

Infrastructure communication: A systematic literature review

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Abstract

In the last few decades, research on communication and development has developed due to the emergence of many development theories in third-world countries. This research aims to determine the research trends in the infrastructure sector from a communication perspective and identify gaps. Papers were selected based on specific words relevant to the issue of development communication and infrastructure communication throughout Indonesia. A total of 33 papers from international and national journals were analyzed to find several paper themes, and analyzed based on categories that emerged from these themes. The analysis results showed that there were only four papers still dominated by development communication. This study also identified gaps in the literature on infrastructure communication, especially those using Niklas Luhmann's Communication Theory. This systematic research (Systematic Literature Review) used the PRISMA (Preferred Reporting Items for Systematic Review and Meta-analysis) method in which, as found, there has been no research on the theme of infrastructure in the field of communication science specifically looking at how it occurs or how communication on infrastructure communication itself really is. It is important to see the infrastructure problem entirely and cross-sectional subject in a unified system - not as the pieces of events in one research object/area. An understanding of communication issues in infrastructure development will make it easier for various parties to determine future communication.

Keywords: Communication; development; infrastructure

1. Introduction

Acceleration in infrastructure continues to be carried out to improve connectivity and stimulate growth in various regions in Indonesia. However, despite the infrastructure sector being the main focus of development and being one of the pillars of Indonesia's development by 2045 (Ministry of National Development Planning/Bappenas, 2019), currently Indonesia's infrastructure competitiveness is still ranked 72nd out of 140 countries in Asia and 5th out of countries in Southeast Asia and China (Schwab & World Economic Forum, 2019).

Based on the parameters as set by the International World Competitiveness Yearbook, Indonesia's infrastructure lags behind in several aspects of performance, leaving various problems in the infrastructure sector. The criteria for assessing infrastructure here include basic infrastructure, technology infrastructure, science infrastructure, health & environment, and education (IMD, 2023).

The Chairman of the Implementation Team of the Committee for the Acceleration of Priority Infrastructure Delivery (KPPIP) mentioned the main problems of Indonesia's infrastructure development and problems in project planning and preparation as problems that ranked second and contributed 27% (Utomo, 2017). Problems in project planning and preparation are related to coordination issues between project

stakeholders and the quality of project documents or often known as stakeholder management. Infrastructure development, which is usually a mega project, automatically involves many stakeholders, positioning stakeholder management crucial to the success of a project.

Research has shown that effective communication and coordination among stakeholders is critical to the success of any given project (AI Nahyan, 2019), and effective communication will ensure stakeholder participation in change management (Aurangzeab, 2016). Communication and development, thus, have become intertwined and a topic of much research. Most of these studies highlighted the important role of communication in development and position communication as a "transactional" process. The process is an exchange of messages between the parties involved in a development process, i.e. government and community with an aim to change or improve people's lives.

For example, research on how the role of interpersonal communication among village government officials (Linstanawati, 2014), aimed to observe the role of interpersonal communication and the performance of village government officials on infrastructure development in Sungai Kayu Village, West Kapuas District, Kapuas Regency.

Another study dealt with public development communication in improving infrastructure improvements with a focus on the elements of communication consisting of sources, messages, channels, recipients and effects related to the Two-Step Flow Communication Theory (Bulamei, 2017).

There are other similar studies, including effective two-way communication between government and community in

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strengthening the possibility of achieving good governance outcomes (CommGAP, 2009), as well as research conducted by Leonardo (2006) revealing the significance of preparation in the two-way communication process from the beginning of the project cycle. It can be stated that the main factor causing project failure is directly or indirectly related to communication.

The literature study based on previous research results showed that communication in infrastructure development tends to discuss the communication transmission process (top-down) and the ability of involvement in project involvement. The communication process is often criticized for being too mechanistic (Sapienza, et al., 2016). A cross-sectional discussion will have an impact on infrastructure that will only be seen at a micro level without entirely seeing the communication process occurred in the infrastructure system.

In fact, communication in infrastructure development specifically is a complex phenomenon that requires various perspectives to fully understand it. It is not only from a mechanistic perspective considering communication as a process of exchanging messages, but also from a linguistic perspective (how language shapes and reflects meaning) and a psychological perspective (how individuals perceive and process information).

Therefore, it is necessary to investigate the gap in communication studies with a different perspective, especially in the field of infrastructure development. The aim is to see infrastructure as an entire subject in a unified system, not as the pieces of events in one research object/area. The use of systems theory in looking at communication in infrastructure is one way of looking at the research gap.

Niklas Luhmann's systems theory highlights communication and explains how important it is to understand the content and level of communication relationships, where communication is not only about the transmission of information but also about the formation of relationships and the context in which communication occurs (Luhmann, 1995). Social systems theory highlights that organizations are essentially based on paradoxes for being built on communicative events (Schoeneborn, 2011).

Some existing literature studies include *Luhmann's Theory of Psychic Systems and Communication in Social Work Practice* (2022) and *Ecological Communication in Information Society: Reflections on Niklas Luhmann's Thought in Understanding Ecological & Disaster Issues in Indonesia* (2019). It explains how important to understand the content and level of communication relationships, where communication is not only about the transmission of information but also about the formation of relationships and the context in which communication occurs (Luhmann, 1995).

Therefore, it is necessary to examine the existence of studies that use a communication approach to system theory to see the research gap in infrastructure communication. For this, the problems in this study are formulated as follows. 1) How is the distribution of research that discusses communication in infrastructure development using Niklas Luhmann Communication Theory; and 2) How is the tendency of research that discusses communication in infrastructure development? This research provides new participation: 1). Presenting systematic knowledge and synthesizing various existing literatures on communication in infrastructure development using Niklas Luhmann's communication theory,

and 2). Critically evaluating the content and contribution of existing literature.

2. Methodology

This research is a systematic literature review using the PRISMA (Preferred Reporting Items for Systematic Review and Meta-analysis) method. It aims to collect studies with as much evidence base as possible and relevant to the research being conducted (Thorpe, Holt, Macpherson, & Piiaway, 2017). Systematic Literature Review research is a research method that aims to identify, evaluate, and interpret research results. Siswanto (2010) stated that Systematic Review is secondary data that can be used by researchers to synthesize relevant research results enabling them to contain more complete facts. The procedure carried out in making a Systematic Literature Review consists of several stages: 1). Formulating research questions, 2). Reviewing Systematic literature, 3). Screening and selecting relevant articles, 4). Analyzing and systematizing the findings, 5). Implementing quality control, and 6). Making final report.

The data collection process in this study was conducted to develop a database on communication in infrastructure development by filtering and selecting samples through inclusion-exclusion criteria. In this search phase, the initial keywords used to find all relevant literature included "Infrastructure Project", "Communication", "Development Communication" and "Communication in infrastructure development".

Table 1. Database criteria

Criteria	Database
Keywords	KW 1 – Development Communication
	KW 2 – Infrastructure Communication
	KW 3 – Niklas Luhmann's Systems Theory (in Infrastructure Communication)
Search Engine /	MP 1 – Google Scholar
	MP 2 – Scopus
Database	MP 3 – Publish or Perish
Exclusion Criteria (K2)	K2 1 – All keywords selected but not appearing in the journal, abstract, keywords, and full-text sections
	K2 2 – Books, Essays, Editorials, and opinion pieces in a discussion

The next stage was to select the academic databases (i.e. Google Scholar, Science Direct, and Publish or Perish) to search for journals in the field of Communication Science with keywords 'infrastructure project' and 'communication'. Furthermore, to ensure that the articles were relevant, inclusion/exclusion criteria were applied for the period 2013 to 2023.

Through the Publish or Perish tool, researchers over the period of 2013 to 2023. The initial search resulted in many theme findings on the two keywords infrastructure projects and communication in various fields considering that communication plays a vital role in all spheres of life; it is an interdisciplinary field of study connected to various fields such as social theory, psychology, culture, technology, and linguistics.

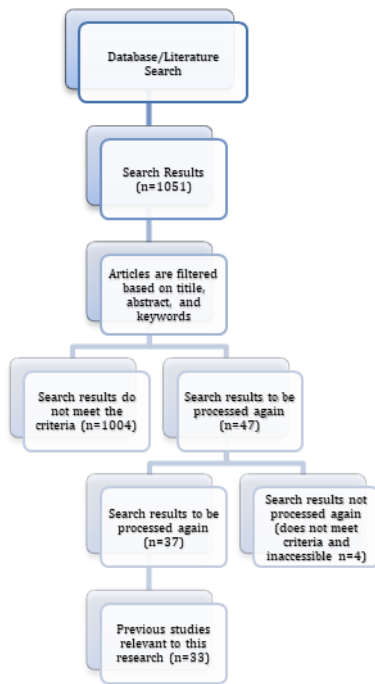


Fig. 1. Prisma flow diagram systematic review
Source: Wolor, Nurkhin, & Citriadin (2021)

The first step was to cluster the findings of communication and infrastructure topics based on existing fields. After obtaining the title topics that fell into the realm of communication science, filtering and selecting relevant articles was carried out. The criteria for article selection were the communication topics discussing about various aspects of communication, including communication processes, theories, techniques, and effects in various contexts in the field of communication science and related to infrastructure projects.

3. Results and Discussion

This Systematic Literature Review articles analyze previous research articles relevant to the research topic. The articles used followed the results of article identification on the PRISMA diagram and the article summary is presented in Table 2.

This research outlined a review of previous research through the Publish or Perish tool, using the keywords 'infrastructure project' and 'communication' over the period 2013 to 2023. The research trend showed a total of 89 studies that matched the keywords with the highest numbers occurred in 2013 and 2022 with 14 and 16 studies respectively. In 2023 there were only 3 studies as the lowest value over the 10 years as shown below:

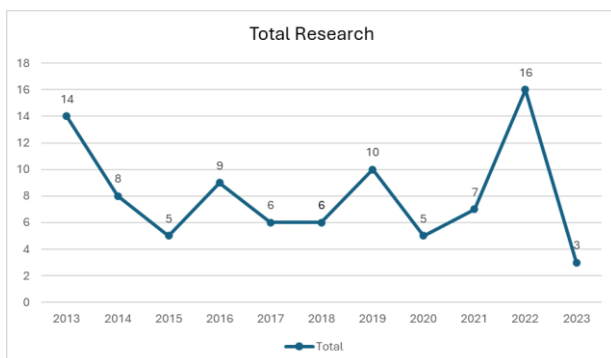


Fig. 2. Trend in number of researches according to keyword

The data showed that research clusters with the keywords 'infrastructure project' and 'communication' referred to several disciplinary clusters outside of communication science, including engineering, computer science, health, environment, and transportation. In the computer science cluster, research with the two keywords mentioned above commonly referred to the form/naming of products related to Information and Communication Technology (ICT). As for the communication science cluster, some studies were included in the theme/title of infrastructure communication to be analyzed in detail the theory and methodology used to obtain the research gap in this study. A total of 29 studies were included in the field of engineering, 45 in the field of computer science, 4 in the field of health, 6 in the field of environment, 2 in the field of transportation, and 4 in the field of communication science as shown in Fig. 3.

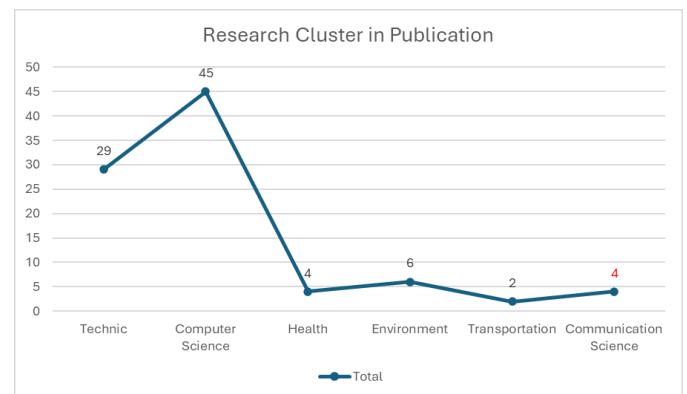


Fig.3. Research cluster in publication

On the other side, the number of studies on development communication on Google Scholar has now reached 998 publications since the period 2013-2023. If it was further narrowed down to communication in infrastructure development, there were 35 publications in the same period. Of the total 35 publications, 4 were included in the realm of communication science studies. In Scopus-indexed publications, there were a total of 10 publications with the theme of communication in infrastructure development. However, if traced back, there were only 2 theme titles included in the realm of communication science in a period of 10 years calculated from 2013 to 2023.

A literature review can provide a better understanding of whether the observations made can be confirmed. Comprehensive reviews can help researchers to identify what needs to be known about a study (Hernández-Linares & López-Fernández, 2018), as in the case with communication in infrastructure development. A good infrastructure development that meets targets cannot be separated from communication with all existing stakeholders. The communication perspective in Niklas Luhmann's understanding was used to provide alternative contingencies regarding infrastructure communication. It explains that social systems provide a conceptual instrument for observing various existing phenomena in social reality, such as society, organizations, and the interactions occurred within them. Luhmann stated that communication is a continuous thing (Mattheis, 2012).

This research is a conceptual instrument to overcome various existing symptoms in social reality. The theory of

social systems is concerned with the meaning of consciousness, freedom, and communication, and places all analysis of these basic things with scientific knowledge, such as modern physics and biological theory. This is the basis for the idea that social systems have a referential nature and are carried out through communication used in various fields, including infrastructure development. Research conducted by Valentinov (2019), which discussed about a cross-fertilization between stakeholder theory and Niklas Luhmann's social system theory, showed that the sustainability of corporations or other social systems depends on sensitivity to their respective environments.

Luhmannian thought has made a significant contribution to the understanding of communication as an important process in society (Wahyuni, 2021). Luhmann applied a systems theory approach analyzing the conditions under which modern society can respond to ecological threats (Konold & Schwietring, 2021). This theory explains the arrangement or order. Luhmann himself attempted a new way of looking at society through a social system perspective, where this perspective sees society as a system that has its logical movement and is independent of the active human capacity within it (Miller-Klugesherz, 2022). This social systems theory is Luhmann's perspective on the role of communication in responding to things that occur in contemporary societal systems such as social workers and infrastructure development (Rodger, 2022). As explained by Niklas Luhmann, social systems can be disrupted by ecological problems, but their subsystems can also be seen in media discourse (Arifudin, Wahyuni, Indah, Haryadi, & Trisakti, 2020). Luhmann's theory observes society (Laursen, Harste, & Roth, 2022). The key to Luhmann's general approach to the social world, which only consists of verbal and non-verbal communication, means that Luhmann treated communication rather than individuals as the basic concept of social theory (Cooren & Seidl, 2020). Luhmann's theory was also used in mental health services with the findings of recent service system transformations (Weaver, 2022). This is in line with the explanation that there are differences between two fundamental ways in which a system can build internal relationships with the environment (la Cour, 2006). Luhmann offered a theory and perspective deeply embedded in society (Albert, 2016). Communication is a critical in modern society in having and playing an important role in being able to answer the complexities occurred in infrastructure development and can be

a solution through responding to various existing pressures.

World Bank & Calabrese (2008) studies showed that a strategic communication approach has a vital role in minimizing political, cultural and social risks inherent in the development process. In addition, most economists agreed that infrastructure investment is necessary for a country to industrialize (Henckel & McKibbin, 2010). The development process of a country that continues to develop cannot be separated from the role of existing communications. Strategic communication in the PPP program in this research explained that the public is better at understanding the government's vision in implementing reforms. This is also in line with the concept of public relations in infrastructure development as the party that makes communication between contractors and the public good. This research explained the finding that public relations is a solution to communication problems in infrastructure projects (Chatra, Havifi, & Yenmis, 2019). Many errors, certainly, are often found in the field of communication in project development.

Cervone (2014) conducted a review on some of the errors that conducted a review of some of the existing errors and how these errors could be avoided. From the start of the project, preparations for the two-way in their research explained that the main factor making projects failed, either directly or indirectly, is communication. Problems certainly are often encountered when carrying out infrastructure development. In research conducted by Putri (2020), there were obstacles in land acquisition during the development of public infrastructure in West Sumatra. This was surely in view of a suboptimal communication between the government and the community. Competition is also emerging between the United States, China and the European Union over increasingly contested infrastructure constraints (Abels & Bieling, 2023) in an international scale. Communication is an important bridge between the legal system and development in every country (Quinteiro & Calixto, 2020). Apart from effective communication, behavioral and technical factors significantly influence communication outcomes (Kwofie, Ohis Aigbavboa, & Thwala, 2019). In infrastructure development, the relationship between government equity, communication and project performance has a very significant relationship. Public-private communication has a vital role as an intermediary in this relationship (Hu, Li, Liu, Wang, & Cheng, 2020).

Table 2. Results of review articles on the Publish and Perish

Researcher/Year	Title	Results
Karen Paul (2014)	Stakeholder Theory, Meet Communications Theory: Media Systems Dependency and Community Infrastructure Theory with an Application to California's Cannabis/Marijuana	The use of media systems communication theory and community infrastructure theory to conceptualise a stakeholder model for the marijuana industry in California.
AI Nahyan, et al. (2019)	Infrastructure Development in the UAE: Communication and Coordination Issues Amongst Key Stakeholders	Stakeholder management and its impact on improving project outcomes, particularly in the management of transport infrastructure projects in the United Arab Emirates.
Carolijn van Noort (2021)	Infrastructure Communication in International Relations	Communication on infrastructure in developing countries in relation to international relations.
Alfandias Seysna Putra, et.al (2022)	Developing Knowledge Management Strategy to Improve Project Communication in Construction of Coal Mining Infrastructure: A Conceptual Study	The relationship between knowledge management and improved project stakeholder communication in coal mining construction projects.

Table 3. Results of review articles on Google Scholar

Researcher/Year	Title	Results
Suharyo, S. (2018)	A Communication Pattern of President in Infrastructure Development: The Case of Jokowi in The Daily Kompas News	This research questioned the idea that journalistic work is always objective and impartial, and it showed that media reporting is often determined by political, social and ideological factors.
Nalomba, M.T. (2016)	An assessment of the communication strategies used in stakeholder mobilization for infrastructure development and maintenance of classrooms in Schools, the case of Chinsali	This study aimed to assess the communication strategies used by the Government of the Republic of Zambia in mobilising stakeholders for the Construction and Maintenance of Infra-structure classrooms in schools in Chinsali District, Zambia.
Putri, N.E. (2019)	Communication Model for Sustainable Development of Public Transportation Infrastructure in West Sumatra	This research aimed to build a communication model for sustainable public transport infrastructure development in West Sumatra..
AI Nahyan, et al. (2019)	Infrastructure development in the UAE: Communication and coordination issues amongst key stakeholders	This research examined the management of transport infrastructure projects in the United Arab Emirates to understand how management processes (especially coordination and communication among stakeholders) have an impact on reducing risks, thereby improving project outcomes.

Table 4. Results of review articles on Scopus

Researcher/Year	Title	Results
Suharyo, S. (2018)	A Communication Pattern of President in Infrastructure Development: The Case of Jokowi in The Daily Kompas News	This research questioned the idea that journalistic work is always objective and impartial, and it showed that media reporting is often determined by political, social and ideological factors.
AI Nahyan, et al. (2019)	Infrastructure development in the UAE: Communication and coordination issues amongst key stakeholders	This research examined the management of transport infrastructure projects in the United Arab Emirates to understand how management processes (especially coordination and communication among stakeholders) have an impact on reducing risks, thereby improving project outcomes..

Table 5. Results of review articles

Researcher/Year	Journal	Results
AI Nahyan, et al. (2019)	Risk Management in Engineering and Construction	Research proved that effective communication and coordination among key stakeholders is critical to the success of existing projects. The main lesson in this research is the application of various ways to improve communication between stakeholders.
Aurangzeab Butt, et al (2016)	International Journal of Project Management	This research used stakeholder management theory and produced findings that effective communication will ensure stakeholder participation in change management. Additionally, a lack of communication in change situations creates need and confusion later.
World Bank and Daniele Calabrese (2008)	World Bank Working Paper No. 139	The results of this research showed that the strategic communication approach plays a crucial role in minimizing the political, cultural, and social risks inherent in the development process.
Emeraldy Chatra, et al. (2019)	Jurnal Ranah Komunikasi (JRK)	Research carried out using Edmun Husserl's phenomenological approach, namely the use of transcendental reduction, resulting in the finding of infrastructure public relations as a solution to communication problems in projects affected by the construction of the Padang-Sicincin toll road.
Herry Pintardi, et al. (2011)	Jurnal Manajemen dan Kewirausahaan	This research examined how stakeholder conditions determine project success and can be developed to form predictions and early warnings in achieving project success.
H. Frank Cervone (2014)	International Digital Library Perspectives	This research reviewed several errors in the communication field in a project and how these errors could be avoided.
Leonardo Mazzei and Gianmarco Scuppa (2006)	World Bank Working Paper No. 84 The International Bank for Reconstruction and Development	Research conducted using communication-based assessment resulted in the finding that preparation is needed in the two-way communication process from the start of the project cycle. The main factor that causes project failure is directly or indirectly related to communication.

Continued Table 5. Results of review articles

Wallace H. Provost JR. (1986)	Int. J. General Systems	This research is a conceptual instrument to overcome various existing symptoms in social reality. Systems theory is about the meaning of consciousness, freedom, and communication, and places all analysis of these fundamental things with scientific knowledge, such as modern physics and biological theory.
Suharyo S (2018)	The 3rd International Conference on Energy, Environmental and Information System	The results of this research showed the framing carried out by Kompas in covering news about the failure of the Golkar Party in cadre formation. Therefore, the Golkar Party has always failed in making its cadres to become the President of the Republic of Indonesia. This was because the party system was not working, so it was very unfortunate that a party as big as Golkar did not add color to the political constellation at the national level. This provided an impression that the Golkar Party is "cursed." Because of this, the nomination of Joko Widodo as a presidential candidate in 2019 was carried out by the Golkar Party. Joko Widodo's program included forest conservation, marine tourism, and waste utilization.
Nora Eka Putri, et al. (2020)	Proceedings of the 6th International Conference on Social and Political Sciences	The results of this research showed that the communication model developed was integrative so that in the end good communication was built between the government, developers, and communities affected by the construction of the Padang-Sicincin toll road.
Titus Ebenezer Kwofie, et al. (2019)	Built Environment Project and Asset Management	Effective communication was at the heart of successful PPP projects and management. Behavioral and technical factors significantly influenced communication outcomes.
Vladislav Valentinov, et al. (2019)	Administration & Society	The cross-fertilization between stakeholder theory and Niklas Luhmann's social system theory confirmed that the sustainability of corporations or other social systems depends on sensitivity to their respective environments.
Zhen Hu and Qianmeng Li, et al (2020)	Engineering, Construction and Architectural Management, Emerald Publishing Limited	The cross-fertilization between stakeholder theory and Niklas Luhmann's social system theory showed that the sustainability of corporations or other social systems depends on sensitivity to their respective environments.
Mckibbin, W., & Henckel, T. (2010)	Journal of Infrastructure Policy and Development	The result of this research showed a tendency in political discourse to assume that for all spending labeled "infrastructure", the government is the most appropriate party to implement these projects. To increase the benefits of infrastructure investment, there are various problems in both developed and developing countries that need to be addressed, including: measuring infrastructure benefits; the way in which the project should be evaluated; delivery mechanisms and the ongoing regulatory environment.
Abels, J., & Bieling, H. J. (2023)	Competition and Change	This research asked how these connectivity conflicts influenced EU infrastructure policy and what specific factors played a role in translating these global changes into strategy. By seeing competition between the three countries in terms of infrastructure, research showed that the EU was in the process of becoming a geopolitically and geoeconomically oriented infrastructure policy actor.
Mattheis, C. (2012)	Goettingen Journal of International Law	This article critically examined the 'constitutionalization vs. fragmentation debate' and examined it in a systems theory-based view. The historical background related to Niklas Luhmann's systems theory was analyzed whether his move 'from territoriality to functionality' can be applied to modern international law. The existence of a theoretical constitutional system is an element in modern international law that is state-centered: value-based law, 'structural linkages' between the political system and the legal system in Indonesia, the term general values such as core human rights and basic principles.
T20 (2020)	Asian Development Bank Institute	The policy proposals for the G20 include that 1) the G20 must work together with MDBs and other stakeholders to reach a common understanding of sustainable infrastructure, 2) G20 countries must work together with multilateral, regional and national development banks to create project preparation global sustainability and guarantee facilities managed at the country level, supported by development banks, 3) The G20 should work with MDBs to reform and simplify the PPF, 4) G20 countries should work together with MDBs and other stakeholders to ensure that best operationalization of standards and tools and to ensure that infrastructure scaling is calibrated, and 5) G20 countries must establish monitoring, transparency and accountability mechanisms to ensure that project implementation goes according to plan.

Continued Table 5. Results of review articles

Albert, M. (2016)	Oxford Research Encyclopedia of Politics	The results of this research showed several observations regarding the fact that Luhmann's theory tends to ignore the international political dimension, but his theory has provided an opportunity to explain it innovatively.
Inagaki, N. (2007)	The World Bank	The results of this research showed that 1) Academic research in development communication needs to involve more structural issues that may not be addressed adequately in project evaluations carried out as part of individual aid projects, and 2) Development communication research needs to address existing gaps. A methodological paradigm for advancing a more holistic understanding of communication processes in international development settings.
Miller, J. A. (2022)	Kybernetes	The results of this research showed that the climate change mitigation efforts are a combination of a moral communication system. These efforts have degraded subsystems of the ten major systems given the nature of the dominant moral care/harm binary. A communication gap still exists because this moral communication cannot adhere to the binary code of the system and communicate the urgency of the climate crisis. The more time passes, the more regulations force mitigation organizations, their activist efforts and their moral communications to adapt and sacrifice their actions to align with the rules of the system that surrounds them.
Rodger, J. J. (2022)	Journal of Social Work	A conceptual framework derived from Luhmann's systems theory was applied to the description of social worker encounters. Communication in social work practice is polyphonic: it is structured by a combination of communicative codes that practitioners must use dependent upon the communicative context. The main conclusion of this article is that Luhmann defends the conception of the individual as an active agent in systems theory with an aim to highlight the functioning of systems within which individuals interact.
Laursen, K. B., Harste, G., & Roth, S. (2022)	Kybernetes	The results of this research showed that 14 cases social systems theory allowed researchers to study moral communication without having to do it.
Konold, D., & Schwietring, T. (2021)	Politics and Governance	The result of this research revealed that the specific functional logic of various social subsystems must be taken into account when analyzing sustainable development and the gap between the goals and ambitions of (global) environmental policies and their visible consequences.
Higuchi, A. (2021)	Kybernetes	The author emphasized that suspicions regarding communication asymmetry are accentuated in the case of anonymity. When one communicates using a moral code, it is impossible to discern whether the implications of self-binding are undermined through the observation or the consequences of the communication and can only be questioned or confirmed through the communication. However, criticizing mass outbursts and blaming each other by isolating only one aspect of the phenomenon is merely superficial.
Weaver, N. (2022)	Kybernetes	The findings in this study were that three themes emerged in participants' conversations: "Competing versions of recovery," "Misaligned service expectations" and "Disrupted care pathways." Recovery can be understood as a form of moral communication and autopoietic meaning-making activity, according to Luhmann's radical constructionist epistemology. This can potentially result in competing recovery versions, which is a major contributor to increased complexity.
Cooren, F., & Seidl, D. (2020)	Academy of Management Review	Researchers in this article agreed that the Luhmannian approach could also be enriched with insights from other organizational communication research regarding questions related to (1) inter-penetration as a logic of reciprocal appropriation, (2) heteropoietic and hybrid dimensions of autopoiesis, and (3) organizational and outside formal organizations.
Quinteiro, M. E. M., & Calixto, A. J. (2020)	Revista Argumentum-Argumentum Journal of Law	The result of this research showed that Systems Theory through the application of deductive methods in terms of the complexity of social and legal relations implies the importance of building communication structures between these orders for the protection of human rights. It is concluded that there is a need to establish coordinated and non-hierarchical interactions between legal systems as a necessary mechanism for the continuity of different systems and for the best protection of human rights today.

Continued Table 5. Results of review articles

Arifudin, Wahyuni, Indah, H., Haryadi, & Trisakti, F. (2020)	Asia-Pacific Social Science Review	The results of this research showed nine subsystems affected by the haze disaster: economics, politics, law, science, education, religion, arts, public health, and volunteerism. Of these, politics dominated local Indonesian media. In addition, the number of discourses was in line with hotspot fluctuations. In conclusion, the problem of haze can be seen by understanding the discourse in local mass media, which has described which subsystems make up the social system. Therefore, this research suggested to reduce political dominance and increase the role of other subsystems, especially the legal, scientific and educational subsystems in the Indonesian social system..
Angelakou, E.-P. (2020)	International Conference on Cultural Informatics, Communication & Media Studies	Through the communication indicators of the two dimensions mentioned above, it emphasized the degree and type of communication relationships that the school develops, both internally and with important environmental systems. In addition, it could figure out whether the school's "communication" allows it to become a learning organization.
Suhardiyah, M., & Siswanto, A. H. (2020)	Indonesian Journal of Islamic Communication	The results obtained in this research showed that communication in Luhmann's view is a social system based on actions (activities) using communication and attribution tools to reduce the complexity of people's beliefs. Luhmann's style of action communication is critical to apply to the people of Surabaya city to create harmony between religious communities. Therefore, inter-religious communities in the urban area of Surabaya built communication using various models, namely Interpersonal Communication, Group Communication, Organizational or Institutional Communication, and Cultural Communication. This communication model can be seen in the daily life of the urban community of Surabaya to foster harmony between religious communities. All of these communication models are supported by mutual respect, mutual acceptance of differences and a culture of mutual cooperation.
Handaka, T., Wahyuni, H. I., Sulastri, E., & Wiryono, P. (2019)	Kasetsart Journal of Social Sciences	The results of this research showed that regional autonomy provided opportunities for regional governments (districts/cities) to change Regional Work Units (KPD) based upon their interests. This change has made the EC goat farming extension structure a spin/zig-zag. Regional autonomy at the micro level, namely the election of village heads, also hampered the government's communication system process in EC goat farming extension. Regional autonomy at the micro level complicated the government's communication system because it interfered with the existence of farmer groups. Even though farmer groups were structures that have implemented a government communication system, there was outreach from extension workers to farmers.
Šubrt, J. (2019)	RUDN Journal of Sociology	The result of this research showed that in Luhmann's conception there is an emphasis on consensus guaranteed by the communication process. However, what is missing are the topics of work, production, conflict, struggle and violence. The current decline in interest in Luhmann's works is reinforced by the fact that he was unable to translate his conception into empirical sociological research instruments. Nevertheless, Luhmann's theory of functionally differentiated society and its consequences remained a significant stimulus for contemporary sociological thought.
Schoeneborn, D. (2011)	Management Communication Quarterly	The results of this research are based on social systems theory, highlighting that organizations are basically based on paradox for being built on contingent communicative events. As a result, organizations are driven by a constant need to deparadoxize their inherent possibilities. In this case, Luhmann's approach successfully combined a processual and communicative conceptualization of organizations with the notions of boundaries and self-referentiality. Despite the merits of Luhmann's approach, its accessibility tended to be limited due to the hermetic terminology it used and the fact that it ignored the role of material agency in the communicative construction of organizations.

Communication between all parties, including affected communities, is critical to be concerned. Apart from the community, communication problems in infrastructure development often occur with internal stakeholders so that the project does not run as targeted. Al Nahyan (2014) conducted a research by examining the management of transportation infrastructure projects in the United Arab Emirates to

understand how the management process in terms of coordination and communication between stakeholders had an impact on reducing risks, thereby increasing project results. The findings from this research showed that effective coordination and communication are critical in increasing the success of protests. An important thing that can be highlighted is how to implement various methods to improve

communication between stakeholders. Findings from previous research are in line with findings from Butt (2016) that effective communication will ensure stakeholder participation in change management. The lack of communication in a change situation will create needs and confusion later, so communication planning in projects requires more attention to stakeholders. Modeling the relationship between stakeholders and project success can be developed to form predictions and early warnings in achieving project success (Chandra et al., 2011).

Problems in communicating infrastructure development cannot be separated from the mass media, which should be neutral, but are determined by many factors such as politics, geography and ideology. In a research conducted by Suharyo (2018) regarding the framing of President Joko Widodo by Kompas, a newspaper in Indonesia. The results of this research contained the framing carried out by Kompas in covering news about the failure of the Golkar Party in cadre formation. The Golkar Party always failed to make its cadres become President of the Republic of Indonesia. Because of this, the nomination of Joko Widodo as a presidential candidate in 2019 was carried out by the Golkar Party. Joko Widodo's program itself was closely related to infrastructure development in Indonesia. One of the Pillars of Indonesian Development 2045 is equitable development, which consists of accelerating poverty alleviation, equal distribution of business opportunities and income, equitable regional development, and equitable and integrated infrastructure development. Based on the Indonesian Vision 2045 Pillar of Equal Development, Future Infrastructure Development and Equity is directed at increasing physical and virtual connectivity, encouraging equitable development between regions, fulfilling basic infrastructure, supporting urban and rural development, and anticipating natural disasters and climate change, including sea level rise (Kementerian PPN/Bappenas, 2019).

4. Conclusion

Although there are many studies related to the big theme of infrastructure, there are still few that fall into the communication science cluster. This means that the use of a communication perspective in looking at infrastructure projects is still very minimal. Out of a total of 89 studies on infrastructure over the past 10 years, only 0.04% (less than 1%) looked at communication issues in infrastructure projects.

As for the research in the communication cluster, four studies in the communication cluster mostly explored the intersection between stakeholder theory and communication theory. The focus was on the critical role of effective communication and coordination to ensure project success. There was one study that specifically discussed infrastructure communication (Noort, 2021), but the focus was on the importance of communication in infrastructure development in the context of international relations.

Thus, it can be concluded that there is no research on the theme of infrastructure in the field of communication science that specifically looks at how communication occurs or how communication in infrastructure communicates itself. The role of communication in infrastructure studies carried out previously was more on efforts to prove the importance of the

role of communication, or how to manage stakeholder management to optimize communication between stakeholders and prevent potential negative events from occurring in infrastructure projects. The conditions in these previous studies have opened up opportunities in the future to fill the void in communication studies using a non-transmission perspective. This will add to the diversity of communication studies in the cybernetics tradition that sees communication as having a specific function to reduce complexity through meaning selection and not just message transfer.

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