LUHMANN'S SYSTEMS THEORY APPLIED TO DATA PROTECTION IN THE DIGITAL AGE: A MULTIPLE CASE STUDY IN TECHNOLOGY COMPANIES

https://doi.org/10.56238/sevened2024.029-014

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ABSTRACT

The present work aimed to analyze the application of Niklas Luhmann's Systems Theory in data protection in the digital age, identifying its contributions to the understanding and regulation of this field in technology organizations. It sought to present the concepts of Niklas Luhmann's Systems Theory, as well as the principles of data protection in the digital age and the intersection between these two areas. The methodology used was the documentary analysis and the study of multiple cases, carried out in documents available on the internet of technology organizations selected according to their relevance in the sector. Thus, the following organizations were chosen: Google, which makes its data protection measures available through documents such as Google *Privacy Policy* , Google *Safety Center* , and *Google Cloud* Compliance; Microsoft, with its data protection measures set forth in the Microsoft *Privacy Statement* , *Microsoft Purview Compliance Manager* , and *Microsoft 365 Guidance for Security &* Compliance; Netflix, which provides information on security and privacy best practices for data protection in its *Netflix Partner Help Center* ; and Cisco, which, through the *Cisco Trust* Center and *Cisco* Security, provides documents related to data privacy. The research concluded that Luhmann's theory, with its concepts of autopoiesis, operational closure, self-referentiality, communication, structural coupling, interpenetrations, and allopoiesis, provides a robust framework for understanding how these companies manage and protect user data.

Keywords: Niklas Luhmann's Systems Theory. Data Protection. Digital. Multiple Case Studies. Organizations Technology.

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INTRODUCTION

The digital age has brought with it a number of challenges and opportunities in the field of personal data protection. With the exponential increase in the volume of data generated and shared on a daily basis, critical questions about privacy, security, and regulation arise. In this context, Niklas Luhmann's Systems Theory offers an innovative perspective to understand and address these questions. Developed in the twentieth century, Luhmann's Systems Theory proposes that social systems operate autopoietically, that is, they are capable of self-reproducing and maintaining their operations independently of their external environment, while interacting with it in a complex way.

The application of Systems Theory to digital law, specifically to data protection, allows for a deeper analysis of the internal mechanisms and interactions between different social and technological systems. According to Luhmann (1995), social systems are composed of communications that self-reproduce through connection with other communications. This focus on communication as the basic unit of social systems provides insights into understanding how data protection laws and regulations can be developed and implemented effectively.

In Luhmann's Systems Theory, communication is considered the fundamental operation of social systems. Unlike traditional approaches, Luhmann (1995) sees communication not as an act of transferring information between individuals, but as a self-referential process that produces and reproduces the social system itself. According to Luhmann (1995), communication is the operation that generates the social system by establishing connections between communications. This focus highlights the centrality of meaning, which is continuously produced and reproduced through communicative operations.

This work, therefore, seeks to deepen the understanding of these core concepts of Niklas Luhmann's Systems Theory and analyze their application in data protection in the digital age, with the following research problem: how can Luhmann's Systems Theory be applied to data protection in the digital age to create more effective and resilient protection systems in technology organizations? Although there are studies on data protection and Luhmann's Systems Theory separately, there is a lack of research that integrates these two fields, exploring how Luhmann's (1995) concepts can be applied to improve data protection. By understanding how social systems self-organize and communicate, it is possible to develop more effective approaches to the regulation and protection of personal data in an increasingly complex and interconnected digital environment.

Thus, the objective of this research is to analyze the application of Niklas Luhmann's Systems Theory in data protection in the digital age, identifying its contributions to the understanding and regulation of this field in technological organizations. This research is relevant because it addresses the urgent need to protect personal data in an increasingly digitized world, using an innovative theoretical approach that can offer new perspectives and solutions.

This article is organized as follows: section 2 presents the literature review; Section 3 describes the methodology used; Section 4 analyzes and discusses the results; and section 5 concludes with the main findings and implications of the research.

LITERATURE REVIEW

LUHMANN'S SYSTEMS THEORY

Definition and main concepts

Niklas Luhmann's Systems Theory proposes that society is composed of a series of autonomous systems that operate in a self-referential manner. These systems, such as legal, economic and scientific, are defined by their own operations and are operationally closed, which means that they can only be influenced internally and not directly by external events (LUHMANN, 1995). This approach allows systems to maintain their identity and stability, even in the face of external disruptions. Luhmann (1995) argues that this autopoiesis is essential for the survival and evolution of social systems.

Communication is central to Luhmann's theory and is seen as the basic operation that underpins social systems. For Luhmann, communication is not merely an exchange of information, but a process that builds and rebuilds social systems. He describes communication as a combination of three selections: information, expression and understanding, which together form an autonomous process that maintains the social system (LUHMANN, 1984). Language, while important, is only one part of this process, serving as a medium that facilitates complexity and differentiation within the system.

In addition, Luhmann (1997) introduces the concept of functional differentiation in which different social systems specialize in different functions, each operating according to its own internal logic. For example, the legal system works on the basis of the legal/illegal binary code, while the economic system operates on the basis of the pay/non-pay code (LUHMANN, 1997). This functional differentiation allows for greater complexity and efficiency within society, as each system can focus on its specific function without direct interference from other systems.

Niklas Luhmann's (1997) Systems Theory is a sociological approach that defines communication as the basic operation of social systems. Luhmann argues that communication is an autonomous process that creates and sustains these systems in which language plays a crucial role in the construction of meaning and internal differentiation (MAURER, 2010). Communication, according to Luhmann (1997), is essential to reduce the complexity of the social world, selecting and combining information in ways that make sense within the system. Thus, communication is not only a means of transmitting information, but a process that constitutes the social system itself.

Autopoiesis and Communication

A central concept in Luhmann's theory (1997) is autopoiesis, which refers to the ability of systems to reproduce and maintain themselves through their own operations. For social systems, this means that they are operationally closed, functioning on the basis of their own communications and not being directly influenced by external events. This operational closure allows the systems to maintain their identity and stability, even in the face of external disturbances (MAURER, 2010). Autopoiesis highlights the importance of self-reference and the autonomy of social systems.

In the context of ecological communication, Luhmann (1995) applies his theory to understand how social systems interact with the environment. Jacob A. Miller (2022), by integrating Luhmann's communication theory with J.D. Peters' concept of the "communication bottleneck", addresses the challenges in communicating about climate change mitigation. Miller (2022) argues that ecological communication should be demoralized, that is, addressed without the moral burden traditionally associated with environmental issues. This allows for a more objective and systematic analysis of societal responses to climate change.

Complexity and contingency are fundamental aspects of Luhmann's theory, emphasizing that communicative operations are always contingent and depend on the internal conditions of the systems. Miller (2022) applies this perspective to analyze the complexity of social responses to climate change, highlighting how different systems (scientific, political, and economic) respond according to their own internal logics. This approach helps to understand why communicating about climate change can be so challenging and fragmented.

Finally, the autonomy of systems is a crucial principle in Luhmann's theory. Each system operates autonomously, according to its own operations and internal logic. This autonomy is essential for understanding how social systems communicate and interact with

the environment and with each other (MAURER, 2010). Luhmann's theory offers a powerful tool for analyzing complex social phenomena, such as data protection in the digital age and climate change mitigation, providing a clear view of the interdependence and autonomy of social systems.

In the article "The Democratic Ideal vs. Luhmann's Autopoietic Systems in Adult Education" (2017), written by Jeffrey Zacharakis, the author uses the context of adult education to argue that autopoiesis implies that educational systems should be seen as autonomous entities that evolve according to their internal dynamics, without directly depending on external influences. Zacharakis (2017) compares this to democratic ideals, suggesting that while democracy strives for inclusion and direct participation, Luhmann's autopoietic approach emphasizes the need for continuous adaptation and self-referentiality to respond effectively to learners' needs.

Vessela Misheva, in "Luhmann's Systems Theory and the Question of the Mass Media" (2005), applies Luhmann's systems theory to the field of mass media, highlighting how communication serves as the basic operation that underpins social systems. According to Luhmann, communication is composed of three essential selections: information, expression and understanding. Misheva (2005) explores how mass media functions as an autopoietic system, producing and reproducing communications that are self-referential and operationally closed. This operational closure allows mass media to create and maintain a reality of their own, influencing public perception according to the internal dynamics of the media system, rather than being directly shaped by external factors.

David Seidl, in "Luhmann's Theory of Autopoietic Social Systems" (2004), provides a comprehensive overview of Luhmann's theory of autopoietic systems, with a special focus on autopoiesis and communication. Seidl (2004) explains that social systems are autopoietic to the extent that they are capable of producing and reproducing their own constituent elements through their internal operations. Communication, in this context, is the central operation that allows social systems to maintain their cohesion and continuity. Each communicative act, by selecting and combining information, expressions, and understandings, contributes to the stability and adaptability of the social system, allowing it to respond to a complex environment while maintaining its identity and functionality.

Communication, as defined by Luhmann, is not merely an exchange of information, but an emergent and dynamic process that constitutes and sustains social systems. Jeffrey Zacharakis (2017) argues that in adult education, this view of communication emphasizes the need for education systems to be able to continuously adapt to changes and the needs of learners while remaining self-referential and operationally closed. This is in contrast to

traditional democratic ideals, which often emphasize direct participation and inclusion, suggesting that an autopoietic approach can offer a more resilient and responsive form of educational management.

Finally, the application of Luhmann's theory to the field of mass media, as discussed by Vessela Misheva (2005), demonstrates how autopoietic communication can create a reality of its own within specific systems. Mass media, by operating in a self-referential manner, shapes public perception and social reality through its own communicative processes. This approach highlights the importance of autonomy and operational closure of social systems in maintaining their identity and managing environmental complexity, as explored by David Seidl (2004). These concepts are fundamental to understanding the dynamics of social systems in Luhmann's theory, offering valuable insights into autopoiesis and communication.

Application in Different Fields (e.g., Sociology, Law)

Niklas Luhmann's systems theory is applied in a significant way in the field of law and sustainability, as explored in the work "Hermeneutics of Sustainability from the Perspective of the Brazilian Federal Constitution" (SILVA et al., 2017). In this work, the theory is used to understand how the Brazilian Constitution can be seen as an autonomous system that responds to sustainability issues through its own legal structures and processes. Luhmann suggests that legal systems are autopoietic, that is, capable of self-reproducing and maintaining their internal operations. Legal communication is essential for the implementation and maintenance of sustainability policies, highlighting the interdependence between social and environmental systems, and how these legal systems adapt to incorporate new social demands.

In the field of legal and social philosophy in Argentina, "The Adoption of Niklas Luhmann's Systems Theory in Argentine Legal and Social Philosophy" (PRICE, 2014) discusses the adoption of Luhmann's systems theory to understand the complexity of legal and social systems. The theory is applied to show how legal systems function in a self-referential and autopoietic manner, operating independently of direct external influences, but still interacting with other social systems, such as economic and political ones. This work highlights the importance of the functional differentiation of systems, where each one fulfills its specific role in an interdependent but autonomous way, allowing for a more in-depth analysis of how laws and policies are formulated and implemented within the Argentine context.

Finally, in the field of legal semiotics, Claudius Messner, in "Luhmann's Judgment" (2013), and Kathrin Maurer, in "Communication and Language in Niklas Luhmann's Systems Theory" (2010), apply Luhmann's theory to explore how legal and communication systems operate. Messner (2013) focuses on how legal judgments are formed through autopoietic communicative operations, highlighting the autonomy of legal systems while responding to the demands of society. Maurer (2010), in turn, addresses how communication is the basic operation that sustains social systems, with language facilitating the complexity and internal differentiation of these systems. These works demonstrate the versatility of Luhmann's theory, applying its principles to understand the autonomy, interdependence, and functionality of social systems in different contexts.

DATA PROTECTION IN THE DIGITAL AGE

Evolution of data protection legislation

The General Data Protection Regulation (GDPR) was proposed by the European Commission on January 25, 2012 as part of a comprehensive reform of the European Union's data protection rules. The aim was to harmonize data protection laws across the EU, give citizens more control over their personal data, and modernize regulation to reflect technological changes and globalization. The need to reform the 1995 Data Protection Directive (Directive 95/46/EC) arose due to the rapid transformations in the digital landscape and the growing importance of personal data in the digital economy. After intense negotiations between the European Parliament, the Council of the European Union, and the European Commission, the GDPR was officially adopted on April 27, 2016. The Regulation entered into force on 24 May 2016, with a transition period of two years, and will be fully applicable from 25 May 2018.

The GDPR, as it is usually written in acronym, replaced the 1995 Directive and established a single set of rules applicable to all companies operating in the EU, regardless of their geographical location, as long as they handle personal data of EU residents. The regulation introduced several key innovations, including the principle of "explicit consent" for the processing of personal data, the right of individuals to access and correct their data, the right to be forgotten, and the obligation to notify data protection authorities and affected individuals in the event of a data breach. In addition, the GDPR has significantly increased penalties for non-compliance, providing for fines of up to €20 million or 4% of the company's global annual revenue, whichever is greater.

The impact of the GDPR has been global, influencing data protection legislation in several other regions and countries, which have gone on to adopt similar regulations to

protect the privacy of their citizens. The implementation of the GDPR marked an important milestone in the protection of personal data, setting high standards that aim to ensure security and privacy in the digital age.

In addition to the General Data Protection Regulation (GDPR) in the European Union, many countries have implemented their own robust data protection laws. In the United States, for example, the California Consumer Privacy Act (CCPA) establishes privacy rights similar to those in the GDPR for California residents. In Brazil, the General Data Protection Law (LGPD) came into force in 2020, creating a comprehensive framework for the protection of personal data in the country. Other examples include the Personal Information Protection Act (PIPA) in South Korea, Singapore's Personal Data Protection Act (PDPA), and Australia's Data Privacy Act (1988). These legislations share common principles, such as the need for explicit consent for data processing, the right of individuals to access and correct their information, and the obligation of companies to protect data from unauthorized access and breaches. The differences between these laws reflect cultural and legal variations, but they all have the common goal of protecting the privacy of individuals and ensuring that personal data is handled ethically and securely.

Niklas Luhmann's systems theory is central to understanding the complexity involved in data protection in the digital age. In the book "The General Data Protection Regulation: A Law for the Digital Age?" (2017), L. Mitrou explores GDPR as a robust legal response to the new demands of the digital age. The GDPR is seen as an effort to regulate communication and the flow of information in an interconnected environment. Mitrou (2017) highlights fundamental principles, such as transparency, consent, and the right to be forgotten, which are essential to ensure the privacy of individuals' data. These principles reflect Luhmann's view of the need for autonomous, self-referential legal systems that can manage complexity and ensure regulatory efficiency.

Mikael Knutsson, in "Compliance with the General Data Protection Regulation: An Exploratory Case Study on Business Systems' Adaptation" (2017), addresses how companies are adapting their systems to comply with the GDPR. The book highlights the importance of robust information systems and internal compliance procedures, emphasizing the need for autopoiesis — the ability of business systems to self-organize and evolve to maintain regulatory compliance. Knutsson (2017) argues that adapting to the GDPR is not just a matter of implementing new technologies, but also of creating an organizational culture that values data privacy and security. This perspective is in line with Luhmann's theory, which sees social systems as autonomous and self-referential, capable of continuously adapting to changes in the regulatory environment.

Eleni Tzoulia, in "Targeted Advertising in the Digital Era: Modern Challenges to Consumer Privacy and Economic Freedom" (2020), analyzes the challenges of targeted advertising in the digital age and its implications for consumers' privacy. The work discusses how the massive collection of personal data for personalized advertising can compromise individual privacy. Tzoulia (2020) examines the European Union's legal responses, including the GDPR, which aims to ensure that data collection and processing are transparent and based on informed consent. The application of Luhmann's theory in this context highlights how legal and economic systems interact and adapt to new technological realities, maintaining their autonomy and functionality. This illustrates the importance of regulation to protect privacy while enabling cost-effective innovation.

Tuz (2023), in "Data Privacy and Security: Legal Obligations for Businesses in the Digital Age," explores the legal obligations of businesses regarding data privacy and security in the digital age. Tuz (2023) emphasizes the need for companies to implement robust security measures to protect personal data from cyber threats and comply with data protection laws, such as GDPR. The autopoietic approach suggests that companies should develop and maintain internal systems that ensure ongoing compliance. This aligns with Luhmann's view of the self-referentiality of social systems, where each system must be able to adapt and evolve independently, maintaining its internal cohesion while responding to external demands.

Finally, Christian Mattheis, in "The System Theory of Niklas Luhmann and the Constitutionalization of World Society" (2012), discusses the application of Luhmann's theory in the context of the constitutionalization of global society. Mattheis (2012) suggests that the principles of Luhmann's theory, such as autopoiesis and operational closure, can be applied to understand the formation of a global regulatory order, such as the one established by the GDPR. This perspective suggests that global legal systems operate in an autonomous and self-referential manner, creating regulatory frameworks that adapt and respond to global data protection needs, while maintaining their own cohesion and identity. The application of Luhmann's theory provides a robust theoretical framework for analyzing how regulatory systems can evolve to meet the challenges of the digital age, ensuring the protection of personal data in an increasingly interconnected world.

Caixia Zou and Fanyu Zhang (2022) discuss the importance of the right to interpretation of algorithms as a key step towards algorithmic governance. The work highlights how the transparency and interpretability of algorithms are crucial to protect personal data and ensure the accountability of automated decisions. The application of Luhmann's theory suggests that regulatory systems should be able to self-organize to

include norms that govern the use of algorithms, while maintaining transparency and protection of personal data.

These works provide a comprehensive overview of how Luhmann's systems theory can be applied to understand and manage data protection in the digital age, highlighting the importance of autopoiesis, communication, and the autonomy of legal and organizational systems in the digital age.

INTERSECTION BETWEEN SYSTEMS THEORY AND DATA PROTECTION

Existing approaches that integrate systemic theories with data protection

Yishi Wu, in "Balancing Data Protection and Data Utilization: Global Perspectives and Trends" (2024), explores the balance between data protection and utilization from a global perspective. Wu (2024) applies Luhmann's theory to argue that social systems — such as legal, economic, and technological — operate in an autonomous and self-referential manner, but are interdependent in managing the complexity associated with data protection. The autopoiesis of legal systems is crucial to create norms that guarantee the protection of data while allowing its use for innovation and economic development. This balance is necessary to maintain the functionality of systems in an ever-evolving digital environment.

Selita Facts, in "Justice in the Genomic and Digital Era: A 'Different World' Requiring 'Different Law'" (2020), addresses the legal and ethical challenges in the genomic and digital age, highlighting the need for new legal approaches. Selita (2020) uses Luhmann's systems theory to explain how legal systems must evolve autopoietically to deal with the new challenges presented by digitalization and genomics. Luhmann's theory offers a framework for understanding how legal systems can maintain their autonomy and functionality while incorporating new norms and regulations that respond to technological and societal changes while adapting to the complexities of a rapidly changing world.

Emerson Palmieri, in "The Media and the Social Order in Niklas Luhmann" (2020), explores the role of media in maintaining social order through the lens of Luhmann's systems theory. Palmieri (2020) argues that the media, as an autopoietic social system, influences public perception and the formation of social norms, including those related to data protection. The media plays a crucial role in communicating and disseminating information about data protection, shaping public opinion, and influencing policies and regulations. Luhmann's theory helps to understand how the media operates in a self-referential manner, maintaining its autonomy while interacting with other social systems, such as the legal and technological systems.

The study "The Implementation of the Integrated System of Archival Description (ZoSIA) at the State Archives in Katowice and the Data Protection" (LASKOWSKA and HAJEWSKI, 2019) addresses the implementation of the Integrated Archival Description System (ZoSIA) and its implications for data protection. Luhmann's theory is applied to understand the management of archival data in an institutional context, where the implementation of ZoSIA is analyzed as an autopoietic process. This archiving system adapts and evolves to ensure data protection while maintaining the integrity and accessibility of information. Luhmann's theory provides a framework for analyzing how archival systems operate autonomously, but need to interact with legal and technological systems to comply with data protection requirements.

These works demonstrate how Luhmann's systems theory can be applied to understand the intersection between data protection and various social fields in the digital age, highlighting the importance of autopoiesis, autonomy, and interdependence of social systems.

Potentialities and limitations of this intersection

Niklas Luhmann's Systems Theory offers a powerful framework for understanding the complexity and dynamics of social systems in the digital age. Angela Valeo and Kathryn Underwood, in "Analysis of Special Education Tribunal Outcomes Using Luhmann's Systems Theory" (2015), use Luhmann's theory to analyze outcomes of special education tribunals, demonstrating how education systems can adapt and evolve through autopoietic processes. This approach is relevant to data protection, in which legal and technological systems need to constantly adjust to new regulations and technological innovations, maintaining their internal cohesion and responsiveness to external challenges.

Arun Teja Polcumpally, in "Artificial Intelligence and Global Power Structure: Understanding Through Luhmann's Systems Theory" (2022), applies Luhmann's theory to understand the global power structure in relation to artificial intelligence. Luhmann's theory highlights the ability of social systems to self-organize and adapt to the increasing complexity brought about by artificial intelligence and *big data*. In the context of data protection, this perspective helps to identify how legal, economic, and technological systems can interact and adapt to protect personal data, while also taking advantage of the benefits of artificial intelligence. The construction of second-order observations makes it easier to understand the complex interactions between these systems.

Jacob A. Miller, in "Demoralizing: Integrating J.D. Peters' Communication "Chasm" with Niklas Luhmann's (1989) Ecological Communication to Analyze Climate Change

Mitigation Inaction" (2022), discusses how Luhmann's theory can be applied to understand ecological communication and inaction in relation to climate change mitigation. This approach can be transferred to data protection, highlighting the importance of communication and transparency between systems to address global challenges. Luhmann's theory can help identify gaps in communication and promote greater collaboration between social systems to improve data protection and privacy, encouraging a more integrated and effective approach.

However, despite its potential, Luhmann's Systems Theory has some limitations when applied to data protection in the digital age. The analysis of Angela Valeo and Kathryn Underwood (2015) points out the difficulty of translating complex theoretical concepts into effective and concrete practices. In the field of data protection, this means that the theory may not provide clear guidelines for implementing privacy and security policies. In addition, Luhmann's emphasis on the autonomy and self-referentiality of social systems, as highlighted by Arun Teja Polcumpally (2022), can lead to underestimation of the influence of external and intersystemic factors. Finally, Jacob A. Miller (2022) notes that the demoralization of communication, a feature of Luhmann's theory, can be problematic in data protection, where ethical and moral considerations are essential for formulating policies that protect the rights of individuals.

METHODOLOGY

In this session, the typologies used to carry out the research, the collection, analysis and treatment of data, the delimitation of the study, population and sample and the methodological procedures for the application of the case study will be described.

TYPOLOGY OF RESEARCH

This work is an empirical research, characterized as descriptive, because, according to Gil (2009), the main objective of this type of research is to describe characteristics of a given population or phenomenon. The present research seeks to demonstrate the organizations that have implemented robust data protection measures, in the theoretical light of Luhmann's principles.

Regarding the typology characterized as a case study, Silva (2006, p. 57) states that "it is a study that analyzes one or a few facts in depth". The initial ideas for the case study arise, first, with the scope of the study, which is configured as an empirical investigation. According to Yin (2010, p. 39), the case study "investigates a contemporary phenomenon in depth and in its real-life context, especially when the boundaries between the phenomenon

and the context are not clearly evident". In other words, the case study seeks to deepen the knowledge about a certain phenomenon; In this case, the research deepens the knowledge about information security.

The type of case selected was the multiple case study, considering:

1) Technology Sector Organizations;
2) Four main units of analysis: selected companies from among the world's largest technology companies.

For the selection of companies, the following criteria were applied: (i) leading companies in the technology sector; (ii) companies from developing or emerging countries; (iii) availability and completeness of data protection information for the purposes of the comparative analysis made available on its websites. According to Yin (2010), multiple case studies are more convincing than single case studies, due to the logic of replication of the object of analysis in different contexts.

The approach to the problem is considered qualitative, because, in this type of study, according to Sampieri et al. (2013, p. 376), it seeks to "understand and deepen the phenomena, which are explored from the perspective of the participants in a natural environment and in relation to the context". These same authors characterize the qualitative approach as understanding, describing and interpreting the phenomena, through the conceptions and meanings obtained by the experiences of the participants, aiming to understand the experiences, points of view and opinions of the individuals in the face of the phenomenon studied.

As for the procedures, the research will be conducted through a multiple case study. As mentioned by Collis and Hussey (2005, p. 73), citing the work of Scapens (1990), entitled "Researching Management Accounting Practice: The Role of Case Study Methods", the author lists the types of studies and cites: descriptive, illustrative, experimental and, finally, explanatory case studies, in which the existing theory — in this study, Niklas Luhmann's theory of systems — is used to understand and explain data protection in the digital age, identifying their contributions to the understanding and regulation of this field in technology organizations.

METHODOLOGICAL PROCEDURES

The cases were selected on the internet with the criterion that they were technology organizations that made documents and data protection implementation measures available on their websites, allowing an analysis according to Niklas Luhmann's Systems Theory. Methodologically, the samples were non-probabilistic, which, according to Sampieri

et al. (2013, p. 405-406), are known as "guided by one or several purposes". This same author classifies the types of samples, and the sample of specialists was chosen, with the participation of a specialist in the area of public management and accounting of the public sector.

To provide greater consistency and reliability in the information collected, some criteria were used for the selection of the respondent, among which were documents implementing data protection measures that contained: encryption and security; privacy policies; control tools; compliance; and other additional information that could be analyzed according to the theory.

DATA COLLECTION AND ANALYSIS

Data collection was carried out in two moments. In the first stage, a search was carried out for articles in the semanticscholar.org with the keywords: data protection, digital age and Luhmann's theory, filtering by the category "Law". More than 89 articles were selected, which were transferred to Zotero so that those could be chosen that, after the analysis of their abstracts, would support the literature review. The inclusion criteria were articles seminal to the study of systems theory and the keywords requested. As an exclusion criterion, articles published before the 2000s were disregarded, due to the non-dissemination of the internet, which occurred only in later years.

In the second moment of this research, the technique of document data analysis was used. According to Caulley (1981 apud LÜDKE and ANDRÉ, 1986, p. 38), [...] documentary analysis seeks to identify factual information in documents based on issues or hypotheses of interest. Thus, it was possible to analyze the application of Niklas Luhmann's Systems Theory in data protection in the digital age, identifying its contributions to the understanding and regulation of this field in technology organizations. The option for this relationship between the documents and the literature review allowed the establishment of a fruitful dialogue between the digital protection policies of the chosen organizations and Luhmann's theory of systems, showing the dynamics and evolution of concepts and discussions about data protection, which were transformed into policies within the organizations, with the intention of disseminating a digital organizational culture.

ANALYSIS AND DISCUSSION OF THE RESULTS

This section of the article consists of demonstrating the results obtained and data analysis, which were structured as follows: Presentation of the selected organizations and subsequently, analyze and correlate aspects of the application of Niklas Luhmann's

Systems Theory in data protection in the digital age in these organizations such as: Autopoiesis; Operational Closure; Self-referentiality; communication; structural coupling and Alopoiesis.

GOOGLE

Google was founded in September 1998 by Larry Page and Sergey Brin while they were doctoral students at Stanford University. The initial goal was to develop a more efficient search engine, which resulted in the creation of one of the most widely used search engines in the world. Over the years, Google has expanded its operations to include a vast array of products and services, such as Android, YouTube, Google Maps, and Google Cloud.

The company has become one of the most valuable in the world, with a market value that often exceeds a trillion dollars. Google's customers range from individual users who use its free services to large corporations who rely on its cloud and digital advertising solutions to operate efficiently. Alphabet Inc. (GOOGL), the parent company of Google, has an estimated market value of approximately $2.16 trillion, with an enterprise value of about $2.05 trillion, according to the Stock Analysis website.

The first case of an organization to be analyzed regarding the implementation of robust data protection measures, under the lens of Luhmann's Theory, is Google. In the document available on its website, entitled "Google Privacy Policy", updated and effective as of March 28, 2024, all information about the data collection carried out by the organization is available.

In the first context used by Luhmann's theory, one of the most important concepts is autopoiesis. In this context, Google's privacy policy details how the company collects, uses, and protects user data, demonstrating its ability to create and maintain its own operations in a self-sustaining manner. This system is designed to continuously adapt to changes in the regulatory and technological environment, reflecting autopoiesis, where the system organizes and evolves based on its own internal dynamics.

As for the operational closure, it can be seen that Google's data protection practices are defined internally, with little direct influence from external factors, except with regard to regulatory compliance. This operational closure allows Google to maintain control over its data protection operations, ensuring that they are consistent and aligned with its own policies and procedures, insulated from direct external influences (MICROSOFT, 2024a).

Two other important issues are self-referentiality and communication from the Luhmannian perspective. In the first aspect, Google often refers to its own policies and

procedures to justify its data protection practices. This self-referentiality is crucial for maintaining the internal consistency and credibility of the system, as it provides a clear and stable basis on which data protection operations are carried out, as well as ensuring that practices are continuously aligned with the company's internal principles and standards.

In the second aspect, communication is a central element in Google's privacy policies, where the company uses clear and transparent language to inform users about its data collection and use practices. Tools like Google Dashboard and My Account allow users to control their privacy settings, fostering a continuous cycle of feedback and adaptation. This reinforces trust and transparency, essential elements for the sustainability of the data protection system (MICROSOFT, 2024b).

In the theory presented, structural coupling can be observed at Google when adapting to data protection regulations and compliance best practices, using the latest ISO/IEC certificates, SOC reports, and self-assessments. This allows the company to more securely utilize Google Cloud or Google Workspace, demonstrating how the system adjusts to external influences while maintaining its own identity. These Google compliance policies also reflect the interpenetrations by integrating data protection practices with other systems, such as legal and technological, ensuring a holistic approach to data privacy and security (MICROSOFT, 2024c).

Allopoiesis, although Google focuses on autopoiesis, can be seen in its interaction with external regulations. This interaction is seen as allopoiesis, where external adaptations are incorporated to maintain the system's compliance and functionality. For example, the judiciary, through a judicial decision, determines that the organization complies quickly, invoking a law or decree established in the country.

MICROSOFT

Microsoft Corporation was founded in 1975 by Bill Gates and Paul Allen, initially developing software for personal computers, including the famous MS-DOS operating system. With the launch of Windows in 1985, the company revolutionized the PC market, becoming one of the largest and most influential players in the technology industry. Over the years, Microsoft has diversified its products and services, including Microsoft Office, Azure (cloud platform), Xbox (game console), and LinkedIn (professional social network), in addition to acquiring GitHub (software development platform). In 2023, Microsoft's market cap is estimated to be approximately 2.5 trillion dollars, making it stand out as one of the most valuable companies in the world. Microsoft's customer base is extensive and varied, ranging from individual consumers to large corporations and government institutions,

cementing its position as a global leader in technology, according to the Stock Analysis website.

As for Microsoft's documents from the perspective of Luhmann's Systems Theory, autopoiesis can be seen in the company's privacy statements, including the *Microsoft Privacy* Statement, which highlights the information contained in the privacy reports, as well as cross-country strengthening commitments on data protection. Also noteworthy are Microsoft *365 Guidance for Security & Compliance* and *Microsoft Purview Compliance Manager* , which demonstrate the company's ability to build and maintain a self-sustaining data protection system. This system continuously adapts to regulatory and technological changes, showing how Microsoft organizes its operations internally to ensure the protection of user data.

Operational Closure and Self-Referentiality are concepts that can be analyzed in the light of theory. The first refers to Microsoft's data protection practices, which are defined internally and operate in isolation from direct external influences. This ensures that Microsoft's lockbox maintains its internal coherence and functionality. The company establishes its standards and procedures to manage data securely and efficiently, minimizing external interference, except for regulatory compliance issues.

In the second case, Microsoft often refers to its own policies and procedures to justify and guide its data protection practices. This self-referentiality is crucial to maintain the consistency and credibility of the system, as the company uses its policies as a constant reference, ensuring that all actions and decisions related to data privacy and security are aligned with its internal guidelines.

Communication is a core element of Microsoft's privacy statements. The company uses clear and accessible language to inform users about its data collection, use, and protection practices. Tools like the *Microsoft Privacy Dashboard* (https://privacy.microsoft.com) allow users to control their privacy settings, fostering a continuous feedback loop and adaptation. This reinforces trust and transparency, which are essential elements for the sustainability of the data protection system.

Microsoft demonstrates structural coupling by adapting its data protection practices to comply with regulations such as GDPR. The company adjusts its system to meet external influences while maintaining its identity and functionality. This is visible in the compliance practices described in the *Microsoft Trust Center* (https://www.microsoft.com/en-us/trustcenter), which detail how the company handles legal and regulatory requirements.

Microsoft's data protection practices reflect interpenetrations by integrating aspects of legal and technological systems. The interaction between these systems allows the

company to maintain robust and comprehensive data protection practices, meeting multiple requirements and expectations. This includes the implementation of international safety standards, such as ISO/IEC 27018. While Microsoft focuses primarily on autopoiesis, the need to adapt to external regulations can be seen as an example of allopoiesis, where external adaptations are incorporated to maintain compliance and system functionality. The ability to integrate external requirements demonstrates the flexibility and resilience of the company's data protection system.

NETFLIX

Netflix is an American online streaming service, launched in 2010 and available in more than 190 countries. It is operated by the over-the-top media company of the same name, whose headquarters are located in Los Gatos, California. Founded in 1997, the company initially offered a DVD delivery service by mail. With the expansion of streaming in the United States from 2007, Netflix adapted and started to invest in this area of the digital environment. His first successful original web series was *House of Cards*, which was released in 2013. In March 2023, Netflix surpassed the 232 million subscriber mark globally, making it one of the most successful streaming service companies in the world.

Currently, Netflix has a market cap of approximately $272 billion, making it the 37th most valuable company in the world in terms of market capitalization. This amount is a measure of the total outstanding shares multiplied by the current share price. In recent years, Netflix has experienced significant growth in its market value, increasing by about 70% in the last year, according to the *Stock Analysis website*.

To analyze the Netflix documents available on the Netflix Partner Help Center in light of Niklas Luhmann's Systems Theory, it is necessary to apply the key concepts of the theory, such as autopoiesis, operational closure, self-referentiality, communication, structural coupling, interpenetrations, and allopoiesis. Autopoiesis refers to the capacity of the system to self-produce and maintain its internal organization, as reported on another occasion.

In the context of Netflix's privacy policy, this is observed in the data protection practices that are designed to maintain the integrity of the system. Operational closure, in turn, implies that the system operates based on its own rules and internal logic. Netflix's privacy policy describes how data is collected, used, and protected internally, demonstrating a closed system that operates based on processes defined by the company itself.

Self-referentiality, in Luhmann's theory, indicates that a system refers to itself in its operations and decisions. Netflix, through its compliance documents and security practices,

frequently refers to its own policies and procedures to justify and explain its actions. Communication is an essential element in this context, as Netflix uses clear and accessible language to inform users about its privacy and security practices. This is crucial for maintaining transparency and building trust with users, a key aspect in personal data management.

Structural coupling occurs when two systems influence each other, while maintaining their distinct identities. Netflix's compliance with regulations such as the GDPR (General Data Protection Regulation) is a clear example of structural coupling. The company adapts its practices to comply with external laws, but continues to operate according to its own rules and structure. Interpenetrations refer to the interactions between systems that result in mutual influences. Netflix's interaction with regulatory authorities and its own users exemplifies these interpenetrations, where adaptation to legal norms influences internal data protection practices.

Allopoiesis, which is the production of external elements for system maintenance, can be seen in the way Netflix integrates external technologies and practices to improve its data security. The use of advanced technologies for fraud detection and prevention, as well as external compliance audits, are examples of this.

CISCO SYSTEMS

Cisco Systems was founded in 1984 by Leonard Bosack and Sandy Lerner, two computer scientists at Stanford University. Initially, the company developed network routers to facilitate communication between different computer systems. Over the years, Cisco has significantly expanded its operations, becoming a global leader in networking and communications solutions, ranging from network infrastructure to cybersecurity and cloud services. As of 2024, Cisco Systems has a market cap of approximately 191.05 billion USD (Stock Analysis). The company serves a wide range of customers, including large corporations, small and medium-sized businesses, government and educational institutions, offering solutions that are fundamental to the functioning of the internet and enterprise networks around the world.

The documents available in the Cisco Trust Center and Cisco Security were essential to analyze Luhmann's Systems Theory in the organization. One concept found was that of autopoiesis, where systems establish their own limits and internal functions to maintain their operability. Cisco implements privacy and compliance policies that work in a self-sufficient manner, ensuring that all operations are aligned with its internal data protection guidelines. As for operational closure, this is evidenced by the way Cisco treats

user data in isolation, protecting it from external interference and maintaining the consistency of its privacy policies.

Self-referentiality at Cisco is noticeable in compliance and privacy practices that constantly refer to the company's own established procedures and standards. Communication plays a crucial role as Cisco utilizes multiple channels to inform its customers about how data is collected, utilized, and protected. Effective communication, both internal and external, is essential to maintain customer trust and ensure regulatory compliance, highlighting how the system self-refers to validate its practices.

The concept of structural coupling is evident in Cisco's interactions with other entities, such as regulators and trading partners, where there is mutual adaptation without loss of autonomy. The compliance and security policies show how Cisco structurally couples with external regulations, adjusting its practices to comply with legal requirements while maintaining its autonomous operations. Interpenetrations are observable in information exchanges and collaboration with other organizations to improve security and data protection, enabling a flow of knowledge without compromising system integrity.

While Cisco, as an autopoietic system, focuses on self-maintaining, it also exhibits allopoietic characteristics when influencing and being influenced by other external systems. The company adopts compliance and security practices that affect the external environment, shaping industry standards and regulatory practices.

CONCLUSION

Analysis of the data protection practices of Google, Microsoft, Netflix, and Cisco Systems in light of Niklas Luhmann's Systems Theory reveals the effectiveness of this approach in the digital age. Luhmann's theory, with its concepts of autopoiesis, operational closure, self-referentiality, communication, structural coupling, interpenetrations, and allopoiesis, provides a robust framework for understanding how these companies manage and protect user data.

Autopoiesis, or the ability of a system to self-produce and maintain its internal organization, is evident in the data protection practices of all the companies analyzed. Google, for example, continuously adapts its privacy and data protection policies according to regulatory and technological changes, demonstrating robust self-sustainability. Similarly, Microsoft operates with an operational closure, internally defining its rules and procedures to ensure the protection of user data, minimizing external interference.

Self-referentiality manifests itself when companies refer to their own policies and procedures to justify their data protection practices. Google often uses its internal policies to

guide its actions and decisions, maintaining the consistency and credibility of the system. Communication, essential for transparency and trust of users, is carried out in a clear and accessible way by both Microsoft and Netflix. Tools like Google Dashboard and Microsoft Privacy Dashboard allow users to control their privacy settings, fostering a continuous loop of feedback and adaptation.

Structural coupling is observed in the adaptation of companies to external regulations, such as the GDPR, without losing their distinct identities. Microsoft and Cisco Systems exemplify this adaptation by adjusting their data protection practices to comply with legal requirements, while maintaining their autonomous operations. The interpenetrations are visible in these companies' interactions with legal and technological systems, allowing them to maintain robust and comprehensive data protection practices that meet multiple requirements and expectations.

While autopoiesis is a primary focus, allopoietic characteristics are also evident when these companies integrate external practices and technologies to improve data security. Netflix's interaction with advanced fraud prevention technologies and Cisco's external audits demonstrate how external adaptations are incorporated to maintain system functionality and compliance. These practices reflect the flexibility and resilience of companies' data protection systems, which are able to integrate external requirements without compromising their identity.

Niklas Luhmann's Systems Theory offers a comprehensive and adaptive framework for data protection management in the digital age. The data protection practices of Google, Microsoft, Netflix, and Cisco Systems exemplify how the concepts of autopoiesis, operational closure, self-referentiality, communication, structural coupling, interpenetrations, and allopoiesis can be applied effectively to create data protection systems that are both self-sustaining and adaptable to external changes.

This holistic approach not only ensures regulatory compliance but also strengthens users' trust and security in an increasingly complex and interconnected digital environment. By applying these concepts, businesses can develop resilient and effective data protection systems, ensuring the privacy and security of user data while navigating the complexities of the digital age.

SUGGESTIONS FOR FUTURE RESEARCH

For future research, it is suggested to apply the analysis in other sectors and with companies from different countries, in order to verify if there are divergences and how they have managed to adapt to the new data protection legislation in this digital age.

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