Indonesian Journal of Science & Technology

Journal homepage: http://ejournal.upi.edu/index.php/ijost/

Neuroscience Intervention for Implementing Digital Transformation and Organizational Health Completed with Literature Review, Bibliometrics, and Experiments

Nani Imaniyati, M. Arief Ramdhany, R. Rasto, Santi Nurjanah, Putri Amelia Solihah, Aay Susilawati*

Universitas Pendidikan Indonesia, Indonesia

*Correspondence: E-mail: naniimaniyati@upi.edu

ABSTRACT

The study aims to investigate neuroscience intervention for the role of digital leadership in the implementation of digital transformation and organizational health at universities in the digital era using bibliometrics. The article data was obtained from the Scopus database. The title and abstract of the article are used to guide the search process by referring to the keywords 'Digital' AND 'Leadership' AND 'Neuroscience'. There are 8 articles were found that were considered relevant. The study period used as the study material is the Scopus-indexed article for the last 9 years (2016 to 2023). The results showed that many publications in Scopus-indexed journals, it can be seen that research on the role of digital leadership in implementing digital transformation and health organizations based on neuroscientific interventions is still rarely researched each year, there are only 8 Scopus documents (2016-2023). The development of research related to the role of digital leadership in implementing digital transformation and organizational health with brain development or neuroscience is closely related, where in the business, management, and accounting spheres, there is a relationship between digitalization leadership style and the development of neuroscience.

ARTICLE INFO

Article History:

Submitted/Received 01 Dec 2023
First Revised 15 Jan 2024
Accepted 01 Mar 2024
First available online 05 Mar 2024
Publication Date 01 Sep 2024

Keyword:

Brain,
Digital leadership,
Digital transformational,
Education,
Neuroscience,
Organizational health.

1. INTRODUCTION

A health organization focuses on its ability to function optimally, adapt to changes, and maintain a positive work environment (Lenka and Kant, 2017; U-senyang *et al.,* 2017; Glushchenko, 2022; Hassan *et al.,* 2023; Kalandarovna and Qizi, 2023; Shittu and Lasisi, 2023; Afolashade *et al.,* 2024). Organizational health in a Higher Educational Institution, such as a university, is a critical aspect that directly impacts its overall performance, effectiveness, and sustainability (Hernandez and Zamora, 2018). That is the main reason why much research on this subject has been well-reported (Calixtro, 2021; Onia and Rmadan, 2023; Shaturaev, 2023; Muhabbat *et al.,* 2023; Shaturaev, 2023). In the context of a university, organizational health encompasses aspects such as faculty satisfaction, student engagement, administrative efficiency, financial stability, and academic reputation (Ali *et al.,* 2016). To achieve and sustain organizational health, the universities need to fulfill their mission of imparting quality education, conducting research, and providing community service as pillars of knowledge and innovation (Suyudi and Putra, 2022).

A university is a health organization if it can function effectively, cope adequately, change appropriately, and grow from within (Ramezanpour, 2020). The university can implement its core functions by delivering high-quality education, conducting impactful research, and providing valuable services to students and the community. Universities, like any organization, face challenges and uncertainties. The universities must be resilient and able to encounter difficulties without compromising the institution's core mission. They need to adapt to technological changes, pedagogy, learning resources, student expectations, and societal needs (Englund *et al.,* 2017). A healthy university should foster an environment where growth is not only about increasing student numbers or infrastructure but also about intellectual and academic advancements, cultural enrichment, and organizational maturity. Growth from within implies sustainable and holistic development (Barnard and Van der Merwe, 2016).

The university's efforts to respond to various changes appropriately and quickly must be balanced with the technological disruption that the university needs to manage (Cruz *et al.,* 2022; Anwar and Minghat, 2024). This disruption can come from advancements in digital technologies. The university should embrace the digital transformation. Nevertheless, digital transformation is not just about technology but more about strategies and new perspectives to rebuild continuous change (Rogers, 2023). Thus, digital transformation requires changes in organizational culture, processes, and mindset, in addition to the integration of new technologies. The implementation of digital transformation and organizational health at universities relies heavily on the role of leadership, or more precisely 'digital leadership' . Thus, universities do not get lost in this digital era. A growing number of higher education institutions (HEIs) are engaged in continuous processes of change. Consequently, their leaders face challenges in developing and executing a cohesive strategy for the institutions' digital transformation initiatives that are also evident externally (Ehlers, 2020).

The relationship between digital leadership and digital transformation influencing organizational health is interesting to research because both are important in shaping organizational health at universities in this digital era. A university is considered in healthy condition if supported by implementing suitable digital transformation and navigated by effective digital leadership. A leader must have a leadership spirit that can manage (Krisnanda and Surya, 2019) and create strategies that can keep up with digital developments. Thus, he can direct members to develop every program that will be implemented. Leaders who have good digital thinking are in harmony with existing interventions in brain development based

DOI: https://doi.org/10.17509/ijost.v9i2.67763
p- ISSN 2528-1410 e- ISSN 2527-8045

on existing neuroscientific theories (Kaltenborn, 2021). Thus, we must know about trends in research and literature review about neuroscience interventions that relationship to digital leadership. Based on the existing problems and background questions, we applied five questions:

(i) How has neuroscience and digital leadership research developed by year?
(ii) How is the development of neuroscience and digital leadership research in Indonesia?
(iii) How is the development of neuroscience and digital leadership research based on subject areas in the fields of business, management, and accounting?
(iv) What is the relationship between digital transformation and digital leadership and health organizations?
(v) How does neuroscience influence digital leadership?

We hereby give a comprehensive collection of bibliometric articles, as indicated in **Table 1**, with references to earlier bibliometric studies and our investigations into earlier bibliometric analysis.

Table 1. Previous studies on bibliometric.

Author	Title	Result
Shidiq *et al.*, (2021)	The use of simple spectrophotometer in STEM education: A bibliometric analysis	The study, which made use of the VOSviewer program, found that modified spectrophotometers are frequently used in chemistry and STEM teaching, providing prospects for future research.
Nordin, (2022)	Correlation between process engineering and special needs from bibliometric analysis perspectives.	VOSviewer, a process engineering tool for mapping analysis, experienced a decrease in publications on "process engineering special demands" between 2017 and 2021.
Bilad, (2022)	Bibliometric analysis for understanding the correlation between chemistry and special needs education using VOSviewer indexed by Google.	An analysis of articles on chemistry and special education using VOSviewer and Publish or Perish showed a decline in publications in 2017 and a rise in 2021.
Riandi *et al.*, (2022)	Implementation of Biotechnology in Education towards Green Chemistry Teaching: A Bibliometrics Study and Research Trends	With journals being the most prevalent source, the study bibliometric analysis of research trends on biotechnology in education revealed four study concept potentials, underscoring the significance of teaching green chemistry in schools.
Nordin, (2022)	A bibliometric analysis of computational mapping on publishing teaching science engineering using VOSviewer application and correlation.	A study that examined teaching, science, and engineering research using the VOSviewer and Perish applications found a significant drop because of pandemic conditions.
Wirzal and Putra, (2022)	What is the correlation between chemical engineering and special needs education from the perspective of bibliometric analysis using VOSviewer indexed by Google Scholar?	Utilizing the VOSviewer software, a research study on the relationship between chemical engineering and special needs examined 800 pertinent papers between 2018 and 2022.
Nandiyanto and Al Husaeni, (2021)	A bibliometric analysis of materials research in Indonesian journal using VOSviewer	A bibliometric assessment of research on Indonesian materials was conducted using VOSviewer, and the results showed that "acid" received the most attention from 2016 to 2021, with 43 publications and 8 foreign linkages.

DOI: https://doi.org/10.17509/ijost.v9i2.67763
p- ISSN 2528-1410 e- ISSN 2527-8045

Table 1 (Continue). Previous studies on bibliometric.

Author	Title	Result
Maryanti *et al.,* (2022)	Sustainable development goals (SDGs) in science education: Definition, literature review, and bibliometric analysis.	The bibliometric analysis, a vital instrument in science education, offers a thorough grasp of the subject, underscoring the important role it plays in facilitating research on the SDGs.
Nandiyanto and Al Husaeni, (2021)	A bibliometric analysis of chemical engineering research using VOSviewer and its correlation with covid-19 pandemic condition.	Despite a decline in research since 2019, chemical engineering uses VOSviewer software for bibliometric analysis, which provides useful information on research trends and themes.
Al Husaeni, (2022)	Computational bibliometric analysis of research on science and Islam with VOSviewer: Scopus database in 2012 to 2022.	In a study on science and Islamic research, VOSviewer was used for bibliometric analysis, which revealed a drop in research, particularly in Indonesia and Malaysia. This study also provided excellent reference materials for future research.
Al Husaeni, (2022)	Bibliometric analysis of briquette research trends during the Covid-19 pandemic.	A review of 973 pertinent papers on briquettes was analyzed using VOSviewer, bibliometric analysis, and data mapping; the results showed a decline in research over the previous three years as a result of the COVID-19 pandemic.
Ragadhita and Nandiyanto, (2022)	Computational bibliometric analysis on publication of techno-economic education.	A study on science and Islamic research that employed data from the Scopus database from 2012 to 2022 and VOSviewer for bibliometric analysis found a reduction in research, mainly in Indonesia and Malaysia.
Al Husaeni and Nandiyanto, (2022)	Bibliometric computational mapping analysis of publications on mechanical engineering education using VOSviewer	A study that used VOSviewer to chart the development of nano propolis research over the last ten years found a spike in research on nanoparticles and propolis.
Febriandi *et al.,* (2023)	Research on algebraic thinking in elementary school is reduced: a bibliometric analysis	VOSviewer, a bibliometric approach, was used to analyze 996 articles from 2012–2021, revealing a decline in research on algebraic thinking skills and providing valuable insights for future research.
Supriyadi *et al.,* (2023)	Global trend of ethnoscience research: a bibliometric analysis using Scopus database	An analysis of the Scopus database showed that ethnoscience research has significantly increased over the past 50 years, suggesting prospective directions for future study. This bibliometric study identified potential directions for ethnoscience research in the future.
Supriyadi *et al.,* (2023)	Didactical design research: a bibliometric analysis	By identifying research topics, authors, sources, countries, affiliations, and most-cited papers in DDR publications, Scopus offers bibliometric analysis. This analysis showed a large growth in DDR initiatives from 2015 to 2022.
Nandiyanto *et al.,* (2023)	Particulate matter emission from combustion and non-combustion automotive engine process: review and computational bibliometric analysis on its source, sizes, and health and lung impact	This study discusses the growth trend of scientific publications on the topic of particulate matter identified based on several categories such as the most cited, publisher, author, country, and affiliation.

DOI: https://doi.org/10.17509/ijost.v9i2.67763
p- ISSN 2528-1410 e- ISSN 2527-8045

Table 1 (Continue). Previous studies on bibliometric.

Author	Title	Result
Kolakoti *et al.,* (2023)	Enhancing heat transfer performance of automotive car radiator using camphor nanoparticles: experimental study with bibliometric analysis	In this study, an attempt was made to investigate the heat transfer performance of a four-wheeler automotive radiator using a novel coolant system.
Nandiyanto *et al.,* (2023)	Particulate Matter Emission from Combustion and Non-Combustion Automotive Engine Process: Review and Computational Bibliometric Analysis on Its Source, Sizes, and Health and Lung Impact	This study aimed to comprehensively analyze particulate matter (PM) emissions from vehicles, focusing on their sources based on combustion and non-combustion process, classification (PM10, PM2.5, PM0.1), and health implications (including PM transportation into lungs).
Nandiyanto *et al.,* (2023)	Involving Particle Technology in Computational Fluid Dynamics Research: A Bibliometric Analysis	This research was conducted to determine (i) the growth in the number of scientific publications in the field of particle technology in computational fluid dynamics (CFD), (ii) top citations based on the number of citations, publisher, and country, (iii) visualization of the most productive author, and (iv) publication development map based on keywords.
Ramdhani *et al.,* (2023)	A comprehensive study on biochar production, bibliometric analysis, and collaborative teaching practicum for sustainable development goals (SDGs) in Islamic schools	This research endeavors to assess the impact of additional practicum sessions and experimental demonstrations through video presentations on students' comprehension in an Islamic boarding school. The study focuses on enhancing students' understanding of the biochar concept, particularly its role as an adsorbent, aligning with contemporary issues related to the Sustainable Development Goals (SDGs) and environmental problem-solving.
Suherman *et al.,* (2023)	How to Improve Student Understanding in Learning Science by Regulating Strategy in Language Education? Definition, Factors for Enhancing Students Comprehension, and Computational Bibliometric Review Analysis	This study aims to explain language education development research for improving student comprehension in learning science. This study also reviews the definition of these strategies, identifies factors that contribute to improving students' comprehension, and conducts a computational bibliometric review analysis.
Al Husaeni *et al.,* (2022)	How Language and Technology Can Improve Student Learning Quality in Engineering? Definition, Factors for Enhancing Students Comprehension, and Computational Bibliometric Analysis	The research aims to review developments in language and technology research that can improve the quality of teaching and learning in engineering. Several factors that can influence the teaching and learning process are explained, supported by a bibliometric analysis (with keywords “Language” AND “Engineering Learning” from Google Scholar from 2020 to 2022).
Fauziah *et al.,* (2022)	Strategies in Language Education to Improve Science Student Understanding during Practicum in Laboratory: Review and Computational Bibliometric Analysis	This study aims to explain the development of language research in science learning. This research also explores the factors that contribute to increasing student understanding and bibliometric analysis using the keywords "language", "practicum", "laboratory" and "science" from 2015 to 2021.

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p- ISSN 2528-1410 e- ISSN 2527-8045

Table 1 (Continue). Previous studies on bibliometric.

Author	Title	Result
Nandiyanto *et al.,* (2023)	Bibliometric data analysis of research on resin-based brake pads from 2012 to 2021 using VOSviewer mapping analysis computations	This study analysis was carried out with the number of publications obtained, relating to the predetermined topics totaling 88 documents in 2017-2021.
Ruzmetov and Ibragimov, (2023)	Past, current and future trends of salicylic acid and its derivatives: A bibliometric review of papers from the Scopus database published from 2000 to 2021	Theoretical and practical interest in salicylic acid and its derivatives has increased over the last two decades, and with it, academic study in the field has been burgeoning. Most scientometric studies have only focused on a specific property of the topic compounds.
Susilawati *et al.,* (2023)	Research trends about STEM of internet of things for science teachers: A bibliometric analysis	This study is to analyze research trends about STEM Learning with the Internet of Things for science teachers by year, subject area, and country, and then visualization using Vos Viewer about deep research and networking with the other keywords.

2. LITERATURE REVIEW

2.1. Digital Leadership

The term 'digital leadership' has been in use for several years, and its emergence can be attributed to the increasing influence of digital technologies on various aspects of business and organizations. While it is challenging to pinpoint the exact moment when the term was first coined, it gained prominence in the early 21st century as digital technologies became integral to organizational strategies and leadership practices (Auvinen *et al.,* 2019). Digitalization and technological developments are potent forces that significantly impact businesses across industries (Araujo *et al.,* 2021). The implications of these trends go beyond adopting new tools and systems; they necessitate a comprehensive transformation of various aspects of organizations. Digital leadership plays a pivotal role in guiding organizations through the challenges and opportunities of the new digital era. As technology continues to evolve rapidly, organizations must not only adapt but actively transform their strategies to remain competitive and relevant (Ruel *et al.,* 2020).

Digital leaders use and enhance the university's digital assets to accomplish business objectives and drive digital transformation (Meng, 2020), such as Learning Management Systems (LMS), educational content and digital resources, research data and repositories, student information systems, websites and web portals, and educational technology tools. These assets play a crucial role in supporting teaching, research, administration, and communication within the university community. Digital leaders possess distinct abilities and perspectives compared to traditional leaders (Soon and Salamzadeh, 2021), reflecting their capacity to direct and utilize the opportunities presented by the digital age.

Digital leadership in a university encompasses various dimensions beyond traditional leadership roles. We derived the dimensions from several previous research studies (Antonopoulou *et al.,* 2020; Gunawan *et al.,* 2023; Hensellek, 2020; Ruel *et al*., 2021). The dimensions of digital leadership are:

(i) technological vision and strategy,
(ii) cultural transformation,
(iii) collaboration and communication,
(iv) data-informed decision-making,

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p- ISSN 2528-1410 e- ISSN 2527-8045

(v) educational technology integration.

Digital leaders in universities should envision how technology can support and enhance the comprehensive digital strategy aligned with organizational mission and goals. Digital leaders in universities promote a culture of digital transformation by encouraging openness to change, experimentation, and digital literacy. They also specialize in change management to ensure stakeholders understand and embrace the benefits of emerging technologies. Digital leaders drive collaboration by utilizing digital tools for seamless interaction among university departments and administrative units. The leaders excel in effective communication strategies, ensuring stakeholders are informed and fostering transparency through digital platforms. Digital leaders establish robust data governance policies to confirm responsible data collection and usage across the university. They leverage data analytics to inform strategic decisions, improve processes, and enhance efficiency and effectiveness. In educational technology integration, the leaders can enhance teaching and learning experiences to support faculties in adopting innovative teaching methods and leveraging technology in the curriculum.

2.2. Digital Technology

Digital technology refers to the use of technology that utilizes digital data or information represented in binary form (0 and 1) (Whitelaw *et al.,* 2020). It includes a wide variety of tools, devices, and systems used to process, store, transmit, and communicate information digitally. Digital technology has been widely researched, interfering and penetrating all aspects of life, especially education (Nuhu *et al.,* 2021; Babalola *et al.,* 2021; Muhabbat *et al.,* 2024; Maulid and Sakti, 2022; Sudaryat *et al.,* 2022; Ogunleye, 2023; Nurlita, 2023; Fegarido *et al.,* 2024; Risnandar and Sakti, 2022; Zuyyinasyam *et al.,* 2023; Damayanti *et al.,* 2022; Ariyanti and Nandiyanto, 2022; Hartanto and Nandiyanto, 2022; Wijaya and Nandiyanto, 2022; Hidayat and Nandiyanto, 2022; Musayaroh *et al.,* 2023).

Following are some of the main components of digital technology:

(i) Computing: This involves the use of computers and their software to process data digitally. This includes personal computers, servers, laptops, tablets, and other smart devices (Fitzgerald *et al.,* 2014)

(ii) Internet: The Internet is a global network that connects millions of digital devices around the world. It enables communication, information exchange, electronic commerce, and access to various online services (Arts *et al.,* 2015)

(iii) Hardware: This includes computer hardware such as processors, memory, storage devices (e.g. hard disks and solid state drives), network devices (e.g. routers and switches), sensor devices, and other devices used to process and store data (Ting *et al.,* 2020).

(iv) Software: This includes computer programs and applications used to perform a variety of tasks, from word processing and spreadsheets to graphic design, web development, and artificial intelligence software (Henderson *et al.,* 2017).

(v) Networks and Communications: This includes the infrastructure used to send and receive data, such as wired, wireless, and cellular networks, as well as communications protocols such as TCP/IP used to transmit data over the internet (Selwyn, 2016).

(vi) Sensors and IoT: Sensors are devices used to detect and measure physical or environmental conditions, such as temperature, pressure, or humidity. The Internet of Things (IoT) connects these sensors to the internet, enabling extensive and automated data collection from various sources (Pagani and Pardo, 2017)

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p- ISSN 2528-1410 e- ISSN 2527-8045

(vii) Digital Security: This includes various technologies and practices used to protect digital data and systems from security threats such as hacking, malware, and identity theft (Higgins *et al.,* 2012).

Digital technology has brought significant changes in various aspects of human life, including communication, education, industry, health, entertainment, and many more. It continues to evolve rapidly, opening up new opportunities and presenting new challenges in an ever-changing digital era.

2.2. Digital Transformation

The term 'digital transformation' has increased significantly in the past two decades (Al Husaeni and Wahyudin, 2023). The concept gained prominence as organizations across various sectors began to recognize the profound impact of digital technologies on their operations (Hilbert, 2020; Pousttchi *et al.,* 2019).

Digital transformation has become a standard term used to describe the strategic, organizational, and cultural changes that organizations undertake to leverage digital technologies effectively. Digital transformation refers to a fundamental and holistic organizational change that is instigated and molded by the widespread adoption and integration of digital technologies (Hanelt *et al.,* 2021). This perspective allows us to potentially elucidate the phenomenon of digital transformation and its management in business operations by tapping into the extensive and varied knowledge repository about organizational change and innovation. Digital transformation entails a strategic reassessment of an organization's objectives, goals, and operational methods in light of the opportunities and challenges presented by digital technologies. It involves shifting from traditional, siloed approaches to more integrated, collaborative strategies that leverage digital technologies across the organization (Kane, 2019). At its core, digital transformation involves the widespread adoption and incorporation of digital technologies throughout the organization (Battistoni *et al.,* 2023).

We can see the digital transformation from various perspectives. In this study, we focus on three dimensions of digital transformation in university:

(i) Academic Innovation and Learning Experience,
(ii) Administrative Efficiency and Operational Excellence, and
(iii) Digital Engagement and Stakeholder Communication (Faria and Nóvoa, 2017; Li, 2020; Mohamed Hashim *et al.,* 2022).

Academic innovation and the learning experience in universities are undergoing a significant transformation through digital initiatives. The teaching staff can integrate several learning models, incorporating digital platforms and resources to enrich the overall learning experience. Universities can embrace new educational technologies (virtual classrooms, e-learning platforms, and interactive content) to develop teaching methods and enhance student engagement (Haleem *et al.,* 2022). It may contribute to a more dynamic and student-centric approach in higher education. Administrative efficiency and operational excellence are at the forefront of digital transformation in universities. This entails the implementation of integrated information systems to streamline administrative processes and elevate data management (Lawrence and Tar, 2018). Additionally, universities are leveraging digital tools for workflow automation in critical areas like admissions, registration, and financial management, aiming to enhance efficiency and minimize manual administrative tasks. The adoption of data-driven decision-making practices may enhance overall operational effectiveness within the university (Gaftandzhieva *et al.,* 2023). Collectively, these initiatives contribute to a more updated and data-informed administrative framework.

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p- ISSN 2528-1410 e- ISSN 2527-8045

Digital engagement and communication with stakeholders in universities involve simple and effective strategies. Universities may use digital channels, social media, and interactive platforms to create seamless and transparent communication among students, faculty, staff, and external stakeholders (Henderson *et al.,* 2015). Virtual events, webinars, and collaborative platforms help connect with a broader audience, encourage collaboration between academic and research communities, and engage with alumni. Maintaining a strong digital presence through the university website, social media, and online channels may help enhance visibility, attract prospective students, and strengthen the institution's brand (Kaplan and Haenlein, 2016).

2.3. Digital Application of Technology to Accelerate Work in Organizations

Digital applications are digital-based means to help people in the activities they carry out, because with these digital applications the work done can be completed easily and in a shorter time. Of course, there are various types of use of digital applications in the world of work, but they all aim to improve employee performance. Performance acceleration is an employee's ability to adjust supporting factors to achieve work results on time (Lailatul, 2020). Acceleration of performance is related to how an employee optimally uses the facilities or variables provided in the process of completing the work being carried out, where when the employee's work results are getting closer to the company goals that have been set, it shows that the level of productivity of the employee concerned is high and means the effectiveness of his work also high. Performance acceleration can be used as a work orientation if you can first create goods or services that prioritize quality and can be completed on time using all available resources in the form of funds or facilities and infrastructure (Lailatul, 2020). The benchmark for good work effectiveness is not merely focused on completing work quickly without paying attention to the quality of the work produced (Puspitadewi, 2019). Performance acceleration is the result of an employee's work based on organizational goals. Thus, the good and bad of the organization's expectations can be determined from the employee's performance in **Table 2**.

Table 2. Types of applications that speed up performance.

Author (Year)	Tittle	Application	Results
Muflihun Waliulu *et al.,* (2021)	Efektivitas Penerapan E-Kinerja Dalam Meningkatkan Kinerja Aparatur Sipil Negara Pada Badan Kepegawaian Daerah Provinsi Sulawesi Utara	E- Kinerja	The implementation of e-kinerja was implemented in the North Sulawesi Provincial Government which made the process of monitoring and controlling each job more efficient because before the implementation of e-kinerja the apparatus was not effective because it took a lot of time to complete the work.
(Wijonarko and Wirapraja, 2021)	Analisis Kualitas Aplikasi OrangeHRM Menggunakan WebQual 4.0 Dalam Mempengaruhi Kepuasan Karyawan dan Produktivitas Kerja	OrangeHRM	Using the OrangeHRM application makes employee work results better because through this application they can access anywhere without time limits for faster work execution and better management decisions.

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Table 2 (Continue). Types of applications that speed up performance.

Author (Year)	Tittle	Application	Results
(Hosain et al., 2020)	The impact of HRIS usage on organizational efficiency and employee performance	HRIS	HRIS becomes a valuable intermediary for users because it provides up-to-date, complete, detailed, and easy-to-understand information. If used effectively, it can help them in employment-related decisions.
(Puspitadewi, 2019)	Pengaruh Digitalisasi Perbankan Terhadap Efektivitas Dan Produktivitas Kerja Pegawai	Perbankan Terhadap Efektivitas Dan Produktivitas Kerja Pegawai Digitalisasi perbankan (Automatic Teller Machine (ATM), Electronic Data Capture (EDC), Internet Banking, Short Message Service (SMS) Banking, dan phone banking)	The era of digitalization of banking, with various forms of applications used triggers the working frequency of employees' brains to be balanced with good competence. The higher the digital competence of employees, the more efficient and effective banking is, which is followed by an increase in work effectiveness, which is followed by an increase in work productivity.
(Ummi and Aldri, 2020)	Efektivitas E- Office Di Dinas Komunikasi Dan Informatika (Kominfo) Kabupaten Pasaman Bara Dalam Era Governensi Digital	SiMPEL (Sistem Administrasi Perkantoran Berbasis Elektronik)	The application of e-office can provide convenience to managers and employees to increase effectiveness and time efficiency as well as increase employee productivity, especially managers because performance is getting better day by day and can reduce paper use because letters can be deposited through a system that can be used as a digital archive.
(Putri and Ali, 2022)	Pengaruh Teknologi Informasi, Sistem Informasi Berbasis Web Dan Knowledge Management Terhadap Kinerja Karyawan	Web Aplikasi	Increasingly sophisticated changes in Information Technology can bring companies to digital and practical business processes because they help employees in their work, whereas web applications have high credibility. Thus, they can make decision-making easier.

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Table 2 (Continue). Types of applications that speed up performance.

Author (Year)	Tittle	Application	Results
(Almaamari and Salial, 2022)	The Use of Social Media and its Influence on Employee Performance: The Case of Zain Bahrain	• MediaSocial (Whatsapp, MySpace)	Because each social media element improves various aspects of employee performance, all aspects of social media elements need to be managed effectively within the organization. The synergy between social media factors has resulted in significant improvements in employee performance. Companies need to improve employee engagement, organizational structure, and effective innovation for successful social media implementation
(Rahmawati, 2020)	Pengaruh Budaya Digital Terhadap Kinerja Karyawan Di Yayasan Pendidikan Telkom	• SIMKUG (Sistem Informasi Keuangan) • HRMI (*Human Resources Management System*) • SIMLOG (Sistem Informasi Pengelolaan Bantuan Logistik) • KM online • MONEV online	Having a digital mindset to implement work processes carried out by the company and employees, is proven by the fact that almost all work processes are carried out digitally and produce better work results, so if the digitalization culture improves then employee performance will also improve
(Lailatul, 2020)	Teknologi Informasi Sebagai Fasilitas Kerja Dalam Meningkatkan efektifitas Kerja Di Pengadilan Negeri Magelang Kelas Ib	• Sistem Informasi Kepegawaian Mahkamah Agung (SIKEP) • Sistem Informasi Pengawasan Reguler (SIWAREG) • Sistem Informasi Layanan Perkara (SILAPER) • E-Court • Sistem Informasi Penelusuran Perkara (SIPP)	The presence of complete features supports the provision of services by the court to the public by continuing to make changes and updates to increase the benefits of the application, work facilities that can help in processing the required data are very useful in employee work processes to increase work effectiveness

DOI: https://doi.org/10.17509/ijost.v9i2.67763
p- ISSN 2528-1410 e- ISSN 2527-8045

Muflihun *et al.* (2021) found a positive and significant contribution to the performance of the State Civil Service. Wijonarko and Wirapraja (2021) found that there was a significant impact on the effectiveness of the work carried out by employees. Puspitadewi (2019) found that digital competence influences the work effectiveness of PT employees, such as BNI (Persero) Tbk. Jember Branch. This shows that the better the digital competence, the better the employee's work effectiveness will be. Al Mashrafi (2020) found that the relationship between employee performance with the court system and the importance of e-HRM is positive and significant. Hosain *et al.* (2020) found that the level of HRIS use does not influence Personal Performance, but Organizational Efficiency influences Personal Performance negatively, and HRIS-oriented Personal Performance influences Personal Performance positively. Ummi and Aldri (2020) found that effectiveness and time efficiency in work increased due to the implementation of SIMPEL, but there were still obstacles to using the application. Putri and Ali (2022) found that there was an influence on employee performance because employee productivity also increased after implementing web applications. Almaamari and Salial (2022) found that social media factors influence different performance measures and all social media factors must be managed effectively in the organization because each factor in social media improves various aspects of employee performance. Social media is also one of the effective methods to improve society (Hidayat *et al.*, 2024; Meidiansyah *et al.*, 2024; Aladesusi *et al.*, 2021; Prabowo and Suroso, 2022; Sopian *et al.*, 2024; Zaoui and Souissi, 2020; Zhang *et al.*, 2020; Zhang *et al.*, 2022). Lailatul (2020) found that the use of applications was a factor in increasing the work effectiveness of the Class IB Magelang District Court. Rahmawati (2020) found that there was an influence of digital culture on the performance of Telkom Education Foundation employees. In general, implementing various types of digital applications into the world of work will have an impact on the completion of the work carried out, and measuring the level of the role of digital applications on employee work effectiveness is different, depending on how prepared the company is in implementing digital applications. A company's readiness to implement digital applications depends on employees' understanding of the application, as well as readiness to use and develop the application within the company to produce maximum results. Saputra (2021) achieved success comes from efforts to organize work. This is in line with the reference (Ummi and Aldri, 2020).

Prioritizing the enhancement of organizational health within the university is paramount, as establishing a robust organizational foundation catalyzes multifaceted success (Lenka and Kant, 2017; Ramezanpour, 2020). A healthy organizational framework fosters a conducive environment for effective leadership, collaborative initiatives, and optimal utilization of resources (İlhan, 2020). This atmosphere enables effective knowledge sharing, collaboration, and problem-solving, which are vital elements for enhancing organizational health in a university (Farooq *et al.,* 2017). This, in turn, underpins the viability of various endeavors, making it a foundational prerequisite for achieving excellence across diverse facets of university functioning (Barnard and Van der Merwe, 2016).

Organizational health is generally seen in goal attainment and performance (Lehmann *et al.,* 2019). Goal attainment and performance have to do with the clarity and alignment of organizational goals and the efficient and effective use of resources to achieve the objectives. Organizational health also discusses cohesiveness and collaboration (Alashkar and Al-Kasasbeh, 2022). In this context, the university community has a degree of unity and cooperation among members and departments and the sufficiency and quality of collaboration within and outside the organization.

DOI: https://doi.org/10.17509/ijost.v9i2.67763
p- ISSN 2528-1410 e- ISSN 2527-8045

Empowerment and innovativeness reflect the organizational health (Singh, 2021; Singh and Jha, 2018). The empowerment optimizes power equalization, the distribution of authority, and decision-making among the university members. The innovativeness shows the organization's ability to foster creativity and implement new ideas. Organizational health also encompasses organizational culture and autonomy (Nierenberg *et al.,* 2017). Finally, organizational health includes problem-solving as the effectiveness of resolving challenges and obstacles and flexibility as the organization's capacity to respond and adjust to changes in the environment (Alfy *et al.,* 2023; Thapa and Cohen, 2023).

2.4. The Influence of Brain Structure on Behavior

The brain is a small organ stored in the skull which is the center of the nervous system and functions as the control and coordination center for all biological, physical, and social activities of the entire body. The average human skull can hold a volume of around 1700 mL, containing several components:

(i) 1400 mL (80%) of the brain,
(ii) 150 mL (10%) of blood,
(iii) 150 mL (10%) of brain fluid.

Humans are born with a perfect brain structure weighing around 1300-1400 g (2% of body weight). The brain is the source of all thoughts, feelings, and desires, and is also the keeper of our memory (Apdillah *et al.,* 2022). In the brain, there are 100 billion neuron cells and 1 trillion neuroglia cells. Each neuron is capable of building 10,000 dendrite branches and can even reach 100,000. Thus, 1,000 trillion synapses (communication connections) will be formed (Fitriana, 2019).

Anatomically, the brain is divided into three main parts, namely:

(i) the big brain (cerebrum),
(ii) the cerebellum (cerebellum),
(iii) the brain stem (brainstem).

The brain captures all stimuli to be understood (perceived) through the work of nerve cells, neural circuits, and neurotransmitters (Widarma and Rahayu, 2017). The brain (cerebrum) is the largest part (±80%) of the brain's weight. The cerebrum is the center of mental activities such as memory, intelligence, and also awareness, and judgment. Its existence allows individuals to think, speak, remember, and control thoughts. This brain also has a big role in a person's learning process. In addition, an individual's level of intelligence is also formed in the cerebrum. The cerebrum is divided into two halves (hemispheres), namely left and right by the longitudinal fissure groove. Each hemisphere has a different function. The left brain, known as the rational brain, works in a linear, sequential pattern, dealing with matters related to logic-ratios, words and language, and mathematics. On the other hand, the right brain, or irrational brain works in irregular patterns, related to creativity, art, design, music, colors, etc.

In **Figure 1**, apart from that, this hemisphere of the brain functions to control and coordinate cross-sections of the body. These two hemispheres of the brain are connected by a structure of nervous tissue called the corpus callosum. The cerebrum is divided into several parts (lobes) with their respective specific functions, namely:

(i) the Frontal lobe; thinking, planning, and conceptualizing activities,
(ii) Temporal lobe; responsible for the perception of sounds and sounds,
(iii) Perietal lobe; responsible for thinking activities, especially memory regulation.

DOI: https://doi.org/10.17509/ijost.v9i2.67763
p- ISSN 2528-1410 e- ISSN 2527-8045

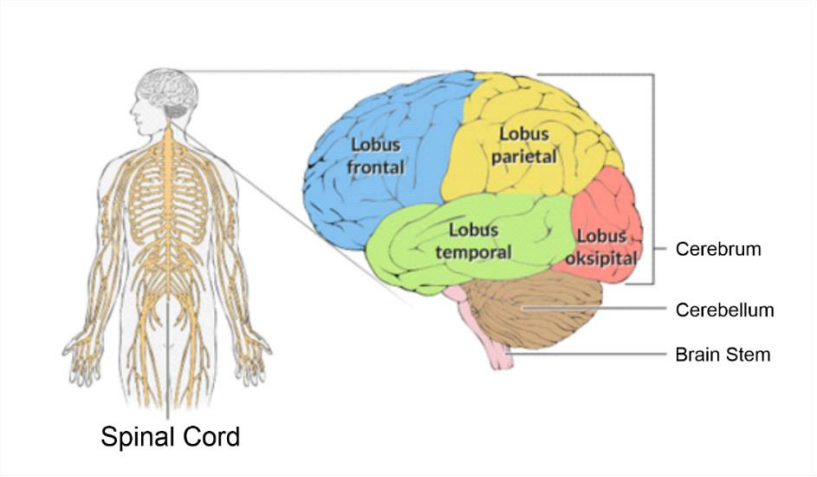

Figure 1. Parts of the brain. The figure was adopted from https://anyanewsvelez.blogspot.com retrieved on January 2024. Source: Alodokter.

The occipital lobe; regulates vision function. The entire brain is covered by a membrane called the cerebral cortex (brain skin). This structure covers the entire surface of the cerebrum down to the deepest grooves. This layer has a thickness that varies between 1.5 and 4.5 mm, the average is 2.5 mm (frontal lobe), the thickest is 4.5 mm (motor area), and the thinnest is 1.5 mm -2, 2 mm (visual area). The number of nerve cells that form it is around 2.6 x 109 neuron cells. This structure looks "irregular" in the form of curves (convolutions) consisting of depressions (sulcus) and protrusions (gyrus). The main functions of the cerebral cortex are sensory, association, and motor functions. Through the Positron Emission Tomography (PET) instrument, it is known that six brain systems integrated regulate all human behavior. The six brain systems are the prefrontal cortex, limbic system, cingulate gyros, basal ganglia, temporal lobe, and cerebellum. These six brain systems have an important role in regulating cognition, affection, and psychomotorism, including IQ, EQ, and SQ (Wijonarko and Wirapraja, 2021). The cerebellum is located at the back of the head, under the occipital lobe close to the tip of the upper neck. It is connected to the brain via the cerebral peduncles. The cerebellum is responsible for the process of coordination and balance. In more detail, Rohkamm (2004) explains that the structure and function of the cerebellum are divided into three specifications:

(i) Vestibulocerebellum (*anrcheocerebellum*), consisting of the flocculonodular lobe and lingula, responsible for controlling balance, axial and proximal muscles, respiratory rhythm, as well as head and eye movements (gaze stabilization).
(ii) Spinocerebellum (paleocerebellum); Functions in controlling muscles related to posture and balance.
(iii) *Pontocerebellum* (*neocerebellum*); functions for body balance, speed, and accuracy of body movements and speech.

The brain stem (brainstem), its position is at the base of the skull bone and extends to the backbone or spinal cord. The brain stem is composed of the midbrain, pons, and medulla. It contains the cranial nerve nuclei and the pathways for the exchange of information from the brain, cerebellum, and spine. This part of the brain regulates basic life functions such as breathing, heart rate, body temperature, digestive processes, and so on.

Men's and Women's Brains and Their Characteristics, Men and Women are created as two different types that have different essences. We label them "men and women" (Rosyidah, and Suyadi, 2021). This difference is *sunnatullah* which was created without discrediting or delegitimizing other types (see **Figure 2**).

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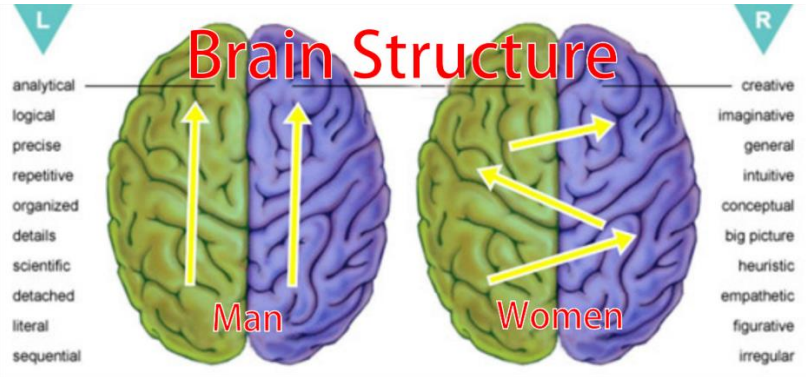

Figure 2. The structure of male and female brain performance. The figure was adopted from https://www.kompasiana.com/heroelonz, retrieved on January 2024.

Based on **Figure 2**, these different essences were created to complement each other. In general, there are at least three points of difference between men and women, namely: brain structure, reproductive organs, and way of thinking. Biologically, human types are divided into sex, not gender, namely male and female. Sex is a biological structure (genitals, reproductive hormones, anatomy-physiology of the body, etc.), while gender is a concept about the social roles of men and women (Andari *et al.,* 2018). A comprehensive understanding of this was conveyed by Dr. Alexis Carrell, who received a medical degree in 1912, stated that the differences between men and women do not come from the unique shape of their respective reproductive organs, nor because of the presence of a woman's uterus and uterus or educational methodology (Suyadi, 2018).

This difference arises from the formation of the body structure itself, as well as from the body's fertilization process from chemicals produced by the ovaries. This statement was reinforced by Mellisa Hines, from the University of California at San Diego, who stated that "from there" women and men are different. They have been differentiated since they were still in the womb. When they are still small cells in the womb, each cell will contain a gender typology, which will influence the body's organs, nervous system, and life behavior. This essence is often not understood by pro-feminist activists (Hadiyanto and Suyadi, 2023). Thus, every individual should grow, develop, and improve their capabilities according to their typology without having to ask themselves to be equated with other types (men and women). In this way, they will discover their true nobility. Men's and Women's Brains: Understanding the biological differences between men and women will be deeper by understanding the structure of the human brain.

Related to this, Pasiak (2005) stated that the brain structure of men and women has differences in several aspects:

(i) corpus callosum
(ii) hypothalamus
(iii) inferior parietal lobe
(iv) hippocampus.

These anatomical differences will have implications for differences in ways and styles of doing things, including learning. In general, brain size is different between men and women.

Men have a larger brain size than women. The following is data on the average brain weight of men and women. In the process of development, the brains of men and women do not follow the same pattern. In general, in men, the right brain develops first, then the left brain (Luders and Kurth, 2020). However, in women, brain development is more balanced between the left and right brain. At the age of 0-6 years, girls' right and left brains develop at an equal

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pace. Meanwhile, in men, the dominant development is the right brain. Thus, we often find that at school age, students who are smart and achieve (good at reading, writing, class top, etc.) are dominated by female students (Brivio *et al.,* 2020). This is also what triggers many male students to be naughty and like to throw tantrums. Entering the age of 6-12 years, the male brain begins to develop in a balanced way between the left and right brain, and when he reaches the age of 18 years (adult) the speed of development of the left and right brain in males is perfect. At this age, men's identity begins to emerge where they begin to be able to create frameworks and achievements, create a picture of the future, become leaders (BEM, UKM, organizations, etc.), convey ideas, communicate (orations, discussions, etc.). At the same time, hormonal differences also strengthen the expression of male and female brain development. The testosterone hormone in men makes them enjoy challenges, like to compete, compete with ideas and concepts, so they enjoy (feel at home) in discussions or meetings. Women also like to gather, but because their hormones are dominated by estrogen and progesterone, it makes them prefer peace, relaxation, and so on. Thus, when they gather, what they enjoy is "gathering" not the material or substance of gathering because when they gather they gather information (Denworth, 2017).

This condition also influences the choice of activities and positions undertaken. Generally, at this level, women will be more involved in activities that are in line with their nature, such as secretary, treasurer, consumption section, and the like. The Corpus Callosum is a white matter consisting of fibers that connect the white matter of the two hemispheres of the brain. Its main function is to facilitate coordination, communication, and exchange of information between the left and right hemispheres of the brain (Kohl *et al.,* 2013). The corpus callosum of women is ± 30% thicker than that of men. The thickness is predominantly in the area of linguistic skills (isthmus and splenium). This condition means that each part of a man's brain will work separately. Thus, they can concentrate and focus more quickly on what they are doing at that time, but at the same time, without realizing it, their hearing will decrease (Giedd *et al.,* 2012). Meanwhile, women, because this thicker structure allows the brain to work simultaneously, make them multitaskers, able to do two or more completely unrelated jobs at the same time. In language, a thicker corpus callosum means that women can speak more fluently and are not limited in the sense of not focusing or fixating on one topic of conversation. Anatomically, it is also proven that the distribution of language centers in the female brain in both hemispheres is much different than in the male brain. It is not surprising that women have more communication skills than men, whether through words, tone of voice, empathy, or body gestures. According to Dr. Aisyah Dahlan, men speak an average of 7000 words, while women speak 20,000 words every day. The hypothalamus is a structure located below the thalamus and just above the brain stem. The hypothalamus is the part of the brain that releases hormones that are used to control the body's organs and cells. Even though it is small in size, the hypothalamus has a very important function (Denworth, 2017).

Its main function is to ensure and maintain the body's systems running well (homeostasis). Some of its specific functions include responding to various stimuli, regulating the endocrine (hormonal) system, controlling the autonomic nervous system such as regulating body temperature, regulating food intake, air, and thirst, controlling daily cycles and physiological behavior, controlling emotional responses, and other functions. Other keys such as regulating behavior related to life's existence (fighting, eating, running away, sexuality and reproduction, etc.). In general, the hypothalamus of men, especially in the preoptic region, is 2.5 –3 times larger than that of women. This condition makes men have a higher level of sensitivity to stimuli than women, including in matters related to sex. Men are more sensitive to stimuli (sound, touch, etc.) than emotions, women are the opposite. In addition, women's brains

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contain more of the hormone serotonin, which also makes them calmer. Inferior Parietal Lobe, It is one of the three divisions of the parietal lobe. It consists of the supramarginal gyrus and the angular gyrus. This structure is responsible for spatial abilities. This area regulates visuospatial abilities and is very necessary for things related to mathematics and architecture. MRI test results show that the inferior parietal lobe in men is 6% larger than in women. Apart from that, the inferior parietal lobe in women looks asymmetrical between the left and right lobes (Luders and Kurth, 2020). The ability to imagine (imaging) and build a three-dimensional imaginary model of a movement, position, and so on is better developed in men than in women. This manifests in the ability to design mechanically, determine the direction of abstraction, and manipulate physical objects. It is not surprising that many men enjoy tinkering with or modifying items. The hippocampus is part of the limbic system located in the medial temporal lobe of the brain. This part of the brain consists of several key structures, namely the hippocampus proper, alveus, and subiculum. This area is responsible for both long-term and short-term memory and also plays a role in the formation of navigation and spatial memory. The memory center (hippocampus) in women's brains is larger than in men's brains. Therefore, women can remember things longer, even down to the details. This condition also causes men to forget easily. This is what causes men to move on more easily from trauma than women. However, during development, hippocampus cells and also parietal lobe cells in women disappear (die) more quickly. Thus, when older women are more likely to lose memory, and spatial recognition abilities, and also become forgetful.

2.5. The Relationship Between Neuroscience and Leadership Transformation

Leadership is a process in which someone influences a group of individuals to achieve a common goal (Northouse, 2007; Santoso 2023; Estrellan and Loja, 2021; Glushchenko, 2023; Adeoye 2023). Based on its type, leadership can be categorized into two groups, namely transactional leadership which uses rewards and punishment as a means to motivate followers, and transformational leadership which inspires followers to transform with internal motivation (Bass, 1990). Transformational leadership is a process in which the leader and followers help each other to increase the morale and motivation of both parties. Meanwhile, Yammarino and Bass (1990) stated that transformational leadership is a leadership style in which the leader articulates a realistic vision of the future of the organization, intellectually stimulates followers and pays attention to the differences that followers have. In 2012, it defined transformational leadership as the interaction between two parties in an organization with a collective goal when the leader transforms, motivates, and develops the ethical behavior and aspirations of followers. From the definitions put forward by these experts, transformational leadership is a participative leadership style that increases the morale, internal motivation, and performance of followers, resulting in changes in followers' mindset and behavior as well as organizational effectiveness.

According to Bass (1990), four components form a transformational leadership style, which can be described:

(i) idealized/charismatic influence, namely the leader has a vision and mission that is in line with the organization, a strong stance, and is committed and consistent in every decision. Thus, followers voluntarily follow the leader;
(ii) inspirational motivation, namely setting high standards while encouraging their achievement;
(iii) intellectual stimulation, namely encouraging followers to have a learning culture and always develop ideas;

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(iv) individualized consideration, namely the leader's ability to understand the differences in each follower and facilitate their development.

The brain is an organ in the human body that plays an important role as a control center. The brain consists of several parts with their respective functions, one of which is the hypothalamus. The hypothalamus produces several hormones viz:

(i) Antidiuretic Hormone. Antidiuretic hormone is a hormone that functions to regulate the balance of water or fluid levels in the body, one of which is blood volume. Therefore, this hormone can affect blood pressure. Too little or too much fluid levels can make the human body weak. Antidiuretic hormone (ADH), also known as vasopressin, is a peptide hormone produced by the hypothalamus and stored in the posterior pituitary gland. ADH has an important role in regulating water balance in the body by controlling water reabsorption in the kidneys. Chemically, ADH is a polypeptide consisting of nine amino acids (Handler and Orloff, 1981). An important chemical bond in the ADH structure is the peptide bond. Peptide bonds are formed through a condensation reaction between the amino group on one amino acid and the carboxyl group on another amino acid. This bond forms a stable peptide chain. In more detail, ADH consists of nine amino acids arranged in a specific sequence: cysteine-tyrosine-isoleucine-glutamine-asparagine-cysteine-proline-arginine-glycine (Wendt *et al.,* 2023). A peptide bond is formed when the amino group ($-NH_2$) on one amino acid combines with the carboxyl group (-COOH) on another amino acid, with the release of a water molecule. This process produces strong bonds between the nitrogen atoms of one amino acid and the carbon atoms of another amino acid, forming a peptide chain. The chemical structure of ADH can be explained in **Figure 3**. Based on **Figure 3**, N is the nitrogen atom in an amino acid residue that forms a peptide bond with the carbon atom (C) in another amino acid residue. R is a side group that is part of certain amino acids. This peptide chain provides ADH with the structural stability necessary to function as a hormone in the human body (Xu *et al.,* 2023). With its unique chemical structure, ADH allows specific interactions with ADH receptors in the kidney, triggering an increase in the permeability of the cell membranes of the distal tubules and collector tubules to water, thereby increasing water reabsorption and reducing the volume of urine produced.

(ii) Oxytocin Hormone**.** The hormone oxytocin affects the reproductive system, such as sexual arousal, ejaculation, and the birth process. Apart from that, oxytocin also plays a role in controlling various human behaviors and emotions. In women, this hormone plays a role in building the emotional bond between mother and baby. Oxytocin is a peptide hormone consisting of nine amino acids. Its chemical structure involves peptide bonds between successive amino acids in the polypeptide chain. In the case of oxytocin, these peptide bonds link amino acids to one another, forming a stable peptide chain (Feldman and Bakermans-Kranenburg, 2017). In more detail, oxytocin consists of nine amino acids arranged in a specific sequence: cysteine-tyrosine-isoleucine-glutamine-asparagine-cysteine-proline-leucine-glycine. A peptide bond is formed when the amino group (-NH2) on one amino acid combines with the carboxyl group (-COOH) on another amino acid, with the release of a water molecule. This process produces strong bonds between the nitrogen atoms of one amino acid and the carbon atoms of another amino acid, forming a peptide chain. The chemical structure of oxytocin is shown in **Figure 4**. In **Figure 4**, N is the nitrogen atom on an amino acid residue that forms a peptide bond with the carbon atom (C) on another amino acid residue. R is a side group that is part of certain amino acids. These peptide chains provide oxytocin with the structural stability necessary to function as a hormone in the human body (Sindermann *et al.,* 2021). With its

DOI: https://doi.org/10.17509/ijost.v9i2.67763
p- ISSN 2528-1410 e- ISSN 2527-8045

characteristic chemical structure, oxytocin enables specific interactions with oxytocin receptors in various body tissues, triggering appropriate biological responses such as contraction of uterine muscles during labor, release of milk during breastfeeding, and regulation of social and emotional behavior.

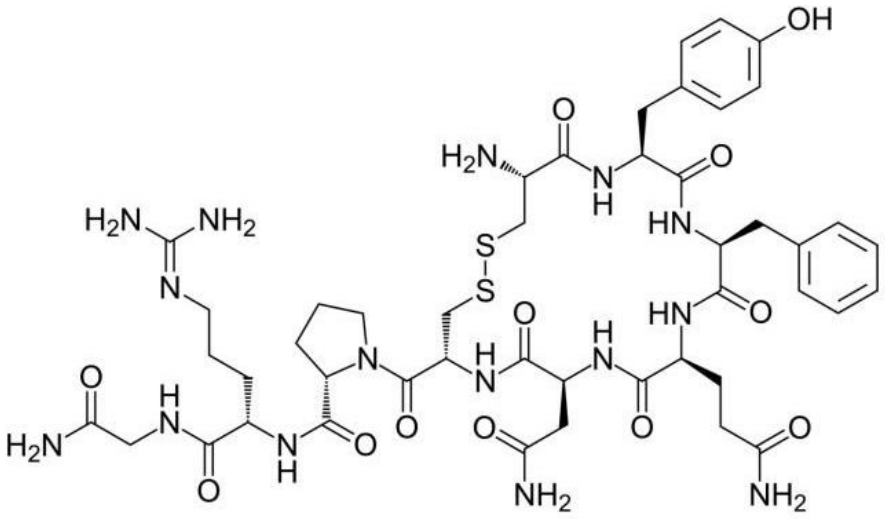

Figure 3. Chemical bonds of antidiuretic hormone. The figure was adopted from https://www.shutterstock.com, retrieved on January 2024.

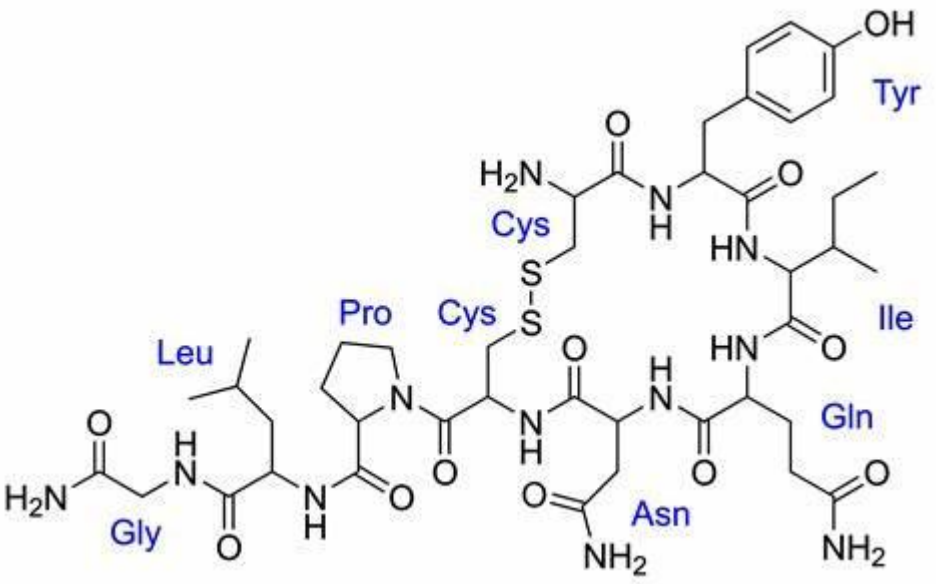

Figure 4. Chemical structure of the hormone oxytocin. The figure was adopted from https://www.dreamstime.com, retrieved on January 2024.

(iii) Somatostatin Hormone. The hormone somatostatin plays a role in inhibiting the pituitary gland from producing certain hormones, such as growth hormone and thyroid-stimulating hormone (TSH). This hormone works in the central nervous system. Somatostatin, also known as growth-inhibiting hormone (GHIH) or growth-inhibiting hormone (GHIH), is a peptide hormone produced in the brain and pancreas (Ampofo *et al.*, 2020). It has an important role in regulating many functions in the human body, including regulation of the secretion of growth hormone, insulin, glucagon, and other hormones. The chemical structure of somatostatin consists of 14 or 28 amino acids depending on the isoform. However, the general structure consists of a peptide chain

DOI: https://doi.org/10.17509/ijost.v9i2.67763
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with peptide bonds connecting one amino acid to another. This peptide bond is formed through a condensation reaction between the amino group on one amino acid and the carboxyl group on another amino acid. The following is an example of the general structure of somatostatin which consists of 14 amino acids shown in **Figure 5**. In **Figure 5**, N is the nitrogen atom on an amino acid residue that forms a peptide bond with the carbon atom (C) on another amino acid residue. R is a side group that is part of certain amino acids. This peptide chain gives somatostatin the structural stability necessary to function as a hormone in the human body. Somatostatin's chemical structure allows it to interact with somatostatin receptors found in various body tissues, including the hypothalamus, pancreas, and gastrointestinal tract (Shamsi *et al.,* 2021). Through these interactions, somatostatin influences the secretion of other hormones and various physiological functions, such as inhibiting the secretion of growth hormone, insulin, and glucagon, as well as regulating gastrointestinal motility and gastric acid secretion. Thus, the chemical structure of somatostatin plays an important role in mediating its biological effects in the human body.

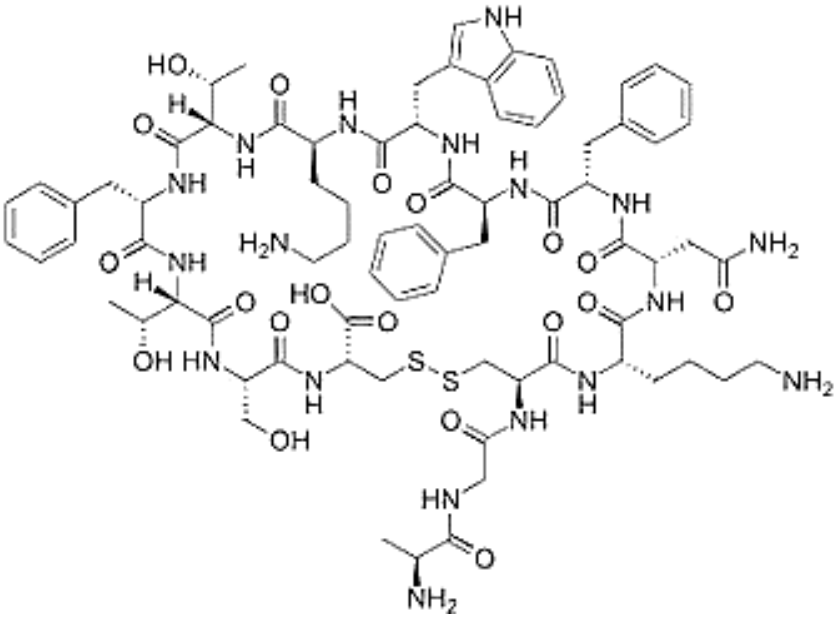

Figure 5. Chemical structure of the hormone somatostatin. The figure was adopted from https://www.dreamstime.com, retrieved on January 2024.

(iv) Releases Growth Hormone (GHRH). Growth hormone-releasing hormone (GHRH) berperan memicu kelenjar pituitari menghasilkan hormon pertumbuhan. Hormon ini memengaruhi tumbuh kembang anak serta metabolisme karbohidrat dan lemak dalam tubuh. The synthesis of human growth hormone-releasing hormone (hGH-RH), by the chemoselective serine/threonine ligations (STLs) of three unprotected peptide fragments, is reported. To allow for the multiple-fragment ligation, we chose the Msz (p-(methylsulfinyl)benzyloxycarbonyl) group, which is compatible with the preparation of peptide salicylaldehyde esters via Fmoc-SPPS and readily removed by reductive acidolysis, to protect the serine and threonine residue at the N-terminus (Zhang *et al.,* 2020). Growth Hormone-Releasing Hormone (GHRH) adalah hormon peptida yang dihasilkan oleh hipotalamus dalam otak manusia. GHRH memiliki struktur kimia yang terdiri dari serangkaian asam amino yang dihubungkan bersama oleh ikatan peptida. The chemical structure of GHRH based on its aminosquamous acid sequence is shown in **Figure 6**. Based on **Figure 6**, human GHRH is a peptide consisting of approximately 44

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p- ISSN 2528-1410 e- ISSN 2527-8045

amino acids. These peptide chains consist of various amino acidic compounds such as alanine, glutamine, arginine, etc., which are linked together by peptide bonds between the carboxyl group (-COOH) of one amino acid and the amino group (-NH_2) of the next amino acid in the chain. Here, "H" refers to the N-terminal end of the peptide, and "NH_2" refers to the C-terminal end. The amino acid sequence shown above is the sequence of the acid aminosquades that make up human GHRH (Zhang *et al.,* 2022). Although we can provide a general idea of the chemical structure of human GHRH based on its amino acid sequence, it should be noted that this explanation is very simplified. The chemical structure of peptides such as GHRH involves various complex chemical interactions between the atoms that make up the acidic amino scale, including covalent bonds and non-covalent interactions such as hydrogen bonds, ionic bonds, and hydrophobic interactions. GHRH plays a role in stimulating the anterior pituitary gland to release growth hormone (GH), which then influences the growth of cells, tissues, and organs in the body, as well as various metabolic processes and other body functions.

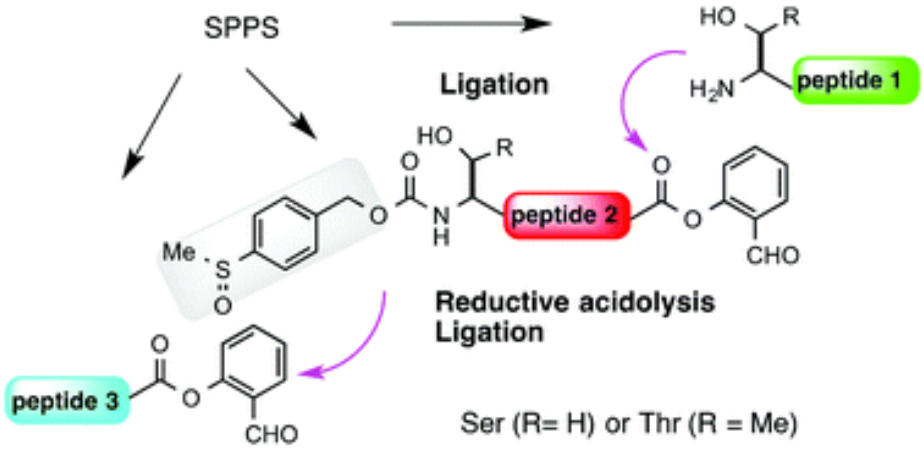

Figure 6. Chemical bonds of Growth hormone-releasing hormone (GHRH) Source: (Zhang *et al.,* 2020).

(v) Gonadotropin-releasing hormone (GnRH). This hormone, known as gonadotropin-releasing hormone (GnRH), is related to reproductive functions, such as menstruation, maturation of sexual organs, and also puberty. Gonadotropin-Releasing Hormone (GnRH) is a peptide hormone produced by the hypothalamus in the human brain. GnRH is responsible for stimulating the anterior pituitary gland to release gonadotropin hormones, such as luteinizing hormone (LH) and follicle-stimulating hormone (FSH) (Moenter and Evans, 2022). The chemical structure of GnRH in humans is based on the specific sequence of amino acids that make up the peptide chain. Human GnRH is a peptide consisting of about 10 amino acids arranged in a specific sequence. Below is a general example of the chemical structure of GnRH in humans which can be generally depicted as shown in **Figure 7**. In **Figure 7**, "NH_2" refers to the C-terminal end of the peptide. This sequence of acidic aminoscales forms a peptide chain which is the basic structure of GnRH in humans. Each amino acid in a peptide chain is linked to another via a peptide bond. A peptide bond is formed between the carboxyl group (-COOH) of one amino acid and the amino group (-NH_2) of the next amino acid in the chain. This is a process that produces a stable peptide structure. Although this amino acid sequence provides a general idea of the chemical structure of GnRH in humans, this structure involves complex interactions between the atoms in the acidic amino scales that form the peptide chain (Emons and Gründker, 2021). This includes covalent bonds between the

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carbon, nitrogen, and oxygen atoms in the peptide chain, as well as non-covalent interactions such as hydrogen bonds and ionic bonds. Thus, GnRH plays a role in regulating the reproductive and hormonal systems of the human body, by stimulating the release of gonadotropin hormones which are important for normal reproductive function.

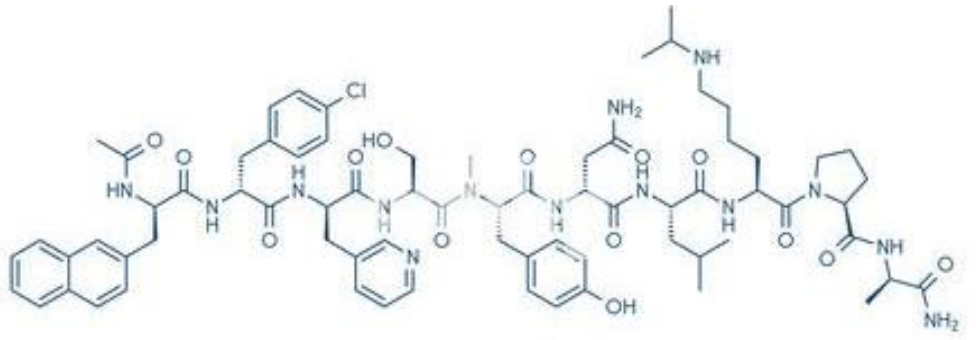

Figure 7. Chemical bonds of gonadotropin-releasing hormone (GnRH) The figure was adopted from https://www.alamy.com/ retrieved on January 2024.

(vi) Corticotropin-releasing hormone (CRH). This hormone, also known as corticotropin-releasing hormone (CRH), plays a role in controlling the body's response when experiencing physical or emotional stress. Additionally, corticotropin-releasing hormone is also responsible for suppressing anxiety and controlling appetite. Chemically, CRH is a polypeptide consisting of a long chain of amino acids. CRH is produced in the brain, especially in the hypothalamus, and then released into the blood circulation (Sukhareva, 2021). When a person experiences stress or pressure, the anterior pituitary gland under the brain will secrete adrenocorticotropic hormone (ACTH) in response to stimulation by CRH. ACTH then stimulates the adrenal glands to produce cortisol, a stress hormone that is important in regulating various body functions during stressful situations as shown in **Figure 8**. In **Figure 8** more specifically, the chemical structure of CRH consists of a specific sequence of amino acids linked together with peptide bonds. A peptide bond is a covalent bond formed between the carboxyl group on one amino acid and the amino group on another amino acid, producing a peptide chain (Vgontzas *et al.,* 2022). This structure allows CRH to maintain its biological function while interacting with specific receptors in the pituitary gland, thereby triggering the hormonal response necessary in stressful situations.

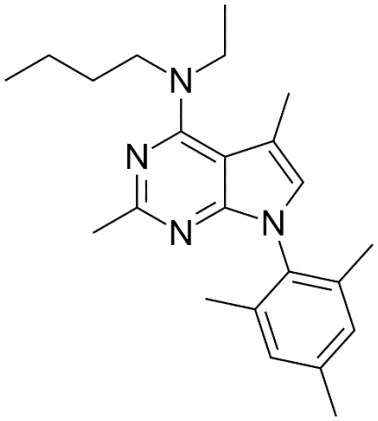

Figure 8. Chemical bonds of corticotropin-releasing hormone (CRH) The figure was adopted from https://favpng.com retrieved on January 2024.

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(vii) Thyrotropin-Releasing Hormone (TRH). This hormone, which is also called thyrotropin-releasing hormone (TRH), functions to stimulate the production of thyroid hormone to control the body's metabolism, cardiovascular system, brain development, muscle control, and digestive and bone health (Pech-Pool *et al.,* 2020). TRH plays a role in regulating the secretion of thyroid-stimulating hormone (TSH) from the anterior pituitary gland. Chemically, TRH is a small peptide or protein consisting of a certain number of amino acids bonded together in a certain sequence. The chemical structure of TRH can be shown in **Figure 9**. In **Figure 9**, there is a series of amino acids connected to form a polypeptide chain. The sequence of amino acids in TRH will determine the nature and function of the hormone. At the end of the C-terminus (right end in the structure), there is a carboxyl group (-COOH) which indicates the termination of the polypeptide chain. At the end of the N-terminus (left end in the structure), there is an amino group (-NH2) which indicates the starting point of the polypeptide chain. Thus, TRH is a peptide molecule consisting of many amino acids bonded together via peptide bonds. The most important chemical bond in the TRH structure is the peptide bond, which connects one amino acid to the next amino acid in the polypeptide chain (Chaiwongkot *et al.,* 2023). This peptide bond is formed through a condensation reaction between the carboxyl group on one amino acid and the amino group on another amino acid. As a peptide hormone, TRH plays a role in regulating the secretion of the TSH hormone from the anterior pituitary gland. TRH is released from the hypothalamus and reaches the anterior pituitary gland via the bloodstream, where it stimulates the production and release of TSH. TSH then stimulates the thyroid gland to produce thyroid hormone, which has an important role in regulating the body's metabolism.

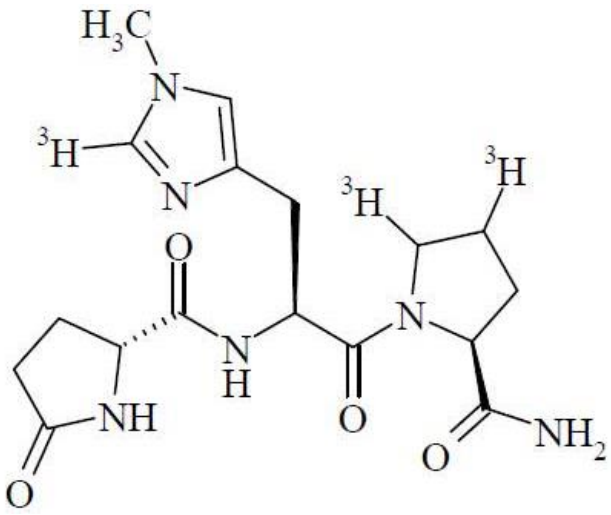

Figure 9. Chemical bonds of thyrotropin-releasing hormone (TRH). The figure was adopted from https://www.perkinelmer.com, retrieved on January 2024.

(viii) Dopamine Hormone. Dopamine is a type of neurotransmitter, not a hormone. As a neurotransmitter, dopamine is a chemical compound that plays a role in transmitting signals between neurons in the central nervous system. Therefore, the discussion of dopamine will be more related to its chemical structure as a neurotransmitter rather than as a hormone. The chemical structure of dopamine consists of a heterocyclic aromatic ring called the benzene ring, which has a hydroxyl group (-OH) attached to one carbon atom in the ring (Zachry *et al.,* 2021). This gives dopamine its characteristic chemical properties as a catecholamine, a type of compound that has a benzene ring

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with two hydroxyl groups attached. In more detail, the chemical structure of dopamine is shown in **Figure 10**. In **Figure 10**, the benzene ring consists of six carbon atoms arranged in an unsaturated ring connected to two methyl groups (CH3) and one hydroxyl group (-OH) attached to one carbon atom in the ring. The most important chemical bonds in dopamine are the chemical bonds formed between the carbon atom in the benzene ring and other atoms, such as carbon-hydrogen bonds (C-H) and carbon-carbon bonds (C-C). Hydroxyl bonds (-OH) also have an important role because they determine the chemical properties and biological functions of dopamine (Cui *et al.,* 2020). Dopamine plays a role in the transmission of nerve signals by releasing it from the producing neuron into the intercellular space (synaptic cleft), where it interacts with receptors on the receiving neuron (post-synaptic neuron), which then produces an appropriate response in the nervous system. Therefore, the chemical structure of dopamine is important in determining its biological properties and functions as an important neurotransmitter in the human and animal nervous systems.aptic cleft), where it interacts with receptors on the receiving neuron (post-synaptic neuron), which then produces a corresponding response in the nervous system. Therefore, the chemical structure of dopamine is important in determining its biological properties and functions as an important neurotransmitter in the human and animal nervous systems.

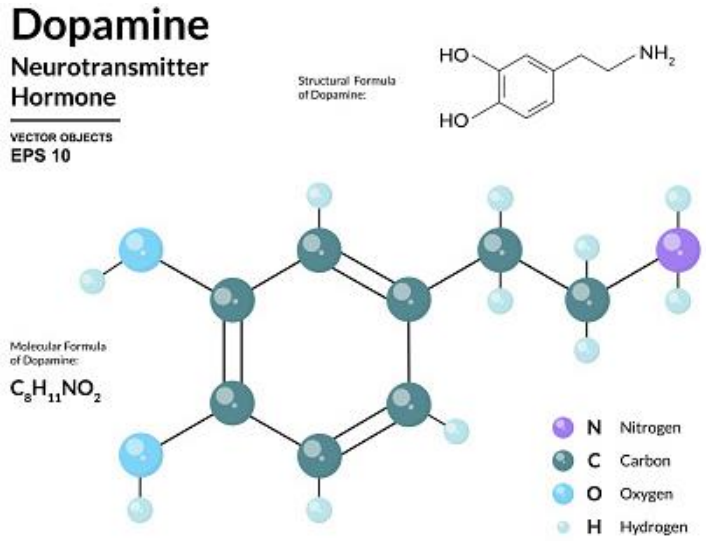

Figure 10. Chemical bonds of the hormone dopamine Source: iStock. The figure was adopted from https://www.istockphoto.com retrieved on January 2024.

(ix) Cortisol hormone. The cortisol hormone is a steroid hormone produced by the adrenal glands, which are located above the kidneys. It is one of the major steroid hormones in the human body and has a variety of important functions, including regulation of metabolism, stress response, inflammation, blood pressure, and control of sleep and wakefulness. Cortisol is produced in the adrenal glands in response to stimulation by adrenocorticotropic hormone (ACTH), which is released by the anterior pituitary gland in the brain (Bikle, 2021). The main function of cortisol is to help the body deal with stressful situations, whether physical or mental stress. This is done by increasing glucose levels in the blood through the process of gluconeogenesis (production of glucose from non-carbohydrate sources such as amino acids and glycerol) and mobilization of fat and protein for energy. The chemical structure of the hormone cortisol is shown in **Figure 11**.

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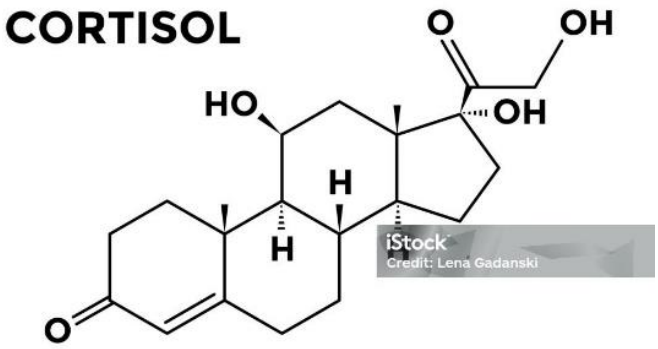

Figure 11. Chemical bonds of the hormone cortisol. The figure was adopted from https://www.istockphoto.com, retrieved on January 2024.

In **Figure 11**, there is a steroid ring (cyclohexane ring) with one hydroxyl group (-OH) attached to one of the carbon atoms in the ring. There is a carbon side chain attached to the 17th carbon atom in the ring. At the end of this side chain, there is a ketone group which indicates the presence of a carbonyl functional group (C=O). This structure indicates that cortisol is a steroid that has a cyclohexane ring core, which is characteristic of steroid hormones. The hydroxyl group (-OH) and carbonyl group (C=O) have an important role in the biological activities of cortisol, such as in the regulation of glucose metabolism, inflammatory responses, and stress regulation (Sheibani *et al.,* 2021). Cortisol has important roles in a variety of physiological processes, including regulation of metabolism, immune response, blood pressure regulation, and more. This hormone is also known as the stress hormone because its levels increase in response to stressful situations or stressors.

2.6. Types of Applications to Speed Up Brain Performance at Work

Table 3 show the types of applications that speed up brain performance While these apps may provide additional benefits, no app can replace an overall healthy lifestyle, including getting enough sleep, a healthy diet, and regular exercise to maintain brain health. Cognitive Training Applications are a type of application specifically designed to train and improve a person's cognitive performance. It focuses on various aspects of cognitive abilities, including memory, attention, problem-solving, and quick-thinking abilities. This app offers a variety of exercises and games scientifically designed to stimulate and develop these areas in the brain.

Here are some important points about cognitive training apps:

(i) Goal: The main goal of cognitive training applications is to improve brain performance in various cognitive aspects. This can include improving memory, improving focus and attention, honing problem-solving abilities, and increasing the ability to think quickly (Laube *et al.,* 2020).

(ii) Exercises and Games: This app offers a variety of exercises and games designed to stimulate the brain in a variety of ways. For example, there are logic puzzles, memory games, information-processing speed exercises, and other activities designed to challenge and develop cognitive abilities (Chang *et al.,* 2021).

(iii) Customization: Most cognitive training apps offer adjustment of the difficulty level according to the user's progress. This means that the better you do an exercise, the more challenging the next exercise will be, thus ensuring that the brain is continually tested and developing (Huckvale *et al.,* 2020).

(iv) Progress Tracking: Many of these apps provide a progress-tracking feature that allows users to see their progress over time. This can help users stay motivated and focused on their cognitive training goals (Campbell *et al.,* 2020).

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(v) App Examples: Examples of popular cognitive training apps include Lumosity, Elevate, Peak, and CogniFit. Each has unique features and a variety of exercises designed to train specific aspects of cognition (Buchner *et al.,* 2022).

Table 3. Types of applications that speed up brain performance.

Application	Results
Lumosity, Elevate, and Peak	Cognitive Training Apps: These apps offer a variety of exercises and games designed to train cognitive skills such as memory, attention, problem-solving, and quick-thinking abilities.
Headspace, Calm, and Insight Timer	Meditation and Relaxation Applications: Meditation and relaxation techniques can help improve focus, reduce stress, and improve overall brain performance.
Sleep Cycle, Stress Check, and Brain Wave	Brain Health Tracking App: This app helps users monitor their brain health by monitoring sleep patterns, stress levels, and brain activity.
Duolingo for learning languages, Khan Academy for math and science, and SoloLearn for learning programming.	Language and Skills Training Apps: To improve brain performance in terms of languages and other skills, various apps offer language learning, mathematics, programming, and other skills.
Todoist, Trello, and Forest help users organize schedules, organize tasks, and stay focused on work that matters.	Time Management and Productivity Applications: Good time management can help increase productivity and brain work efficiency.
Evernote, Microsoft OneNote, and Google Keep	Information Storage and Reminder App: The information storage and reminder app helps users keep ideas, notes, and other important information easily accessible and organized.
Focus@Will and Brain.fm	Music and Sound Apps: Certain music and sounds can improve focus, creativity, and productivity. The application offers music specifically designed to improve brain performance.

Cognitive training apps can be a useful tool in maintaining brain health and improving overall cognitive performance. However, it's important to remember that while brain exercise can provide additional benefits, an overall healthy lifestyle also plays an important role in maintaining long-term brain health.

Meditation and Relaxation App is an app designed to help users practice meditation and relaxation techniques to improve their mental and physical well-being. Meditation and relaxation techniques have been proven to help improve focus, reduce stress, and overall improve brain performance. Some important points about this app include:

(i) Guided Meditation and Relaxation Exercises: This app offers a variety of guided meditation and relaxation exercises that are easy to access and follow. They provide guided audio, video, or text that guides users through various meditation techniques such as breathing meditation, visualization meditation, or mindful meditation (Laube *et al.,* 2020).

(ii) Wide Range of Options: Meditation and relaxation apps often offer a wide selection of content, including meditations for sleep, reducing anxiety, improving concentration, and more. This allows users to choose according to their needs and preferences at any given time (Chang *et al.,* 2021).

(iii) Time and Place Flexibility: Users can use this application anytime and anywhere according to their schedule. This makes it very suitable for use at home, at work, or even while traveling (Huckvale *et al.,* 2020).

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(iv) Progress Tracking and Statistics: Many meditation and relaxation apps provide a progress tracking feature that allows users to see how often they meditate, the duration of meditation sessions, and their progress over time. This feature can help users stay motivated and organized in their meditation practice (Campbell *et al.,* 2020).

(v) Soothing Sounds and Music: These apps also often offer a variety of natural sounds or music designed to calm the mind and help users achieve a deeper state of relaxation (Buchner *et al.,* 2022).

Examples of popular meditation and relaxation apps include Headspace, Calm, Insight Timer, and 10% Happier. Each of these apps has a slightly different approach and features, but they all aim to help users achieve the benefits of meditation and relaxation in their daily lives. This meditation can help to restore people's spirit and some can relate to religious perspective (Chano *et al.,* 2023; Chano *et al.,* 2024). The Brain Health Tracking App is an app designed to help users monitor and understand their brain health by tracking factors that influence brain performance and mental well-being. Some important points about this app are as follows:

(i) Sleep Pattern Monitoring: This app allows users to monitor their sleep patterns, including sleep duration, sleep quality, and regular sleep patterns. This helps users understand whether they are getting enough sleep and whether any sleep issues need to be addressed (Laube *et al.,* 2020).

(ii) Stress Level Monitoring: This app also helps users monitor their stress levels. This can be done through measuring heart rate, activity levels, or user input about their stress levels and feelings. By understanding stress levels, users can take steps to manage them better (Chang *et al.,* 2021).

(iii) Brain Activity Monitoring: Some brain health tracking apps also offer the ability to monitor brain activity. This is possible through technology such as EEG (Electroencephalography) which measures brain waves. This monitoring can provide insight into a user's brain activity and be used to improve concentration, relaxation, or overall cognitive performance (Huckvale *et al.,* 2020).

(iv) Data Analysis and Statistics: These apps often provide data analysis and statistics about users' sleep patterns, stress levels, and brain activity. This helps users understand trends and patterns that may be affecting their brain health and allows them to make necessary changes (Campbell *et al.,* 2020).

(v) Recommendations and Suggestions: Based on the data collected, some brain health tracking apps can also provide recommendations and suggestions to improve brain health and overall mental well-being (Buchner *et al.,* 2022).

3. METHODS

3.1. Bibliometric Analysis Method

The methodology employed in this study is a bibliometric analysis technique combined with computational mapping analysis. Detailed information for the use of bibliometrics is explained elsewhere (Husaeni and Nandiyanto, 2022; Azizah *et al.,* 2021). Utilizing the fundamental principles of bibliometrics, every analysis employs statistical and mathematical methods to statistically examine, elucidate, and visually represent the pertinent research domain. Assessing the status and major aspects might aid in identifying and predicting future research trends and areas of high interest. The research was carried out in five distinct stages, specifically keyword identification, data gathering, data processing and analysis, result analysis, and conclusion.

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The research focuses on the keyword "Neuroscience dan Digital Leadership". Keywords are utilized to designate articles that are deemed pertinent. The Abstract and Title serve as criteria for picking articles based on pre-established keywords. The study period included in the evaluation process spanned from 2014 to 2023. On February 27, 2024, a data search was performed using Scopus. The study concept and methodology of this paper are illustrated in **Figure 12**.

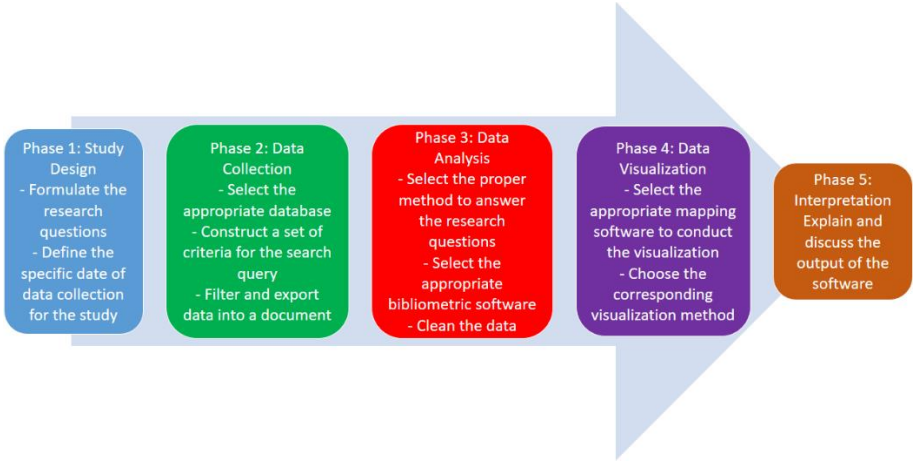

Figure 12. Science mapping workflow using bibliometric analysis.

3.2. Research Framework and Hypotheses Development

The bibliometric analysis method combined with computational mapping analysis is one of the techniques employed in this study. Relative analysis, based on fundamental bibliometric theory, examines, explains, and presents quantitatively significant study fields using mathematics and statistics. Forecasting future research trends and hotspots using status and lock points is possible (Buchner *et al.,* 2022). Five processes were involved in this research: selecting keywords, gathering information, organizing and evaluating information, assessing findings, and formulating conclusions.

Digital leadership and digital transformation play pivotal roles in fostering and maintaining optimal organizational health within a university. Leaders with a keen sense of technological vision and strategy play a pivotal role in navigating the intricate landscape of digital transformation within a university. Their ability to envision future technological landscapes and formulate comprehensive strategies for integration sets the trajectory for the institution's digital experience. Simultaneously, leaders must champion cultural transformation by fostering an organizational culture that thrives on innovation, adaptability, and continuous learning. This cultural shift is integral to embracing the challenges and opportunities presented by digital transformation, ensuring that faculty, staff, and students are equipped with the mindset and skills necessary for success in the ever-evolving digital age.

Collaboration and communication are linchpins for successful digital transformation and organizational health in a university. Leaders adept at fostering collaboration through strategically utilizing digital tools create an environment where interdisciplinary initiatives flourish. Concurrently, effective communication strategies facilitated by digital channels enhance transparency and engagement among stakeholders. Furthermore, leaders' proficiency in data-informed decision-making ensures that the university's digital initiatives are grounded in strategic insights. As these dimensions intertwine, leaders driving educational technology integration reinforce the institution's commitment to an enriched

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learning experience. They empower the university to harness the full potential of digital transformation by promoting innovative teaching methods and facilitating the adoption of digital tools, fostering organizational health in the dynamic of higher education (Araujo *et al.,* 2021; He *et al.,* 2022; Pangarso *et al.,* 2022).

From this framework, we develop four hypotheses:

(i) Hypothesis 1: digital leadership positively affects digital transformation
(ii) Hypothesis 2: digital leadership positively affects organizational health
(iii) Hypothesis 3: digital transformation positively affects organizational health
(iv) Hypothesis 4: digital transformation has a mediation effect on the relationship between digital leadership and organizational health.

The conceptual model of this study can be depicted in **Figure 13.**

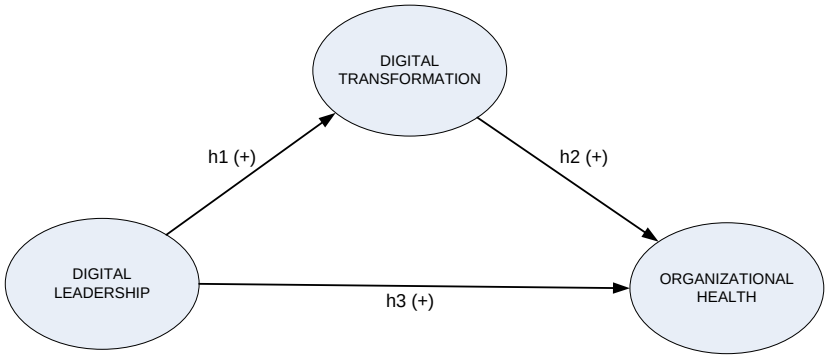

Figure 13. Conceptual model.

3.2. Research Method

This empirical study utilizes a quantitative approach and a descriptive survey method to get the data from respondents. The population of this research is 160 lecturers from 16 universities in West Java. Data were analyzed by Partial Least Square (PLS) to evaluate the measurement and structural model. Based on the data collected from the 153 returned questionnaires, the study aims to provide a comprehensive understanding of the level of organizational health in universities that is influenced by digital leadership and digital transformation. In this model, the digital transformation functions as a mediating variable. By employing a quantitative approach and utilizing PLS analysis, this study seeks to uncover valuable insights and statistical evidence to support the research hypotheses.

The construct of Digital Leadership is an exogenous variable that consists of five manifest variables:

(i) Technological Vision and Strategy,
(ii) Cultural Transformation,
(iii) Collaboration and Communication,
(iv) Data-Informed Decision-Making,
(v) Educational Technology Integration.

The construct of Digital Transformation is a mediating variable that consists of three manifest variables:

(i) Academic Innovation and Learning Experience,
(ii) Administrative Efficiency and Operational Excellence,
(iii) Digital Engagement and Stakeholder Communication.

Finally, Organizational Health is the endogenous variable that consists of five manifest variables:

(i) Goal Attainment and Performance,

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(ii) Cohesiveness and Collaboration,
(iii) Empowerment and Innovativeness,
(iv) Organizational Culture and Autonomy,
(v) Problem-Solving and Flexibility.

Table 4 presents the measurement of each latent variable, manifest variable, and indicator in detail.

Table 4. Measurement of construct, manifest variable, and indicator.

Latent Variable	Manifest Variables	Indicators	Item
Digital Leadership (DL)	1. Technological Vision and Strategy	• Strategic Technology Roadmap • Alignment with Organizational Objectives • Innovation Adoption Rate	1 – 3
	2. Cultural Transformation	• Employee Digital Literacy • Innovation Recognition • Feedback and Adaptation	4 – 6
	3. Collaboration and Communication	• Utilization of Digital Collaboration Tools • Communication Effectiveness • National/Global Collaboration Initiatives	7 – 9
	4. Data-Informed Decision-Making	• Data Governance Compliance • Availability of Real-Time Analytics • Impact of Data Use on Decision Outcomes	10 – 12
	5. Educational Technology Integration	• Usage of Leaning Digital Platforms • Innovation in Teaching Method • Student Engagement in Digital Learning	13 – 15
Digital Transformation (DT)	1. Academic Innovation and Learning Experience	• Integration of E-Learning Platform • Adoption of Emerging Educational Technologies • Student Satisfaction and Engagement	1 – 3
	2. Administrative Efficiency and Operational Excellence	• Implementation of Integrated Information System • Workflow Automation Effectiveness • Reduction in Manual Processes	4 – 6
	3. Digital Engagement and Stakeholder Communication	• Social Media Engagement • Participation in Virtual Events • Effectiveness of Online Communication Channels	7 – 9
Organizational Health (OH)	1. Goal Attainment and Performance	• Achievement of Key Performance Indicators (KPIs) • Employee Productivity	1 – 2
	2. Cohesiveness and Collaboration	• Teamwork and Communication • Interdepartmental Collaboration	3 – 4
	3. Empowerment and Innovativeness	• Employee Empowerment • Innovation Adoption	5 – 6
	4. Organizational Culture and Autonomy	• Cultural Alignment • Degree of Autonomy	7 – 8
	5. Problem-Solving and Flexibility	• Problem-Solving Effectiveness • Adaptability and Flexibility	9 – 10

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p- ISSN 2528-1410 e- ISSN 2527-8045

4. RESULTS AND DISCUSSION

4.1. Bibliometric Analysis Results

Bibliometrics has been employed to facilitate study analysis across several research domains (Nandiyanto *et al.,* 2022). This study employed bibliometric analysis to gain insight into the contemporary research trends related to the neuroscience approaches.

4.1.1. Development of neuroscience and digital technology research by year

A total of 8 publications, spanning from 2016 to 2023, have been published on the topic of neuroscience and digital leadership. The titles, abstracts, and article data were screened to ensure their relevance to the specified study issues. The evolution of research in neuroscience is depicted in **Figure 14**. In general, fewer studies were conducted between 2016 and 2023. There was 1 article in 2016, 1 article in 2017, no article in 2018, no article in 2019, 1 article in 2020, 0 articles in 2021, 3 articles in 2022, and 2 articles in 2023.

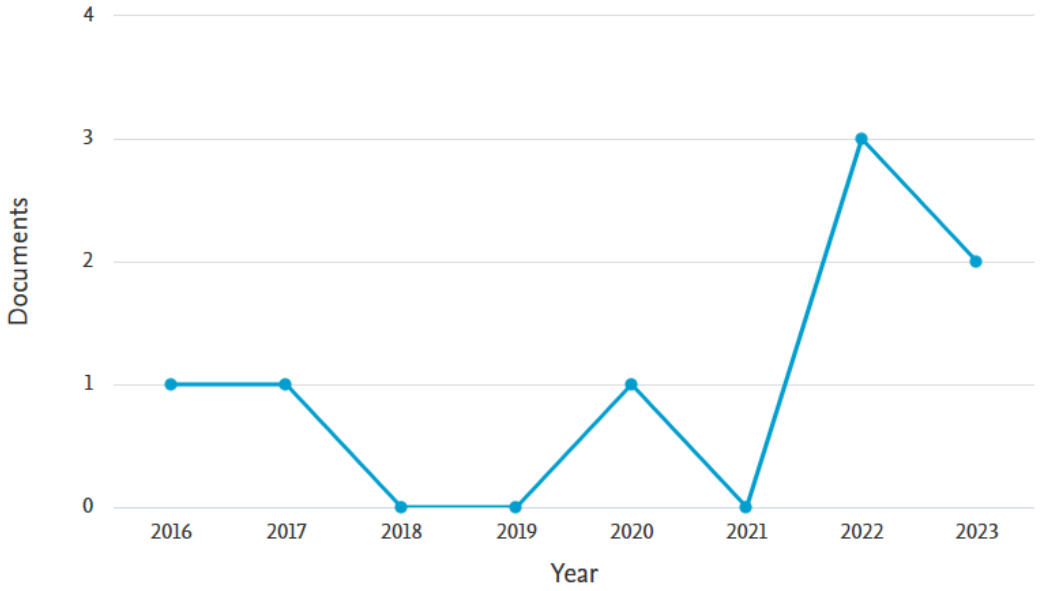

Figure 14. Development of published articles per year related to neuroscience and digital leadership (2014 – 2023).

4.1.2. How is the development of neuroscience and digital leadership research in Indonesia?

Figures 14 and **15** show that research on neuroscience and digital leadership is still very rarely carried out and is still zero in Indonesia. Understanding that research on neuroscience and digital leadership is still rare and minimal in Indonesia requires some basic understanding of the state of research in that country.

(i) Lack of Focus and Priority: In Indonesia, research in the fields of social sciences and humanities, including leadership, may not yet be the main focus for many research institutions and universities. As a result, research on neuroscience and digital leadership may not have received enough attention from researchers (Septiana and Haryanti, 2023).

(ii) Limited Resources: Lack of funding and research infrastructure can be a major obstacle in promoting research in specific fields such as neuroscience and digital leadership. Research involving advanced technology or big data often requires significant investment, which may not be available at many institutions in Indonesia (Aeni and Wiwaha, 2022).

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(iii) Lack of Awareness and Education: Awareness of the importance of neuroscience in the context of leadership may also still be low among leaders and researchers in Indonesia. Additionally, the lack of specialized educational programs in this area can also be a limiting factor (Azmi *et al.,* 2021).

(iv) Limited Access to Literature and Information: Research on neuroscience and digital leadership in Indonesia may be limited by limited access to related literature and information. Much of the leading research in this field may be published in international journals that are not always easily accessible to researchers in Indonesia (Chang *et al.,* 2021).

(v) Level of Technology Readiness: Even though Indonesia has experienced rapid technological growth, there are still challenges in terms of access and mastery of technology which is often a prerequisite for research in the field of digital leadership (Adhan and Prayogi, 2021).

To address the lack of research in this area in Indonesia, ongoing efforts are needed to raise awareness, obtain financial support, strengthen research infrastructure, and increase collaboration between research institutions, universities, and industry. Thus, there will be an increase in the number and quality of research on neuroscience and digital leadership carried out in Indonesia.

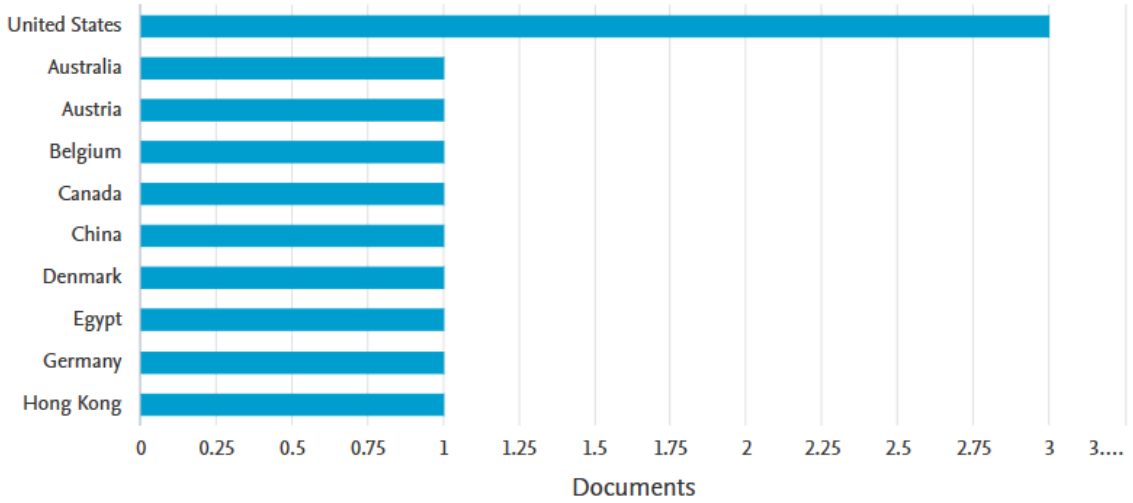


Figure 15. Development of published articles per year related to neuroscience and digital leadership (2016 – 2023).

4.1.3. How is the development of neuroscience and digital leadership research based on subject areas in the fields of business, management, and accounting?

Figure 16 shows that the subjects are business, management, and accounting. There are only 2 articles, namely the article entitled Strategic DT as a New Instrument for Leadership in Digital Transformation and A Study on Factors Influencing Leadership in the Context of Digital Transformation. The findings of the article Strategic DT as a New Instrument for Leadership in Digital Transformation show that neuroscience influences the ease of providing ideas in the context of digital transformation in the field of business management (Porfírio *et al.,* 2021). The second article, namely A Study on Factors Influencing Leadership in the Context of Digital Transformation, shows that the symbiosis between the skills and characteristics possessed by a digital leader, with the new skills possessed by a leader who is influenced by nerves, will

DOI: https://doi.org/10.17509/ijost.v9i2.67763
p- ISSN 2528-1410 e- ISSN 2527-8045

produce a leader who can use neuroscience. These leaders will have much more complex knowledge and capabilities, adapted to the new challenges faced today.

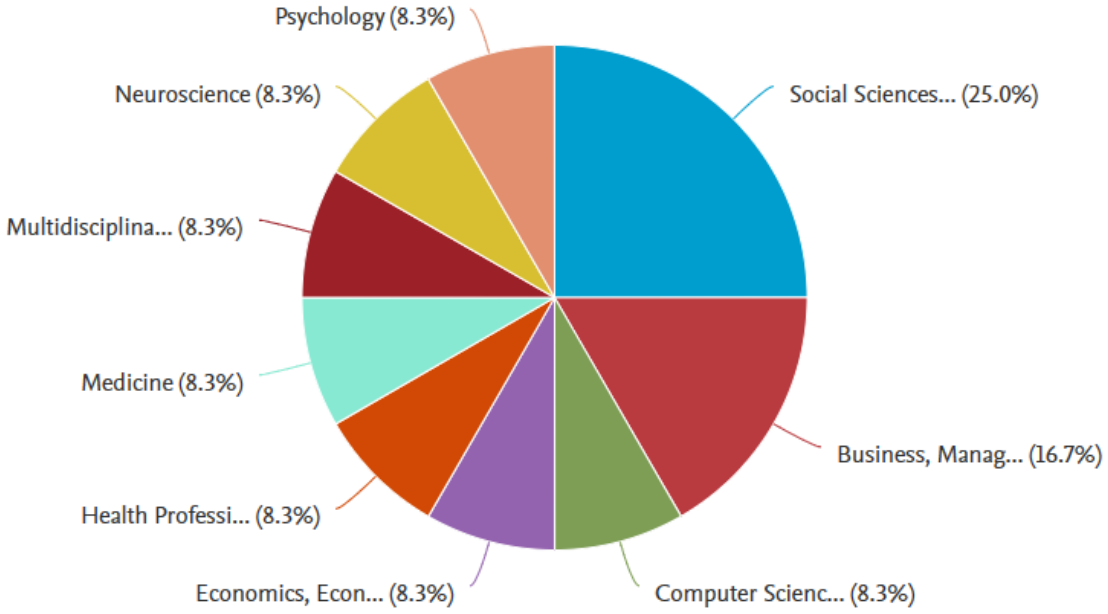
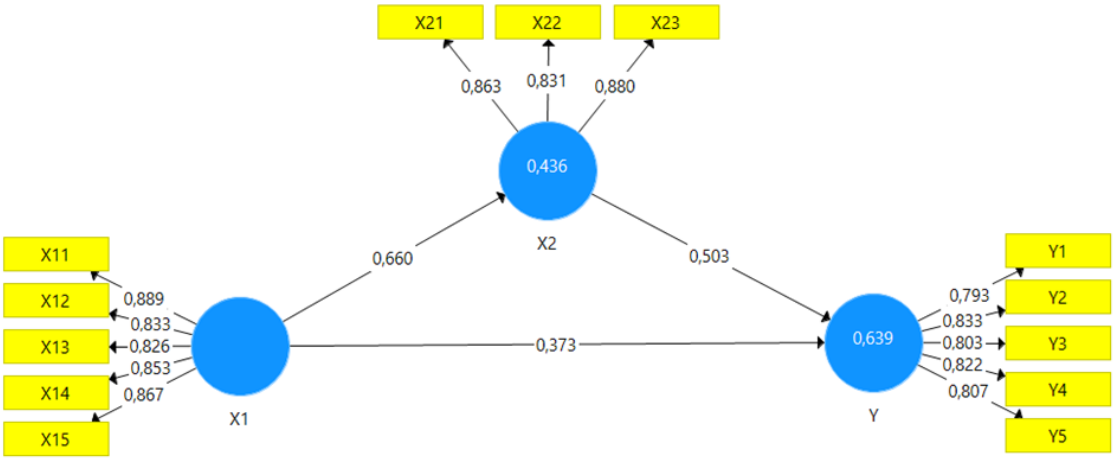


Figure 16. Development of published articles per year related to neuroscience and digital leadership by subject area (2016 – 2023).

4.2. Research Correlation in the Role of Digital Leadership in Implementing Digital Transformation and Organizational Health

The output of PLS here reported the estimated measurement and structural models based on the modeling and analysis of composite variables or indicators (see **Figure 17**).



Notes: X1 = Digital Leadership, X2 = Digital Transformation, Y = Organizational Health

Figure 17. Estimated overall model.

From the output, we can obtain the Eqs. (1,2) of this overall model.

X2 = 0.660 X1, with R-Square 0.436 (1)

Y = 0.373 X1 + 0.503 X2, with R-Square 0.637 (2)

DOI: https://doi.org/10.17509/ijost.v9i2.67763
p- ISSN 2528-1410 e- ISSN 2527-8045

In unraveling the dynamics of our model, the equations take on profound significance, offering insights into the complex interplay among Digital Leadership (X1), Digital Transformation (X2), and Organizational Health (Y). The first equation unveils a critical relationship, indicating that the Digital Transformation (X2) level is intricately tied to and influenced by Digital Leadership (X1) with a coefficient of 0.660. This relationship, encapsulated with an R-Square value of 0.436, underscores the pivotal role of Digital Leadership in shaping the trajectory of Digital Transformation within the universities.

The second equation defines organizational health (Y) in terms of both digital leadership (X1) and digital transformation (X2). Here, the coefficients of 0.373 and 0.503 represent the respective contributions of Digital Leadership and Digital Transformation to the observed values of Organizational Health. With an R-Square value of 0.637, this equation emphasizes the simultaneous impact of Digital Leadership and Digital Transformation in explicating a substantial proportion of the variability within Organizational Health. In our model, these equations crystallize the intricate relationships between digital leadership, digital transformation, and organizational health.

Table 5. presents the outer model explaining the factor loading of each construct (latent and manifest). If the value of each outer loading is above 0.7 the criteria of validity is met. In this sense, each manifest variable (dimension) reflects its latent variables. In digital leadership (X1), the dimension of 'Technological Vision and Strategy' is the most dominant, while 'Collaboration and Communication' is less dominant. Next, in digital transformation (Y), the most dominant dimension is 'Digital Engagement and Stakeholder Communication', while the less dominant is 'Administrative Efficiency and Operational Excellence'. Finally, in the variable of Organizational Health (Y), the most prominent dimension is 'Cohesiveness and Collaboration', while the subtle one is 'Goal Attainment and Performance'.

Table 5. Outer loadings.

	X1	X2	Y
X11	0.889		
X12	0.833		
X13	0.826		
X14	0.853		
X15	0.867		
X21		0.863	
X22		0.831	
X23		0.880	
Y1			0.793
Y2			0.833
Y3			0.803
Y4			0.822
Y5			0.807

Referring to the quality criteria of PLS, the Cronbach's Alpha (CA) values of all latent variables are more than 0.7, and the composite reliability (CR) values are also more than 0.7. The Average Variance Extracted (AVE) values of all latent variables are more than 0.5 (see **Table 6**). These values indicate that all constructs are reliable and valid, consistent with the construct's reliability and validity.

DOI: https://doi.org/10.17509/ijost.v9i2.67763
p- ISSN 2528-1410 e- ISSN 2527-8045

Table 6. Construct's reliability and validity.

Construct	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
X1	0.907	0.911	0.931	0.729
X2	0.821	0.824	0.893	0.737
Y	0.871	0.873	0.906	0.659

To estimate effect size, the value of f-square is used as the measure of practical significance in terms of the magnitude of the effect. These effect-size values indicate that the local effect size of each construct within the context of a multivariate regression model is significant. **Table 7** reports the effect-size value of each path.

Table 7. Effect-size value.

Path	f^2	Effect
X1 → X2	0.733	Substantial
X1 → Y	0.217	Moderate
X2 → Y	0.395	Substantial

Table 8. Recapitulation of hypotheses testing.

Path	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Hypotheses
X1 → X2	0.660	0.665	0.047	14.034	0.000	Accepted
X1 → Y	0.373	0.370	0.066	5.617	0.000	Accepted
X2 → Y	0.503	0.507	0.060	8.403	0.000	Accepted
X1 → X2 → Y	0.332	0.336	0.041	8.071	0.000	Accepted

Hypothesis 1, asserting that digital leadership positively affects digital transformation, stands confirmed as the statistical analysis reveals a significant relationship. Similarly, Hypothesis 2, positing that digital leadership positively influences organizational health, finds support in the data. The statistical evaluation showcases a notable correlation. Moving to Hypothesis 3, which asserts a positive relationship between digital transformation and organizational health, the analysis affirms this claim. A particularly intriguing finding emerges when considering Hypothesis 4, which suggests that digital transformation mediates the relationship between digital leadership and organizational health. The statistical examination upholds this proposition, revealing a mediation effect that is both significant and aligned with our initial hypothesis.

The empirical support for all hypotheses underscores the pivotal roles of digital leadership and transformation in shaping organizational health at universities in the digital era. These findings not only affirm the theoretical underpinnings of our study but also provide practical insights for organizations navigating the complexities of digital transformation and digital leadership in fostering organizational health.

DOI: https://doi.org/10.17509/ijost.v9i2.67763
p- ISSN 2528-1410 e- ISSN 2527-8045

4.3. How Does Neuroscience Influence Digital Leadership?

Neuroscience will influence a person's leadership style. The influence of neuroscience on digital leadership has become an increasingly important research focus in recent years. Several studies have identified several ways in which knowledge about brain function and human behavior can be applied in the context of digital leadership. The following are some of the main influences that have been identified:

(i) Understanding of Human Behavior: Neuroscience provides deeper insight into how the human brain processes information, responds to stimuli, and makes decisions. By understanding this, digital leaders can optimize communication, motivation, and decision-making strategies to more effectively interact with their teams.

(ii) Emotional Intelligence (EQ): Neuroscientific research has highlighted the importance of emotional intelligence in effective leadership. Digital leaders who leverage knowledge of neuroscience can develop their EQ to better understand and manage team members' emotions, and motivate them effectively.

(iii) Creativity and Innovation: Studies on the human brain have revealed how a positive work environment and good leadership support can increase creativity and innovation. Digital leaders can use this knowledge to create a work culture that stimulates creativity and innovation, as well as to design work processes that facilitate collaboration and problem-solving.

(iv) Stress Management and Well-Being: Neuroscience has highlighted the impact of stress on individual performance and well-being. Digital leaders who understand how the brain responds to stress can implement effective stress management practices in the workplace, such as employee wellness programs, flexibility in work schedules, and psychological support.

(v) Data-Powered Decision Making: Neuroscience has provided insights into how the human brain processes and makes decisions based on data. In the context of digital leadership, this knowledge can help leaders to develop more informed and measured decisions, as well as leverage data analysis to inform better strategy and decision-making. These studies, as well as further research in the fields of neuroscience and digital leadership, are helping to identify deepening connections between these two fields. By leveraging neuroscientific knowledge, digital leaders can improve their leadership skills, lead more effectively, and create a more productive and competitive work environment.

The findings suggest that when it comes to digital transformation in universities, the dimension of administrative efficiency and operational excellence makes a relatively modest contribution. Despite this, certain key practices within this dimension hold the potential to significantly impact digital transformation efforts. Ensuring the effective implementation of integrated information systems emerges as a critical factor. Universities need to carefully integrate comprehensive information systems to streamline administrative processes and bolster digital transformation (Dorofeeva *et al.,* 2019). Therefore, while the overall contribution may be modest, specific practices within administrative efficiency and operational excellence hold the key to fostering significant strides in digital transformation in the university.

Another finding is that the cohesiveness and collaboration in the universities have to be maintained because they mostly reflect their organizational health. Those aspects have to do with teamwork, communication, and collaboration (Balyer and Öz, 2018). When teams work well together, share ideas openly, and collaborate effectively, it creates a positive and

DOI: https://doi.org/10.17509/ijost.v9i2.67763
p- ISSN 2528-1410 e- ISSN 2527-8045

supportive environment. This boosts morale, enhances problem-solving, and improves overall productivity. Effective communication ensures everyone is on the same page, reducing misunderstandings. Collaborative efforts strengthen relationships, leading to a cohesive and thriving university community, and ultimately contributing to a healthier and more successful organizational ecosystem (Farooq *et al.,* 2017). Unfortunately, not all universities attained the predetermined objectives and excellent performance in a specific period. It has something to do with lower achievement of several Key Performance Indicators (KPIs). The variability of 'digital knowledge' among the university's employees could be the root of the problem (Wang and Wang, 2020).

Regarding the relationship among variables, we found that digital leadership positively affects digital transformation. It means that leaders who are effective in understanding the technological vision and strategy, cultural transformation, collaboration and communication, data-informed decision-making, and educational technology integration can escort the effective implementation of digital transformation in universities. This finding confirms several previous studies regarding the positive impact of digital leadership on digital transformation (Antonopoulou *et al.,* 2020; Araujo *et al.,* 2021; Schwarzmüller *et al.,* 2018). Aligning with previous studies, this reinforces the importance of nurturing digital leadership capabilities for a seamless transition to the digital era in higher education, ensuring universities stay innovative and responsive to evolving digital transformation.

Besides that, we also found that digital leadership positively affects organizational health. Focusing on the alignment with organizational objectives, digital leaders can adjust their leadership orientation to be more digitalized (Cortellazzo *et al.,* 2019) and can achieve the optimum organizational health at their universities. The finding validated several previous studies that digital leadership has a positive influence on organizational health (Alfy *et al.,* 2023; Singh, 2021; Singh and Jha, 2018; Thapa and Cohen, 2023). This discovery highlights that digital leadership, particularly in aligning with organizational objectives, positively impacts organizational health in universities. Leaders adapting their orientation to be more digitalized can foster optimum organizational well-being. This aligns with prior research, affirming the positive influence of digital leadership on organizational health. The implication underscores the significance of cultivating digital leadership qualities, emphasizing the need for leaders to align their strategies with organizational goals to enhance overall health and effectiveness within the university.

Applicable digital transformation will lead to the optimum organizational health of universities. Embracing practical digital transformation is key for universities to achieve their best organizational health. It enhances efficiency, innovation, and adaptability. This implies that investing in relevant digital changes ensures universities thrive in the digital era, fostering a healthy, resilient, and effective organizational environment (Harjanti & Gustomo, 2017). Finally, we discovered that organizational health can be affected both by digital leadership and digital transformation. The finding corroborated the previous discovery from relevant authors (Alashkar & Al-Kasasbeh, 2022; Harjanti & Gustomo, 2017; *Lehmann et al.,* 2019; Ramezanpour, 2020; Singh, 2021) regarding the effect of digital leadership and digital transformation on organizational health at universities. This underscores the interconnectedness of digital leadership and transformation in fostering a healthy organizational milieu within universities.

5. CONCLUSION

The empirical backing for all hypotheses highlights the crucial contributions of digital leadership and transformation to shaping organizational health within universities in the

DOI: https://doi.org/10.17509/ijost.v9i2.67763
p- ISSN 2528-1410 e- ISSN 2527-8045

digital age. These results not only validate the theoretical foundation of our study but also offer valuable practical insights for organizations managing the challenges of digital transformation and leadership to promote organizational health at universities. The study confirms that digital leadership and digital transformation have a positive impact on organizational health in universities. Embracing practical digital transformation and developing digital leadership capabilities are crucial for universities to stay innovative and responsive to evolving digital transformation. Moreover, aligning digital leadership strategies with organizational goals can foster optimum organizational well-being. The findings underscore the interconnectedness of digital leadership and transformation in fostering a healthy organizational milieu within universities. Therefore, universities have to pay attention to relevant digital changes, and cultivating digital leadership qualities is vital for universities to thrive in the digital era and enhance overall health and effectiveness. From many publications in Google Scholar-indexed journals, it can be seen that research regarding the role of digital leadership in implementing digital transformation and organizational health is still relatively rarely studied every year, especially in the last 8 years (2018-2023). The development of research related to the role of digital leadership in the implementation of digital transformation and organizational health has increased from 2015 to 2020. This increase can be seen from the number of 13 publications in 2018 increasing to 2020 producing 108 publications. After that, it finally experienced a drastic decline again in the last 3 years, namely in 2021 there were 105 articles, in 2022 there were 57 articles, and in 2023 there were 15 articles. Data shows that the popularity of research on the role of digital leadership in implementing digital transformation and organizational health tends to be unstable.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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