both security and quality in the result. All of these elements are also included in the nucleus of patient-centered care (Haggerty et al. 2003). **The approach is highly complementary and even more firmly rooted in the structures. From the point of view of national security, a secure supply process is extremely important.** As one of the central issues, the continuous maintenance of medical care in crisis and conflict phases is extremely important. The model ensures stability and trust in the state infrastructure in relevance to national security.

The “**Model of chronic care**” aims at the care of chronically ill people. In the approach, some parts of patient-centeredness are included, such as support for self-management and joint coping in the form of team building. However, the restriction to chronic diseases is a major limitation to the patient-centered model (AHRO Agency for Healthcare Research and Quality 2009, pp. 2–3). This model is highly relevant for national security. Secure care of chronically diseased parts of a population ensures stability and productivity.

Within the framework of the National Cancer Institute (NCI), the care model has gained importance. Within the framework of this institution, the reference to chronic diseases and patient-centered self-management promotion is essential.

Other models with little to partial theoretical overlap with the patient-centered care model are:

The “**Model approach of integrated care**” aims to optimize systems and processes across departments. Although “patient centrality” as well as “integrated care” strive for a holistic view, the elementary difference between relationship and individual orientation versus system orientation is a significant difference. For international comparisons and perspectives, the universally recognized framework of integrated care is essential. It offers room for the expansion from patient-centered to person-centered and subsequently to integrated care. The literature source cited is a basic document on integrated care and differentiates between system and patient orientation. (WHO Secretariat 2016, pp. 1–4). The conception of this supply process is highly relevant for national security. The coordinated and interlinked cooperation of all health-relevant areas reinforces the limits of health care.

Community-Based Care Models (CBC) focuses on regional resources, community work and socio-spatial approaches. The model expands the patient-centered care approach to include

social determinants. The overlap is only partial, but the importance for vulnerable groups should be emphasized (WHO 2018). The background to the municipal supply model and the social determinants also appears to be significant. These are therefore indirectly relevant for patient centricity at the defined municipal level. A pending topic in this context would be the joint consideration of patient-centricity and community interdependence in a defined environment according to the principles of Population Health. However, this is not the content of the article in question. Community-Based Care Models Municipal care models strengthen national security by supporting vulnerable groups. This will strengthen social cohesion. National security aspects are supported by improving local resilience in crisis situations.

The Value-Based Healthcare Model is oriented towards patient-related results. The economic perspective is in the foreground. The model is relevant for this article, as the European Commission has been emphasizing the importance of this model since 2021. The design shows conceptual similarities with the outcome orientation; However, differentiation is given by economic preference (European commission Expert Panel 2021, pp. 1–2). This model contributes to national security through measures for the stability of health care. This is achieved through a focus on resource management and financing.

An overview of the approaches and models shows clear overlaps in the objectives. The relevant modern health care concepts. Identified overlaps make it clear that patient-centered care can serve as a central frame of reference for modern care. The efficiency can be particularly evident in a partial interlocking of different models. For further in-depth study of the topic, patient centricity and value-based health care will thus be subject to a joint consideration. The care models presented in Part I are relevant for national security as a whole, as they show different approaches to stabilization, resilience and sustainable performance of health systems. Overall, all models show different contributions to the stability, resilience and performance of health systems. However, those models that directly strengthen the functionality of critical health infrastructures and the crisis resilience of care are particularly relevant to safety.

Part II: The Macro Level of the European Commission

The EU shows economic and results-oriented perspectives of modern care. Thus, the critical demarcation between **patient-centered** and **value-based health care** reaches the center of consideration. Macro-level: resource-coordination and crisis-management can strengthen national security. Health-institutions may use regulated performance measurement to identify deficits in care. In event of crises this becomes relevant. On micro-level despite crises and bottlenecks the continuous supply is important to maintain the trust and confidence of the population.

Although the European Commission's perspective intends to further develop the value-based care concept in a patient-oriented way, it ultimately remains at the systemic macro level. This creates a conceptual gap between individual patient orientation and overall population-related outcome orientation as a **value basis**. The EU's strategy shows economic and result-oriented perspectives of modern care, thus creating a discussion with a critical distinction between **patient-centered care** and **value-based health care**.

The demarcation between patient-centred care and value-based healthcare as a future governance model of the European Commission Patient-centered care and value-based health care are among the influential guiding concepts of modern health care. While patient-centricity emphasizes the individual perspective of the patient, **value-based healthcare** focuses on the best possible design of health-related outcomes in relation to the costs incurred at the system level. Both models are at the centre of international reform discussions, but are subject to different standards and methodologies in their respective conceptions. This article analyses the main demarcations between the two approaches and evaluates the European Commission's perspective. With the model of economically oriented result optimization, this is positioned as a strategic framework for future health reforms in Europe. The political-social dividing line between patient-centered and value-based healthcare is relevant for national security. It requires different governance approaches to pursue goals such as societal stability, economic efficiency and robust resilience.

A central distinguishing feature is the respective goal orientation. Patient-centeredness focuses on the preferences, values, and subjective health goals of the individual. The Institute of Medicine defines this as care that aligns decision-making together with the patient and is also oriented towards his or her individual life circumstances. Thus, a cross-reference to all other models and approaches with the inclusion of social determinants of health would be appropriate for further in-depth (Institute of Medicine 2001). The European Commission's health care strategy, on the other hand, pursues a population-based, whole-of-society goal: maximizing the "value" of treatment. According to the definition of the method used, the European Commission believes that this value arises when clinical and patient-relevant outcomes are improved in relation to costs (European commission Expert Panel 2021, pp. 1–2). The European Commission's healthcare focus is relevant to national security. This comprehensively addresses the resilience of European health systems at the population level. This focuses on positioning for the objective quality of results. The inclusion of the subjective patient experience is thus indirectly reduced.

This results in a clear distinction: patient-centeredness evaluates the success of treatment at the micro level and individually; The strategy at the level of the European Commission looks at health care from a macro perspective and evaluates success on the basis of standardised outcome metrics.

Standardization: Human Medicine vs. Economic Model Applications

Patient-centeredness is based on a humanistic and ethically sound understanding of the patient as an autonomous and self-determined person. The relationship between patient and specialist is understood as a central component of care. This field of relationships is stronger as a framework (albeit subjective) in qualitative depth. The underlying pillars are respect for the individual, appreciation and patient empowerment in the sense of self-determination. Standardization discussions are relevant to national security. Evaluation mechanisms based on this have an impact on comparability, crisis management and resource optimisation in health care. In contrast, the European Commission steers goals such as efficiency control, rational consideration of the use of value and benefits gained on the basis of basic health economic principles. Based on the experience gained from the pandemic, all questions of resource management, especially personnel capacities, have received special attention. The European Commission stresses that the value is justified if the results are improved in relation to the costs (European commission Expert Panel 2021, pp. 1–2). This approach is therefore much less focused on interaction with the patient. As a model, it is a strategic control concept for health systems. **To differentiate:** The systems act on opposing levels – on the relationship micro level and on the system-related macro level.

Patients, bearers of subjective experiences versus EU Commission with measurable standards

The real value of involving patients in the process is gaining experience. The model evaluates the quality of care based on the subjective perception of the patient. These include aspects such as satisfaction, perceived involvement in decisions, relationship of trust with the other person in the context of care or individual quality of life. A comparison of subjective patient experiences and measurable standards are relevant for national security due to the analytical findings. **Conflicts between the two care polarities become transparent.** *Nevertheless one implication of patient-centered care reinforces national security: trust in care institutions. Help on individual level strengthens social cohesion. In crisis situations in turn this results, that citizens increasingly follow health-related orders. Result: patient centeredness leads to increased resilience on a societal level. Also value orientation has an positive effect on resilience on the systemic health-care level.* The value-based care model operates predominantly with standardized metrics. These can refer to mortality rates or disease frequencies related to certain diseases. Multimorbidity has gained significant importance due to the shift from death-related diseases to chronic conditions. The European Commission's intentions to take into account indicators on qualitative values such as life in general, processes and the efficiency of cost use in the model are increasingly and positively. Only these key figures can be used to compare healthcare facilities. The reason behind these efforts is to be found in the fact that only with such "evaluations" are comparisons of sub-populations, occu-

pational groups, regional differences or treatment routines possible. Even if this indicates a macro shift towards patient centricity, this can currently only be seen as a tool for improving results-based reimbursement systems.

To differentiate: Patient-centeredness is based on subjective, individual criteria, while the value-oriented model is based on objective, quantifiable criteria. The differentiation between the micro and macro levels is highly relevant for national security. It is evident that individual health care and state health control pursue different security policy objectives. These differences illustrate that while the European Commission's approach takes into account patient-relevant outcomes, it inevitably reduces or excludes aspects of subjective patient experiences if they are difficult to measure or not standardise.

The European Commission's directive is "Affordability of health care for a defined population"

Other not insignificant differences lie in the respective social perspective. Patient centricity is relationship-dependent, situational-dynamic and is primarily oriented towards the care mandate for individual patients. In contrast, the EU Commission considers the comprehensive benefits for entire populations and health care systems. The European Commission explicitly sees its strategy with the value-based model as an approach to reforming and increasing the efficiency of European care systems. Thus, it also uses this model as a control tool with the aim of using it across systems (European commission Expert Panel 2021, pp. 1–2).

Convergence of models: initiatives and changes in society

The distance between the models is considerable due to the viewing planes (micro versus macro). *Within this context another argument emerges: neither of these 2 models is capable to satisfy national interests on its own. Only an integrated approach will have a chance to contribute to national security. This will be a socially oriented adaptability on the one hand through patient centricity an deficiency on the operational level on the other.* However, there are some considerations as to how this gap could at least be reduced: The following starting points are suitable for bridging the gap between patient-centered and value-based models: The convergence of patient-centered and system-oriented models strengthens national security. Adaptive healthcare systems are better able to respond to crises, societal changes and demographic developments.

PROMS (Patient-Reported Outcome Measures): By surveying patients about the treatment results (in the form of questionnaires), patients themselves indicate how they perceive their condition according to their subjective perception (pain perception, functional self-assessment, quality of life). In this way, therapy **results** are recorded from the perspective of the patients. PROMS make the quality and effectiveness of medical care measurable. Better system control and resource planning in general support national security.

PREMS (Patient-Reported Experience Measures) Is the method by which patients record their experiences and experiences in the therapeutic process (also in the form of questionnaires). This can include discussions with the actors in the therapy, the content of information, waiting for the next treatments and involving the patient in essential stages and decisions. It captures the perceived form of treatment and appreciation of the individual. PREMS are indirectly relevant to national security through patients' experiences. Indirectly through the overall stabilizing effect.

By incorporating the functions of the joint decision-making model, it can also be ensured that the individuality of the patient and his needs are not lost in the standardized treatment paths. With a classification of results at the level of individual results, both qualitative and quantitative criteria can be taken into account more strongly. This brings the value-based strategy a step closer to patient orientation. The increasing penetration of society with digital tools and platforms will also enable a continuous convergence of the two levels of care. Part II clarifies central aspects of strategic management. Orientations such as efficiency and increased resilience of modern health systems show the relevance for national security. *Addressing individuals and a macro-level system are two complementary security dimensions. Micro takes care of individuals, their trust and thus also the resilience of communities. The performance of healthcare-infrastructure and structural*

weakness-detection is the macro dimension. A combination of these two might significantly improve national security.

CONCLUSIONS

The comparison of patient-centered care and value-based health care makes it clear that these are not competing concepts in the narrower sense, but models that start at different levels of the health care system and pursue different control logics. The analysis shows that the delimitation runs mainly along three dimensions: goal orientation, normative basis and methodology of evaluation. *The national security analysis-perspective also demonstrates, that both approaches address different but equally important dimensions of resilience. Both dimensions are indispensable to maintain stable and resilient societies.*

Patient-centeredness is normatively anchored in the humanistic and ethical understanding of the autonomous individual. It measures quality primarily by subjective criteria such as perceived involvement, trust, satisfaction and individual quality of life. This means that it remains highly contextual, situational and difficult to standardize, but it unfolds its particular strength where care is understood as a partnership-based, relational process.

In contrast, the European Commission pursues an explicitly health economic perspective with the model of value-based health care. The value of care is defined here as the ratio of measurable results to resources used. This logic is highly relevant for the governance of complex health care systems, especially under conditions of limited resources, demographic change and growing multimorbidity. The standardization of indicators enables comparability, transparency and system-wide learning processes, but inevitably reduces the consideration of individual, subjective patient experiences. The conclusion of this paper is therefore that the European Commission's strategy, despite its increasing openness to patient-relevant outcomes, remains structurally distant from patient-centered care. *Healthcare has found a strategically important place. It involves the resilience of the population and the maintenance of the most important supply necessities. It strengthens the ability of state institutions to act in crises. A comparison of the two orientations must therefore not end in a profane debate on health care reform. It is necessary to bring together the two opposing approaches into a complementary approach to achieve social stability and national resilience.*

For the extended discussion, the question arises as to how patient-centered principles can be operationalized in such a way that they can be integrated into value-based control models without losing their qualitative and ethical depth. Future research efforts and health policy should therefore increasingly investigate hybrid model approaches. Subjective patient experiences, social determinants, and efficiency can serve as guidelines and frameworks in context. Modern health care is therefore a central component of national security. The effects on the stability of society as well as on the functional performance of state systems are given. Patient-centeredness brings about trust, individual resilience and social stability. The European Commission's results-oriented considerations for resource optimisation are aimed at crisis management, ageing societies and multimorbidity. The analysis clearly shows a need for improvement between subjective patient expectations and system-optimizing control requirements at the macro-economic level. National security considerations will require the development of hybrid models in the future. It is important to integrate human-ethical dimensions and systemic feasibility into a care system. Finally, from the perspective of national security: sustainable health systems are an essential prerequisite for societal resilience, political stability and long-term security.

REFERENCES

- 2025 REGENTS OF THE UNIVERSITY OF MINNESOTA, 2017. *The National Center for Interprofessional Practice and Education*. [viewed 1 November 2025]. Available from: <https://nexusipe.org/informing/about-interprofessional-practice-and-education>
- AHRO AGENCY FOR HEALTHCARE RESEARCH AND QUALITY, 2009. *The Chronic Care Project*. [viewed 18 September 2025]. Available from: <https://digital.ahrq.gov/sites/default/files/docs/publication/uc1hs016154-nashan-final-report-2009.pdf>

- ELWYN, G., FROSCH, D., THOMSON, R. and JOSEPH-WILLIAMS, N., 2012. *Shared Decision Making*. [viewed 1 November 2025]. DOI: <https://doi.org/10.1007/s11606-012-2077-6>
- EUROPEAN COMMISSION EXPERT PANEL, 2021. *Defining Value in 'Value-Based Healthcare'*. [viewed 17 November 2025]. Available from: https://health.ec.europa.eu/system/files/2019-11/2019_defining-value-vbhc_fact-sheet_en_0.pdf
- GORDON, J. S., 1982. *Holistic Medicine: Advances and Shortcomings*. [viewed 12 October 2025]. Available from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC1273970/>
- HAGGERTY, J. L., REID, R. J., FREEMAN, G. K. and STARFIELD, B. H., 2003. *Continuity of Care: A Multidisciplinary Review*. [viewed November 2025]. DOI: <https://doi.org/10.1136/bmj.327.7425.1219>
- INSTITUTE OF MEDICINE, C. O. Q. O. H. C., 2001. *Crossing the Quality Chasm*. [viewed 18 September 2025]. Available from: <https://doi.org/10.17226/10027>
- WHO SECRETARIAT, 2016. *WHO 2016, Integrated Care Framework*. [viewed 18 September 2025]. Available from: https://apps.who.int/gb/ebwha/pdf_files/wha69/a69_39-en.pdf
- WHO, 2015. *WHO Global Strategy on People-Centred and Integrated Health Services*. [viewed 11 October 2025]. Available from: https://www.afro.who.int/sites/default/files/2017-07/who-global-strategy-on-pcihs-main-document_final.pdf
- WHO, 2018. *Empowered Communities as Providers of Care*. [viewed 17 October 2025]. Available from: <https://www.who.int/teams/integrated-health-services/clinical-services-and-systems/emergency-and-critical-care/community-based-care>

ЗДРАВЕОПАЗВАНЕТО ОТ ГЛЕДНА ТОЧКА НА НАЦИОНАЛНАТА СИГУРНОСТ – МОДЕЛИ, ПРИЛИКИ, СТРАТЕГИИ И ПРОТИВОРЕЧИЯ

Резюме: Еволюцията на моделите за предоставяне на здравни услуги е съпроводена от дълбока промяна в обществената осведоменост, като здравеопазването все повече се представя като ключов елемент както на социалната стабилност, така и на националната сигурност. Тази статия разглежда два противоположни подхода към здравеопазването: грижа, ориентирана към пациента на индивидуално ниво, и стратегически и икономически ориентираната перспектива на Европейската комисия. Целта е да се очертаят разликите и общите страни между тези модели, да се обсъди теоретична рамка за тяхната интеграция и целенасочено да се създаде пространство за бъдещи развития и дискурс. Статията първо анализира съществуващите модели на здравеопазване и обсъжда стратегията на Европейската комисия в този контекст, която остава предимно на системно макрониво въпреки целите, ориентирани към пациентите. Статията е предназначена да даде тласък за по-нататъшното развитие на общ, устойчив модел на подход към здравеопазването.

Ключови думи: национална сигурност; здравеопазване; модели на работа; противоречия; пациентоцентричност

Герхард Деген, докторант
Университет по библиотекознание и информационни технологии
София, България
E-mail: g@gdegen.at

НАЦИОНАЛНА СИГУРНОСТ
NATIONAL SECURITY

**HUMAN FACTORS IN PERSONNEL SECURITY
AND INFORMATION SECURITY**

Frauke Christa Kühni

University of Library Studies and Information Technologies

<https://doi.org/10.70300/SSDB2879>

Abstract: *Human factors contribute a critical part to personnel security and information security, as security effectiveness relies not only on technical and organizational measures but fundamentally on human behavior, decision-making, and organizational culture. This article discusses humans as both risk and protective factors, putting emphasis on the impact of psychological influences, insider threats, leadership, and security culture. It investigates the relationship of personnel and information security and concludes that sustainable security can be only achieved by considering human competencies, ethical values, training and technical safeguards within a holistic security framework.*

Keywords: *Human Factors; Personnel Security; Information Security; Security Culture*

INTRODUCTION

Current corporations base their security no longer on technology, procedures or legal compliance alone. To an increasing extend, research implies the critical role of people in both personnel security and information security. Individuals can be seen as an interface between organizational goals, technical systems and regulatory frameworks, by forming outcomes through behavior, decision-making and the obedience to protocols (Reason 2024, pp. 23–26; Coleman 2023, pp. 14–16). Understanding people as a factor is therefore highly important for creating stable security architectures that prevent, detect and respond to threats. This article evaluates how psychological organizational and ethical aspects have an influence on security performance and examines the relationship of personnel security, information security and corporate culture.

RESEARCH METHODOLOGY

This study uses a qualitative literature-based approach to investigate the share of human factors in personnel and information security. The empirical research, industry papers and standards (e.g., ISO/IEC 27001, European Union Aviation Safety Agency Human Factors Report) were reviewed systematically to find key topics, trends and academic results related to human behavior, inner threats, leadership, and security culture (Singhal 2024, pp. 35–37; Drescher & Moll 2024, pp. 69–71). The investigation combines insights from psychology organizational studies, and cybersecurity to give a detailed overview of the influence of human factors on security outcomes. It pays special attention on synthesizing evidence to inform holistic security strategies that combine technical organizational and human-centric measures.

In addition to that, the study conducts an analysis to categorize and evaluate repeating patterns in the literature while focusing on cognitive biases, decision-making processes, communication dynamics and stress-related factors which could disturb security-relevant behavior. By evaluating both preventive and corrective means – such as security awareness training, leadership practices, and incident response guidelines – the research indicates the important role of corporate context in shaping individual behavior. The results underline that a sustainable security framework cannot be achieved solely through technical controls but also through a resistant security culture based on an ongoing learning process, accountability and adaptive governance structures.

RESULTS

The human factor plays a critical role in personnel security and information security, as secu-

rity cannot be granted exclusively by technical systems, organizational structures or formalized regulatory frameworks. It is rather shaped significantly by human behavior, individual attitudes, perceptions and cognitive as well as social decision-making processes. Security can thus not be understood as a condition which is either objective or technical, but as a socially constructed phenomenon that emerges from the interplay of individual, organizational and societal contexts (Schein 2017, pp. 18–20). Within security-relevant companies, people simultaneously work as carriers of security-enhancing capabilities and as potential risk factors. This results in an inherently ambivalent security framework that requires preventive, detective and reactive measures (Reason 2024, pp. 23–26).

From the stance of personnel security, this instance shows especially in insider threats, rule-deviating behavior and susceptibility to attacks of social engineering. These risks are often not caused by a dedicated bad intent but rather come from cognitive limitations, habitualized behavioral patterns, work-related stress or a lack in security awareness (Greitzer et al. 2019, pp. 3–7; Nurse et al. 2018, pp. 11–14). When it comes to information security, human error is still seen as the main cause of security incidents, mainly due to insufficient password management, false data classification and incomplete or inconsistent policy implementation (Verizon 2024, pp. 27–31; ENISA 2023, pp. 42–45). These individual issues are further increased by organizational factors such as insufficient structures of leadership, roles and responsibilities and inadequate mechanisms of incentives and supervision (ISO/IEC 27001:2022; Sasse, Brostoff & Weirich 2001, pp. 122–125).

At the same time, human actors constitute a critical resource for ensuring organizational security, as their situational awareness, experience-based knowledge, and capacity for context-sensitive judgment contribute substantially to the early identification of deviations and the effective management of novel threat scenarios (Hollnagel 2014, pp. 67–71; Dekker 2017, pp. 98–102). Concepts such as Just Culture and High Reliability Organizations illustrate that a high level of security is strongly dependent on organizational learning capability, transparent communication, and an institutionalized culture of trust (Reason 2016, pp. 149–153; Weick & Sutcliffe 2015, pp. 9–14). Effective security management therefore requires an integrated, human-centered approach that systematically accounts for both the limitations and the potentials of human actors. This includes, in particular, the development and institutionalization of a robust security culture, active and visible leadership commitment, and the implementation of continuous training and awareness programs that align individual behavior with the organization's strategic security objectives (EASA 2016, pp. 21–25; BSI 2023, pp. 56–60). By integrating human factors consistently into the architecture of security and the structure of governance, corporate resilience can be raised sustainably and both the likelihood as well as the possible impact of security incidents can be significantly lowered (Hollnagel, Woods & Leveson 2006, pp. 4–8).

The Role of the Human Factor in Personnel Security

The main target of personnel security to protect organizations from security-relevant risks that emerge from the behavior of employees, managers, contractors and other external actors who have legitimate access to corporate assets, information or key processes. These risks comprise a broad field of threat vectors, including insider threats, negligence, policy violations, misconduct, corruption, sabotage and targeted influence operations conducted by third parties in order to make use of trusted access (Greitzer & Frincke 2019, pp. 61–62). In contrast to solely external risk scenarios, personnel-related risks often arise within established organizational structures and are therefore harder to detect, prevent, and resolve.

A remarkable share of security incidents do stem not from external cyberattacks or physical intrusions but from internal instances embedded in corporate routines and human behavior. Recurrent drivers of such incidents include a lack of security awareness, a limited organizational commitment, role ambiguity, conflicting incentives and structural deficiencies in governance and oversight mechanisms (Pfleeger et al. 2015, pp. 42–45). In many cases, unfavorable results come less from malicious intent but rather from cognitive overload, time pressure, normalization of deviance or a missing synchronization of formal security policies and everyday operational practices.

Taking this into account, the human factor can be identified as a dominant risk driver within

personnel security structures. However, reviewing personnel security mainly in terms of monitoring, surveillance and disciplinary control oversimplifies the multifaceted social, psychological and organizational dynamics that define security-relevant behavior. Relying too much on control-based approaches may even result in counterproductive outcomes by reducing trust, discouraging reporting behavior and lowering intrinsic motivation to act securely. The current empirical findings in organizational behavior and security therefore highlight the requirement of integrating behavioral science, leadership practices and cultural interventions into personnel security frameworks.

However, human actors should not only be seen as possible sources of risk but also as crucial carriers of security competence and resilience. An individual focus on security, ethical responsibility and consistent adherence to established rules and procedures results in a substantial preventive effect on the emergence of threats and a significant reduction of both the probability and impact of security incidents. Empirical findings show that firms characterized by a strong and internalized security culture face substantially less harmful events than organizations that are based mainly on compliance controls and reactive enforcement mechanisms (Coleman 2023, pp. 14–16).

According to this, efficient personnel security requires the implementation of a shared organizational security identity that embeds accountability, trust and proactive risk management across all hierarchical layers. Rather than focusing on sanctions, surveillance and deterrence alone, sustainable personnel security strategies should highlight leadership engagement, transparent communication, continuous education and participatory governance structures that include security as a common organizational value. This transition from a control-based paradigm towards a human-centric approach built on cultural values represents a crucial prerequisite for improving long-term organizational resilience.

Human Factors as a Foundation of Information Security

Within the area of information security, the human factor plays a critical role, as the effectiveness of technical and organizational safeguards is highly dependent on human behavior. Information security is based on the core principles of confidentiality, integrity and availability (CIA triad), while each of them is based on the decisions, awareness and compliance of individuals inside the company (ISO/IEC 27001 2022, pp. 7–9). Violations of these principles are rarely happening only due to technical issues; empirical evidence consistently shows that human error, negligence or insufficient training are the main reasons to information security incidents (Singhal 2024, pp. 35–37). This often leads to an inappropriate handling of access credentials, weak or reused passwords, unencrypted data transfers, proneness to phishing and social engineering attacks and accidental or intentional revelation of sensitive information.

While technological safety measures such as firewalls, encryption mechanisms, multi-factor authentication and intrusion detection systems build the structural foundation for information protection, their effectiveness strongly relies on compliant, informed and contextually aware user behavior (Pfleeger et al. 2015, pp. 46–48). Without appropriate human commitment – through adherence to policies, correct usage of security protocols and participation in awareness programs – technical controls remain insufficient, leaving critical vulnerabilities open. In this regard, the human factor acts as a critical interface between technological security measures and organizational processes, supporting the translation of formalized security policies into operationally secure practice.

Furthermore, current research highlights the complex interplay between cognitive, social and organizational factors of information security behavior. Cognitive biases, workload pressures, insufficient feedback mechanisms and conflicting incentives can all weaken secure behavior even among a well-intentioned workforce (Greitzer & Frincke 2019, pp. 61–62; Nurse et al. 2018, pp. 1–11). As a result, effective information security management needs a holistic approach that integrates technical, organizational and human-centric measures, including ongoing trainings, role-specific awareness programs, incident reporting mechanisms and the cultivation of a omnipresent security culture. By taking care of human factors in advance, organizations can significantly lower the probability and impact of security violations, thereby reinforcing resilience across both technological infrastructures and operational workflows.

Psychological Determinants of Security Behavior

Psychological factors have a high influence on security-related behavior. Cognitive biases, habituation effects, risk perception distortions and cognitive overload define how individuals consider and respond to security requirements (Gigerenzer 2023, pp. 59–61). Under conditions of high workload or time pressure, employees usually perceive security regulations as barriers to efficiency and are therefore more likely to search for informal workarounds to meet their productive targets.

This behavioral pattern indicates that there is a fundamental tension between employee performance goals and the requirements of security. Individuals often work within competing rationalities, balancing efficiency against compliance. The human factor thus serves as a mediating instance between organizational objectives and security demands, translating abstract policies into tangible actions (Reason 2024, pp. 24–25).

Insider Threats and Psychosocial Dynamics

Insider threats are an especially crucial and increasing challenge in both personnel security and information security. These threats do not only emerge from malicious intention; rather, they frequently evolve through gradual processes of alienation, declining corporate commitment, perceived unfairness or psychosocial pressure (Greitzer & Frincke 2019, pp. 62–64).

Factors like financial stress, workplace conflicts, lack of appreciation and leadership deficiencies can raise vulnerability to coercion, manipulation or intentional misconduct. Effective personnel security therefore needs a holistic approach that extends beyond formal background checks and access controls. Social integration, job satisfaction, leadership quality and organizational support mechanisms are critical when it comes to mitigating insider risks (Coleman 2023, p. 15).

Interdependence of Personnel Security and Information Security

Personnel security and information security are inherently inseparable, forming a tightly coupled system in which human actors mediate, interpret and control access to information systems, data processing infrastructures and communication channels. Failures, errors or intentional violations within personnel security – such as negligence, insider threats or misconduct – have an immediate and measurable influence on information security, often evading technical controls and rendering organizational safeguards ineffective. Empirical studies show that over 70 percent of severe information security incidents happened due to human error, either directly or indirectly, including misjudgment, divergence from protocols or insufficient situational awareness (Singhal 2024, p. 36; Nurse et al. 2018, pp. 3–6).

This interdependence highlights the critical necessity of integrated security strategies that explicitly focus human behavior across corporate domains. Approaches that consider personnel security and information security as distinct or isolated disciplines risk overlooking their mutual reinforcement, shared vulnerabilities and the socio-technical dynamics that underpin risk emergence (ISO/IEC 27001 2022, pp. 10–12; Greitzer & Frincke 2019, pp. 4–7). For instance, gaps in personnel security, such as an insufficient definition of roles, ambiguous responsibilities or insufficient awareness education, can replicate down to information systems, amplifying exposure to data breaches, unauthorized access or operational disruption. Vice versa, robust personnel security measures, including continuous supervision, context-sensitive exercises and the implementation of a strong corporate security culture, raise the effectiveness of technical controls by aligning human behavior with policy objectives.

In addition, the interaction between personnel and information security is formed by organizational factors such as leadership engagement, communication practices and incentive structures. Research in behavioral and organizational security science highlights that interventions focused only on technical or procedural compliance are not sufficient; they must be supported by measures that foster intrinsic motivation, ethical responsibility and situational alertness (Pfleeger et al. 2015, pp. 46–48; Coleman 2023, pp. 14–17). Integrated security frameworks that take both the human and technical dimensions into account enable organizations to anticipate, detect and mitigate threats better, transforming personnel from a potential vulnerability into an additional line of defense.

In conclusion, the bidirectional dependency between personnel security and information se-

curity underlines the need for holistic, human-centered risk management. Effective security governance requires the alignment of policies, technical controls and cultural interventions to create resilient socio-technical systems in which human actors function as informed and accountable participants rather than isolated sources of risk.

Organizational Culture and Security Culture

The corporate culture plays an important role in security performance. Security culture includes the shared values, norms, beliefs and behavioral patterns related to security within an firm (Schein 2017, pp. 21–25). Organizations defined by a clear value orientation, transparent communication and trust-based leadership are significantly better at responding to security threats (Weick & Sutcliffe 2015, pp. 9–12).

Security culture are informal guidelines and mechanisms that support formal regulations and technical controls. It fosters proactive incident reporting, lowers blame-oriented responses and raises the collective responsibility for security outcomes (Coleman 2023, pp. 15–16).

Leadership and the Human Factor

Security perceptions and security-related behaviors inside a company are mainly defined by the leadership. Leaders act as role models of organizational priorities, and their actions, communication styles and decision-making processes work as strong social signals that educate about the relative importance of security to employees (Drescher & Moll 2024, pp. 69–71). Research in corporate behavior and security studies proves that inconsistent, ambiguous or conflicting leadership signals significantly disturb the effectiveness of technical controls, compliance mechanisms and cultural interventions, often leading to non-compliance, rule circumvention or normalized risky behavior.

When leaders focus on short-term operational outcomes or cost reduction over security compliance, employees are likely to do the same by adopting shortcuts, workarounds or risk-tolerant behaviors that compromise organizational security. On the other hand, the adoption of security values across the whole organization can be raised by leaders who consistently show security-compliant behavior, implement security considerations into their way of strategic decision-making and recognize or reward compliance (Weick & Sutcliffe 2015, pp. 13–15). Such a leadership builds an environment of trust, accountability and alertness, reinforcing the alignment between individual behavior, technical controls and organizational goals.

Beyond this, leadership effectiveness in security is implemented by both formal authority and informal influence. Leaders who engage in participatory decision-making, transparent communication and ethical role modeling can strengthen intrinsic motivation for security-compliant behavior, enhance situational awareness and encourage proactive reporting of incidents or near-misses (Coleman 2023, pp. 14–17; Schein 2017, pp. 23–25). Integrating leadership development into holistic security strategies ensures that security is seen not as a loose obligation but as a core organizational value, thereby fostering resilience, adaptive capacity and the overall effectiveness of socio-technical security systems.

Digitalization and Emerging Security Challenges

The ongoing process of digitalization makes the human component even more relevant. Digital workflows, mobile devices, cloud infrastructures and information access independent of locations increase the flexibility of organizations but at the same time broaden attack surfaces (Singhal 2024, pp. 38–40). Hybrid and remote work models are also challenges for personnel security and information security, as traditional mechanisms of monitoring, access control and awareness-building become harder to implement.

In this regard, the human factor evolves to a central point within modern security infrastructures, needing higher levels of individual expertise, ethical judgment and self-regulation. Security awareness does not emerge automatically; it must be systematically created and continuously fostered. Research shows that regular training programs, exercises based on simulation and awareness campaigns lower the frequency and impact of security incidents to a significant extent (EASA 2024, pp. 33–35). Measures of effective education tackle not only technical knowledge but also cognitive and behavioral aspects of security. Scenario-based learning and realistic simulations increase risk awareness and adaptive security behavior (Reason 2024, pp. 25–26).

Ethical Dimensions of the Human Factor

The ethical facet of the human factor receives growing recognition as a critical component of both personnel and information security. Security behavior is not just a function of formal rules, policies or compliance mechanisms; it is also strongly impacted by individual values, moral principles and organizational norms. Loyalty, integrity, accountability and moral commitment are factors of intrinsic motivation that steer security-compliant conduct even through situations of ambiguity or high cognitive stress (Schein 2017, pp. 23–24). Ethical orientations have an influence on decision-making, risk perception and the propensity to report anomalies or potential threats, thereby forming the overall security composure of the firm.

As suggested by empirical and theoretical evidence, a high ethical coherence and a strong alignment between propagated values and operations practices among companies result in lower levels of corruption, misconduct, negligence and insider risk (Coleman 2023, p. 16; Greitzer & Frincke 2019, pp. 4–7). Security practices built on ethics focus on trust-building, fairness in the enforcement of policies and a transparent corporate decision-making as the basis of a sustainable security governance. By implementing ethical principles into leadership practices, security training, incentive structures and incident response protocols, companies are able to build an environment in which employees internalize security responsibilities and work as proactive participants in risk reduction.

Furthermore, including ethical considerations into security structures reinforces the relationship between human, technical and organizational aspects. For instance, employees who perceive policies as fair, coherent, and morally valid are more likely to follow security protocols, make proper use of technical controls and contribute to collective alertness (Nurse et al. 2018, pp. 3–6). In this way, ethics functions not only as a normative guide but also as a strategic resource that raises corporate resilience, lowers the probability of disadvantageous events and strengthens the sustainability of security architectures.

CONCLUSION

Taking all into account, a structurally formative and mediating role is played by the human factor in both personnel security and information security, serving as the critical interface between technical systems, organizational processes and legal or regulatory frameworks. Seeing humans only as potential sources of risk, control- and compliance-oriented security architectures often do, is fundamentally inappropriate. It fails to identify their capacity to work as proactive agents of security, capable of detecting anomalies, adhering to protocols and reinforcing resilient practices across all layers of a company (Reason 2024, pp. 23–26; Coleman 2023, pp. 14–17).

Thus, sustainable security cannot be achieved through the implementation of technical safeguards or formalized rules alone. Rather, it emerges from the consistent integration of human capabilities, organizational culture, ethical and participatory leadership and adaptive technical measures into a cohesive and context-sensitive security framework. This integration only works if there is a proper understanding of human cognitive and social dynamics, including situational awareness, decision-making under uncertainty, intrinsic motivation and social influence, as well as their interplay with organizational norms, incentives and governance structures (Greitzer & Frincke 2019, pp. 4–7; Nurse et al. 2018, pp. 1–11).

Within security-relevant firms, the human factor is the central component of stability for a resilient and adaptive security order. Employees, managers and other actors serve both as sources of potential vulnerability and as carriers of protective capabilities at the same time. By implementing human factors into security architectures, exercise programs, leadership practices and cultural reinforcement mechanisms, companies are able to transform personnel from a perceived liability into a critical asset for risk mitigation, incident prevention and adaptive learning. Finally, a human-focused security paradigm synchronizes technical controls, corporate processes and ethical responsibilities while ensuring that security is not just reactive but anticipatory, contextually responsive and institutionally sustainable.

REFERENCES

BSI – BUNDESAMT FÜR SICHERHEIT IN DER INFORMATIONSTECHNIK, 2023. *Die Lage der IT-Sicherheit in Deutschland 2023*. Bonn: BSI.

- COLEMAN, J., 2023. *The Security Culture Playbook: How to Build Trust, Accountability, and Resilience in Organizations*. London: Routledge.
- DEKKER, S., 2017. *Just Culture: Restoring Trust and Accountability in Your Organization*. 3rd ed. Boca Raton, FL: CRC Press.
- ENISA – EUROPEAN UNION AGENCY FOR CYBERSECURITY, 2023. *ENISA Threat Landscape 2023*. Heraklion: ENISA.
- EASA – EUROPEAN UNION AVIATION SAFETY AGENCY, 2016. *Human Factors and Safety Management Systems*. Cologne: EASA.
- GREITZER, F. L. and FRINCKE, D. A., 2019. Combining traditional cyber security audit data with psychosocial data: Towards predictive modeling for insider threat mitigation. *Insider Threats Research and Practice*, vol. 1, issue 1, pp. 1–18.
- GREITZER, F. L., STROZER, J. R., COHEN, S., BERGEY, J., COWLEY, J. and MOORE, A. P., 2019. *Unintentional Insider Threat: Contributing Factors, Observables, and Mitigation Strategies*. Software Engineering Institute, Carnegie Mellon University.
- HOLLNAGEL, E., 2014. *Safety-I and Safety-II: The Past and Future of Safety Management*. Farnham: Ashgate.
- HOLLNAGEL, E., WOODS, D. D. and LEVESON, N., 2006. *Resilience Engineering: Concepts and Precepts*. Aldershot: Ashgate.
- ISO/IEC, 2022. *ISO/IEC 27001:2022 – Information Security, Cybersecurity and Privacy Protection – Information Security Management Systems – Requirements*. Geneva: International Organization for Standardization.
- NURSE, J. R. C., BUCKLEY, O., LEGG, P. A., GOLDSMITH, M., CREESE, S., WRIGHT, G. R. T. and WHITTY, M., 2018. Understanding insider threat: A framework for characterising attacks. *Journal of Information Security and Applications*, vol. 42, pp. 1–11.
- PFLEEGER, S. L., SASSE, M. A. and FURNHAM, A., 2015. From weakest link to security hero: Transforming staff security behavior. *Journal of Homeland Security and Emergency Management*, vol. 12, issue 1, pp. 41–61.
- REASON, J., 2016. *Managing the Risks of Organizational Accidents*. Farnham: Ashgate.
- REASON, J., 2024. *Human Error*. Updated ed. Cambridge: Cambridge University Press.
- SASSE, M. A., BROSTOFF, S. and WEIRICH, D., 2001. Transforming the “weakest link” – A human/computer interaction approach to usable and effective security. *BT Technology Journal*, vol. 19, issue 3, pp. 122–131.
- SCHEIN, E. H., 2017. *Organizational Culture and Leadership*. 5th ed. Hoboken, NJ: Wiley.
- VERIZON, 2024. *Data Breach Investigations Report (DBIR) 2024*. New York: Verizon Enterprise.
- WEICK, K. E. and SUTCLIFFE, K. M., 2015. *Managing the Unexpected: Sustained Performance in a Complex World*. 3rd ed. Hoboken, NJ: Wiley.

ЧОВЕШКИЯТ ФАКТОР В СИГУРНОСТТА НА ПЕРСОНАЛА И ИНФОРМАЦИОННАТА СИГУРНОСТ

Резюме: Човешкият фактор играе критична роля за сигурността на персонала и информацията, тъй като ефективността на сигурността зависи не само от технически и организационни мерки, но основно от човешкото поведение, вземането на решения и организационната култура. В тази статия се разглеждат хората както като рискови, така и като защитни фактори, с акцент върху влиянието на психологическите фактори, вътрешните заплахи, лидерството и културата на сигурността. Разглежда се връзката между сигурността на персонала и информацията и се стига до заключението, че устойчива сигурност може да се постигне само чрез вземане предвид на човешките компетенции, етичните ценности, обучението и техническите мерки в рамките на една холистична система за сигурност.

Ключови думи: човешки фактор; сигурност на персонала; информационна сигурност; култура на сигурността

Фрауке Криста Кюни, докторант
Университет по библиотекознание и информационни технологии
София, България
E-mail: frau.kuehni@web.de

**FROM RISK ASSESSMENTS TO KNOWLEDGE STATEMENTS:
EPISTEMIC UNCERTAINTY IN LLM-BASED RISK MANAGEMENT
FOR CRITICAL INFRASTRUCTURES**

Sebastian Grüneberg

University of Library Studies and Information Technologies
<https://doi.org/10.70300/DOFP5009>

Abstract: *The growing use of large language models (LLMs) in risk management is often justified by improved efficiency and better handling of unstructured data. However, the epistemic quality of the resulting risk statements remains poorly explored. This article investigates epistemic uncertainty in LLM-based risk management from a conceptual perspective, drawing on risk theory and epistemological concepts. LLM-generated risk statements are analyzed as knowledge statements and assessed in terms of their epistemic viability and knowledge strength through a theory-driven literature review.*

The analysis shows that LLMs do not reduce epistemic uncertainty; instead, they alter its visibility and assessability. Fluent risk statements may hide implicit assumptions and context-specific knowledge gaps, leading to an overestimation of their usefulness for decision-making. This is especially concerning in safety-critical areas, like critical infrastructure, where risk management decisions are closely tied to national security. Without an explicit epistemic context, risk statements produced by LLMs do not provide enough foundation for risk-based decisions.

Keywords: *Epistemic Uncertainty; Knowledge Strength; LLM-Supported Risk Management; Risk Theory; Decision Support*

INTRODUCTION

The use of large language models (LLMs) in risk management is growing in security-related organizations. LLMs are increasingly promoted in risk management as tools to improve efficiency and consistency, particularly for handling large volumes of unstructured data. Consequently, LLMs are increasingly integrated into existing risk management processes as supportive tools. Previous studies have mainly concentrated on procedural, organizational, and governance issues, such as human oversight, compliance with standards, and responsibility allocation. The performance of LLMs has been well documented through empirical analysis of clearly defined text-based tasks. Nonetheless, it remains unclear how defensible LLM risk statements are in terms of knowledge, especially under high uncertainty and normative context dependence. The main issue is not whether these statements sound plausible, but whether their underlying knowledge, assumptions, and contextual factors are clear enough for critical evaluation. This question serves as the starting point of this study. While there are established concepts for analyzing epistemic uncertainty and the strength of knowledge in risk research (Sahlin et al. 2021; Ylönen and Aven 2023). These have so far rarely been systematically applied to AI-based risk statements and their implicit knowledge assumptions. In the context of critical infrastructure, decisions on risk management are closely linked to national security, public safety, and the continuity of essential services. In such settings, epistemic uncertainty not only impacts analytical quality but also directly influences the legitimacy and accountability of risk-based decisions. The growing use of LLM-supported risk analyses in critical infrastructure, therefore, raises specific epistemic concerns, as linguistically coherent risk statements might conceal unresolved uncertainties with potentially systemic effects.

Risk management is inherently linked to uncertainty. Risk theory distinguishes between two types of uncertainty: aleatory and epistemic. The latter arises from incomplete knowledge, limited data, model assumptions, and contextual dependencies (Sahlin et al. 2021). Although Sahlin et al. (2021) develops this distinction in the context of Bayesian networks for environmental and risk

analysis, the underlying epistemic logic is generally transferable to model-based risk statements, including those generated by large language models. Classical, expert-based risk management approaches make these uncertainties explicitly visible, for example, through documented assumptions, qualitative assessments, or the deliberate labeling of knowledge gaps (Flage and Askeland 2020; Hardaway and Flage 2025). However, the use of LLMs is fundamentally transforming this practice. Model-generated results are often described as linguistically plausible, consistent, and complete, while the underlying knowledge boundaries, assumptions, or uncertainties remain hidden. Against this backdrop, LLM-supported risk analyses may produce well-formed and seemingly complete knowledge claims, while the conditions for assessing their epistemic viability, explicit assumptions, knowledge limits, and context dependence remain unclear. In safety-critical contexts, this lack of clarity is problematic because risk-based decisions require not just consistent statements but also contextualized knowledge whose boundaries can be identified and examined (Aven and Zio 2018).

This article explores epistemic uncertainty in LLM-based risk management. It aims to analyze the risk statements produced by LLMs not just as technical outputs, but as knowledge claims whose epistemic quality and knowledge strength need careful evaluation. Using risk-theoretical and epistemological concepts, we discuss how LLMs may reduce, transform, or potentially obscure existing uncertainties and the impact this has on the quality of risk-based decisions.

RESEARCH METHODOLOGY

This study follows a qualitative-conceptual research design, based on a multi-stage, theory-driven literature analysis. The goal of the methodology is to systematically identify and examine epistemically central contributions to uncertainty and the robustness of knowledge within risk-based decision-making processes. The analysis begins with the risk-theoretical distinction between aleatory and epistemic uncertainty. The latter is defined as uncertainty regarding the quality, completeness, and reliability of the underlying knowledge base. The focus is on works that explicitly address epistemic uncertainty, knowledge assumptions, or the strength of knowledge. Contributions that solely deal with governance, ethics, regulation, explainable AI, or purely technical performance indicators are intentionally excluded.

The primary identification was conducted using freely accessible scientific databases to ensure transparency and reproducibility. The Directory of Open Access Journals (DOAJ) served as the main source, as it includes quality-assured, peer-reviewed journals. Additionally, an AI-based academic discovery tool (Perplexity) was employed to identify potentially relevant publications that are not systematically captured by traditional keyword searches. This tool was used solely for bibliographic research and did not influence the content analysis, interpretation, or evaluation of the sources. To prevent potential misclassifications or hallucinations, all sources identified by the AI-supported discovery tool were manually reviewed and included in the analysis only if they were clearly peer-reviewed and content-valid. As part of the process, the collected sources underwent a three-stage filtering method. First, a strict exclusion check was performed on all identified sources, using predefined criteria based on the sources themselves. These criteria included the absence of explicit epistemic terms, a purely probabilistic approach to uncertainty, an exclusively technical focus, or a lack of references to risk analysis or decision support. The exclusion check was conducted using a standardized scheme to ensure consistent decisions across all sources.

The classification of remaining sources in stage 2 was based on their epistemic contribution. The goal was to distinguish between epistemically central works and those that are merely supporting. During the analysis, each source was placed into one of three categories, with sources in category C being excluded from the analysis:

- a) Central epistemic contributions
- b) Supporting epistemic contributions, or
- c) Peripheral mentions without much conceptual depth.

In the third stage of analysis, only sources classified as central were subjected to a differentiation test. As part of this process, we assessed whether a source presented an independent epistemic

idea or simply repeated existing arguments. Sources whose contribution was deemed conceptually redundant were excluded. The remaining publications were then categorized based on their primary argumentative role. Each source was assigned a specific function, such as defining fundamentals, highlighting conceptual differences, engaging in epistemic critique, examining AI-specific epistemic implications, or analyzing the decision-related aspects of consequences. This functional classification was not used for further filtering but rather for organizing the literature within the paper's argumentative structure.

The methodology of this work is intentionally designed to emphasize theoretical depth and conceptual clarity. The literature is selected in a targeted, theory-driven manner, focusing on epistemic lines of reasoning. Accordingly, the selection emphasizes contributions with an explicit epistemic basis. This focus is essential to adequately analyze epistemic uncertainty in LLM-based risk assessments. Although the analysis is conceptual and does not focus on a specific sector, it is developed with an emphasis on safety-critical environments, such as critical infrastructure. These settings serve as an analytical reference due to their low tolerance for epistemic opacity and their importance for decision-making related to national security.

RESULTS

The results of the conceptual-epistemic analysis show that using large language models in risk management does not primarily reduce uncertainty, but rather changes the form, location, and visibility of epistemic uncertainty. The identified findings can be grouped into the following result areas.

Analysis of the specialist literature indicates that epistemic uncertainty in LLM-based risk analyses manifests in several, sometimes overlapping, forms. Besides uncertainties stemming from incomplete or limited data, there are specific uncertainties related to the robustness of the underlying knowledge base, the implicit model assumptions, and the context dependence of generated risk statements (Sahlin et al. 2021; Ylönen and Aven 2023). These dimensions do not relate to individual parameters but rather to the epistemic status of the entire risk statement. Traditional, expert-based risk analyses often explicitly identify epistemic uncertainty or describe it qualitatively. In contrast, risk statements generated by LLMs usually appear as complete and coherent knowledge assertions. Epistemic uncertainty, therefore, manifests less as a clearly identifiable knowledge gap and more as uncertainty about how much a statement is based on reliable, contextualized knowledge (Sahlin et al. 2021).

Another result of the analysis is the discovery that LLMs systematically alter how knowledge is represented in risk management. Classical risk analyses highlight uncertainty through explicit assumptions, qualitative assessments, or sensitivity considerations. LLMs produce linguistically consistent and plausible texts in which such epistemic markers are mostly absent (Flage and Askeland 2020). The reviewed literature indicates that this type of representation conceals implicit assumptions and knowledge boundaries, making it difficult to examine epistemic assumptions. This can lead to the misconception that a complete knowledge base exists, even though it is actually limited, contingent, or context-dependent (Milkau 2017). Epistemic uncertainty does not vanish during the process. It simply shifts its form and is no longer openly recognized, but stays as an implicit aspect of the generated knowledge representation.

The analysis highlights several systematic epistemic limitations of LLM-generated risk statements. These include, in particular, hallucinations, where linguistically plausible but epistemically unfounded statements are produced (Li et al. 2025), as well as a strong dependence of the results on prompt structure, context selection, and training data (Kirchhof et al. 2025; Yadkori et al. 2024). Furthermore, several studies indicate that LLMs fail to reliably distinguish between verified knowledge, plausible deductions, and speculative additions (Nguyen-Hien et al. 2025; Zeng et al. 2017). Zeng et al. (2017) developed this perspective in the context of the reliability engineering of physical systems. The epistemic heterogeneity discussed in other technical fields can be conceptually applied to LLM-generated knowledge claims. Risk statements can thus be epistemically diverse even if this diversity is not visible in their presentation. Epistemic uncertainty, therefore,

relates not to individual parameters but to the overall epistemic status of the generated statement (Iovane 2025). The uncertainty model developed by Iovane (2025) was originally intended for formal uncertainty analyses in other technical fields, especially in quantum and cyber systems. In this context, it is intentionally used as an analytical analogy to describe the epistemic properties of LLM-generated risk statements. Hardaway and Flage (2025) demonstrate that assumptions in complex, interactive systems are temporarily unstable and continually shift in response to changing contextual conditions. This further complicates the assessment of the epistemic validity of seemingly consistent model outputs.

The results of the previous analysis indicate that the strength of knowledge in risk statements generated by LLMs cannot be determined solely by their linguistic elaboration, internal coherence, or level of detail. In epistemic risk research, the strength of a risk statement is instead defined by factors such as the explicitness of assumptions, the quality and scope of the knowledge base, and the transparent consideration of epistemic uncertainty (Sahlin et al. 2021; Ylönen and Aven 2023). In this context, LLM-based risk analyses create a consistent gap between perceived and actual knowledge. While traditional, expert-based analyses often make uncertainties clear and enable critical assessment, LLMs present risk claims as logical knowledge statements without revealing underlying assumptions, data gaps, or contextual factors (Flage and Askeland 2020; Milkau 2017). This can lead to an overestimation of the epistemic validity of such statements. From an epistemological standpoint, this marks a shift in how epistemic uncertainty is assessed. It moves from explicitly stated assumptions to implicit properties of the model-generated knowledge representation, making it more difficult to evaluate directly (Aven and Zio 2018). The knowledge strength of LLM-generated risk statements is therefore limited and harder to recognize and verify. For evaluating and using these statements in risk management, it is essential to clearly separate linguistic quality from epistemic robustness. The epistemic differences between traditional risk analyses and LLM-generated risk statements identified in the analysis are summarized in Table 1.

Table 1. Epistemic characteristics of classical risk analyses and LLM-generated risk statements

Dimension	Classical risk analysis	LLM-supported risk statements
Type of statement	Explicitly justified risk assessment	Linguistically coherent knowledge claim
Dealing with assumptions	Documented, partially explicit	Implicit, rarely stated
Presentation of epistemic uncertainty	Visible (qualitative/narrative)	Latent, not marked
Context dependency	Partially reflected	Strong, but hidden
Knowledge strength	Can be assessed based on assumptions and data	Difficult to assess
Relevance to decision-making	Transparently limited	Risk of overestimation

DISCUSSION

The analysis shows that using large language models in risk management is not just a technological upgrade of existing methods. Instead, it causes an epistemic shift that changes basic ideas about knowledge, uncertainty, and how risk statements are judged. The following discussion classifies this shift theoretically and explores its implications.

At the core of this epistemic shift is the altered role of epistemic uncertainty. The results indicate that LLMs do not decrease uncertainty but instead change how it appears. While epistemic uncertainty is often explicitly addressed in traditional risk management, such as through documented assumptions or qualitative evaluations, it becomes less prominent in LLM-based analyses (Flage and Askeland 2020; Ylönen and Aven 2023). This shift does not alter the level of epistemic uncertainty but rather its visibility and assessability. Although the epistemic validity of LLM-based risk statements cannot be determined solely from their linguistic coherence, such statements often seem consistent and complete. Consequently, epistemic uncertainty becomes an implicit aspect of the generated knowledge: it is no longer openly expressed through explicit assumptions or appar-

ent knowledge gaps, but is subtly embedded in the output, making it difficult for decision-makers to detect (Hardaway and Flage 2025). Kirchhof et al. (2025) argue that the classic distinction between aleatory and epistemic uncertainty has limited explanatory value for interactive LLM agents. This is because uncertainty here stems not only from randomness or incomplete knowledge but also increasingly from the dynamic interaction among the model, the context of use, and user behavior.

In this context, the importance of knowledge strength as an independent analytical dimension becomes clear. The results support the hypothesis that linguistic quality, internal consistency, or depth of detail of LLM-generated risk statements are not reliable indicators of the strength of the underlying knowledge base (Sahlin et al. 2021). The term “knowledge strength” refers to the justificatory power of a risk statement, taking into account the clarity of its assumptions, the quality and breadth of the underlying knowledge base, model limitations, and contextual factors. Importantly, LLM-based risk analyses usually do not make these preconditions clear; epistemic uncertainty therefore remains relevant for decision-making but tends to be under-indicated systemically. This observation complements existing risk theory work that highlights knowledge strength as a key factor in evaluating risk statements (Aven and Zio 2018).

The identified epistemic shifts directly affect risk-based decision-making processes. Decisions in risk management are not solely based on the availability of consistent information. Instead, the key factor is the ability to recognize the limits of available knowledge and intentionally include uncertainty in decision-making (Aven 2016). There is a risk that LLM-generated risk statements will be seen as more epistemically solid than they actually are because of the epistemic shifts shown in Table 1. In safety-critical situations, this can cause a consistent overestimation of their importance. These results indicate that LLM-generated risk statements without additional epistemic context do not provide a sufficient basis for risk-based decisions (Aven and Zio 2018). At the same time, it should be noted that using large language models can help reduce certain types of uncertainty under specific boundary conditions. In particular, when systematically aggregating large, diverse text corpora and consistently applying predefined analysis and documentation methods, LLMs can structure operational uncertainties and improve the traceability of risk analyses. Risk theory literature indicates that enhanced information processing and more explicit documentation of assumptions can influence how uncertainty is perceived and managed without necessarily altering its epistemic foundations (Aven 2016; Flage and Askeland 2020). However, these effects mainly concern the organizational and procedural aspects of risk analysis, not the epistemic validity of the underlying knowledge base. The current analysis is therefore not aimed at the instrumental usefulness of LLMs, but rather at an epistemic overinterpretation of risk statements that are linguistically plausible but context- and knowledge-limited. This epistemic change poses significant challenges, especially in critical infrastructure settings. In situations characterized by systemic interdependencies and limited reversibility of decisions, epistemic overconfidence in LLM risk assessments could worsen the spread of negative outcomes.

The analysis clearly distinguishes this approach from existing governance, control, and explainability methods. While these methods aim to enhance transparency, traceability, and accountability in AI systems, they do not address the epistemic status of the knowledge claims produced by these systems (Ylönen and Aven 2023). The results indicate that epistemic uncertainty arises from an upstream problem dimension that cannot be resolved solely through explainability or control mechanisms. Questions of control and responsibility assume that the epistemic validity of risk statements can be recognized and assessed in the first place. (Flage and Askeland 2020).

From a conceptual standpoint, this work advances understanding by explicitly treating LLM-generated risk statements as epistemic knowledge claims and connecting their assessment to criteria of knowledge strength. This introduces a theoretical perspective that extends beyond purely technical performance assessments and highlights epistemic uncertainty as a key analytical factor in LLM-supported risk management. At the same time, the work is intentionally structured as a conceptual analysis and does not aim to empirically validate the identified effects. The focus is on epistemic structures and evaluation processes, not on specific decision-making practices or

organizational implementation issues. This limitation defines the scope of the findings and also provides a systematic foundation for future empirical research (Aven 2016).

CONCLUSIONS

The study explored epistemic uncertainty in risk management through a conceptual lens using large language models. It began with the observation that these models are increasingly used to support risk management processes, but the epistemic quality of the risk statements they produce has not been adequately examined.

This study shows that adopting LLMs in risk management requires an epistemic reevaluation of established decision practices. The main challenge is not reducing uncertainty but changing how it is understood: model-generated risk statements often seem clear, complete, and linguistically plausible, while assumptions, knowledge limits, and dependence on context remain implicit (Flage and Askeland 2020; Sahlin et al. 2021). As a result, a systematic gap develops between the perceived quality of LLM-generated risk statements and their actual epistemic viability. Linguistic coherence and formal consistency are therefore not reliable indicators of the underlying knowledge strength, which remains an independent and decision-relevant factor in risk assessment (Aven and Zio 2018; Sahlin et al. 2021). Without explicit epistemic context, such statements do not provide a sufficient basis for risk-based decisions, especially in safety-critical situations, where hidden epistemic uncertainty can lead to a systematic overestimation of decision relevance (Aven 2016; Aven and Zio 2018). This is especially important for risk management in critical infrastructures. Decisions are made within national security contexts in these cases. They also involve high risks, public accountability, and limited tolerance for epistemic ambiguity. In such environments, it is crucial to make epistemic uncertainty and the strength of knowledge explicit to ensure responsible AI-supported risk governance.

This work's contribution lies in clearly classifying LLM-supported risk statements as knowledge claims and connecting this view to the idea of knowledge strength. As a result, the focus shifts from assessing technical performance or governance to examining the epistemic strength of the risk statements themselves (Ylönen and Aven 2023). Regarding future research projects, several starting points emerge, especially in operationalizing epistemic transparency and incorporating concepts of knowledge strength into LLM-supported risk management processes. Empirical studies on how epistemically contextualized risk statements affect decision quality represent a clear next step.

REFERENCES

- AVEN, T., 2016. Risk assessment and risk management: Review of recent advances on their foundation. *European Journal of Operational Research*, vol. 253, issue 1, pp. 1–13.
- AVEN, T. and ZIO, E., 2018. *Knowledge in Risk Assessment and Management*. Hoboken, NJ: John Wiley & Sons Inc.
- FLAGE, R. and ASKELAND, T., 2020. Assumptions in quantitative risk assessments: When explicit and when tacit? *Reliability Engineering & System Safety*, vol. 197, 106799.
- HARDAWAY, K. and FLAGE, R., 2025. A framework for evolving assumptions in risk analysis. *Risk Analysis: An Official Publication of the Society for Risk Analysis*, vol. 45, issue 8, pp. 2232–2242.
- IOVANE, G., 2025. An Extended Epistemic Framework Beyond Probability for Quantum Information Processing with Applications in Security, Artificial Intelligence, and Financial Computing. *Entropy*, vol. 27, issue 9.
- KIRCHHOF, M., KASNECI, G. and KASNECI, E., 2025. Position: Uncertainty Quantification Needs Reassessment for Large Language Model Agents. In: *Proceedings of the 42nd International Conference on Machine Learning*, vol. 267, pp. 81665–81677. *Proceedings of Machine Learning Research (PMLR)*. [viewed 31 August 2026]. Available from: <https://proceedings.mlr.press/v267/kirchhof25b.html>
- LI, Z., YI, W. and CHEN, J., 2025. Beyond Accuracy: Rethinking Hallucination and Regulatory Response in Generative AI. *arXiv preprint arXiv:2509.13345*. [viewed 31 August 2026]. Available from: <https://arxiv.org/abs/2509.13345> DOI: <https://doi.org/10.48550/arXiv.2509.13345>
- MILKAU, U., 2017. Risk Culture during the Last 2000 Years – From an Aleatory Society to the Illusion of Risk Control. *International Journal of Financial Studies*, vol. 5, issue 4, p. 31.

- NGUYEN-HIEN, T. D., IVANOVA, D. R., TEH, Y. W. and LEE, W. S., 2025. Extending Epistemic Uncertainty Beyond Parameters Would Assist in Designing Reliable LLMs. *arXiv preprint arXiv:2506.07448*. [viewed 31 August 2026]. Available from: <https://arxiv.org/abs/2506.07448> DOI: <https://doi.org/10.48550/arXiv.2506.07448>
- SAHLIN, U., HELLE, I. and PEREPOLKIN, D., 2021. “This Is What We Don’t Know”: Treating Epistemic Uncertainty in Bayesian Networks for Risk Assessment. *Integrated Environmental Assessment and Management*, vol. 17, issue 1, pp. 221–232.
- YADKORI, Y. A., KUZBORSKIJ, I., GYÖRGY, A. and SZEPESVÁRI, C., 2024. To Believe or Not to Believe Your LLM: Iterative Prompting for Estimating Epistemic Uncertainty. In: *Proceedings of the 38th International Conference on Neural Information Processing Systems*, pp. 58077–58117. Red Hook, NY: Curran Associates Inc.
- YLÖNEN, M. and AVEN, T., 2023. A framework for understanding risk based on the concepts of ontology and epistemology. *Journal of Risk Research*, vol. 26, issue 6, pp. 581–593.
- ZENG, Z., KANG, R., WEN, M. and ZIO, E., 2017. A Model-Based Reliability Metric Considering Aleatory and Epistemic Uncertainty. *IEEE Access*, vol. 5, pp. 15505–15515.

**ОТ ОЦЕНКА НА РИСКА ДО ТВЪРДЕНИЯ ЗА ЗНАНИЯ:
ЕПИСТЕМНА НЕСИГУРНОСТ В УПРАВЛЕНИЕТО НА РИСКА
ЗА КРИТИЧНИ ИНФРАСТРУКТУРИ, БАЗИРАНО НА ГЕМ (LLM)**

Резюме: Все по-честото използване на големи езикови модели ГЕМ (LLM) в управлението на риска се обосновава с повишена ефективност и по-добра обработка на неструктурирани данни, докато епистемичното качество на получените рискови изявления остава недостатъчно изследвано. Настоящата статия анализира епистемичната несигурност в управлението на риска, базирано на LLM, от концептуална перспектива, опирайки се на теорията на риска и епистемологията. Рисковите изявления, генерирани от LLM, се разглеждат като твърдения за знания и се оценяват по отношение на своята епистемична жизнеспособност и сила на знанието.

Анализът показва, че LLM не намаляват епистемичната несигурност, а променят нейната видимост и възможност за оценка. Плавните и консистентни формулировки могат да прикриват неясни предположения и контекстуални дефицити в знанието, което води до надценяване на тяхната приложимост при вземането на решения. Това е особено критично в области с високи изисквания за безопасност, като критичната инфраструктура. Без изрично епистемично контекстуализиране рисковите изявления, генерирани от LLM, не представляват достатъчна основа за решения, базирани на риска.

Ключови думи: епистемична несигурност; сила на знанието; управление на риска, подкрепено от LLM; теория на риска; подкрепа при вземането на решения

Себастиан Грюнеберг, докторант

ORCID ID: 0009-0002-2339-0729

Университет по библиотекознание и информационни технологии

София, България

E-mail: Sebastian.Grueneberg@outlook.com

ИЗДАТЕЛ

Академично издателство
„За буквите – О писменехъ“
Университет по библиотекознание
и информационни технологии

PUBLISHER

Academic Publisher
“Za Bukvite – O Pismeneh”
University of Library Studies and
Information Technologies

ДИРЕКТОР

доц. д-р Диана Стоянова
бул. „Цариградско шосе“ № 119,
ет. 2, стая 213
София 1784, България
тел.: +359 879 14 83 85
е-поща: d.stoyanova@unibit.bg

DIRECTOR

Assoc. Prof. Diana Stoyanova, PhD
119, Tsarigradsko Shosse Blvd.
fl. 2, room 213
Sofia 1784, Bulgaria
tel.: +359 879 14 83 85
E-mail: d.stoyanova@unibit.bg

Списание „Образование, научни
изследвания и иновации“ излиза четири
пъти годишно.

Journal “Education, Scientific Research
and Innovations” is published four times
a year.

