

Positioning Spiritual Capital within The Theory of Integrated Reality as an Analytical Framework for Systemic Development: A Conceptual Synthesis

La Himmah il Princess Choris^{1*}, M. Shoim²

Universitas Airlangga, Indonesia¹

Universitas 17 Agustus 1945 Surabaya, Indonesia²

Email: la.himmah.il@feb.unair.ac.id^{1*}, dgchoris@gmail.com²

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Abstract

Contemporary development theories often explain material, institutional, and technological factors separately, leaving transcendent values and collective meaning insufficiently integrated into systemic analysis. This study aimed to position Spiritual Capital (SC) within Integrated Reality Theory (IRT) and clarify its contribution to systemic development. A critical conceptual synthesis was conducted by deconstructing the assumptions underlying both theoretical traditions, comparing their ontological foundations and causal claims, integrating SC into the Consciousness variable (C), and formalizing the relevant mechanisms and propositions. The synthesis identified SC as a core component of C, expressed as $C = \text{Civic-Strategic Awareness (CSA)} \times \text{SC}$, and explained its systemic influence through ethical, motivational, and meaning-based pathways. It also distinguished SC from social capital, moral culture, and civic virtue through four defining elements: transpersonal orientation, resilience under weak external supervision, an intergenerational horizon, and existential meaning. Four testable propositions, operational indicators, three theoretical anomalies, and boundary conditions related to spiritual authoritarianism, exclusivism, and the instrumentalization of spirituality were formulated. The findings established IRT as a formal heuristic framework for operationalizing SC while providing the Consciousness variable (C) with a stronger theoretical foundation. In conclusion, this integration supported Techno-Spiritual-Based Developmentalism as a policy-analytical framework and provided a roadmap for empirical testing through comparative, structural equation modeling, panel data, and qualitative research designs.



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INTRODUCTION

In the contemporary landscape of development thought, two intellectual traditions have developed in parallel but have rarely interacted productively. The first is the discourse on Spiritual Capital (SC), pioneered by Zohar and Marshall (2004). This tradition emerged from a critical-hermeneutic concern with the limitations of materialism in explaining economic and social behavior. Spiritual Capital proposes that human behavior is shaped not only by material incentives and social norms but also by transcendent values, existential meaning, and a sense of purpose beyond material accumulation. However, a fundamental limitation of this tradition is the absence of a formal model of causal interaction. It is rich in normative insight but remains limited

in terms of empirical operationalization (Basedau et al., 2018; Leydesdorff, 2021; Williams, 2016).

The second tradition is Integrated Reality Theory (IRT), which was developed as an integrative framework for analyzing interactions among development variables that are often examined separately, particularly in response to the fragmentation among economics, politics, and the sociology of development (Shoim, 2026). IRT conceptualizes reality as a dynamic process involving five fundamental variables: Energy (E), Information (I), Entropy (S), Consciousness (C), and Evolution (v), which interact within the system-efficiency function $\Phi = (E \times I / S) \times C$. Although IRT offers a formal analytical framework, its Consciousness variable (C) remains relatively abstract and requires more specific theoretical content. This conceptual gap provides a basis for integrating the two traditions.

It is important to emphasize that IRT is not positioned as a grand theory claiming to explain all social phenomena, but rather as a middle-range systemic framework that provides a structured diagnostic tool for macrosystems such as organizations, institutions, and states (Merton, 1968). IRT does not assume that all development outcomes can be fully decomposed into E, I, S, C, and v. Instead, it is positioned as a deliberately selective analytical framework designed to identify recurring systemic patterns that are often fragmented across development studies rather than to model every possible causal determinant. IRT may help explain outcomes that established theories do not fully capture, such as why two countries with similar fiscal capacities and formal institutions can produce substantially different development outcomes. Within the IRT framework, such differences may be associated with variations in Entropy (S) and the quality of Collective Consciousness (C), dimensions that are less explicitly addressed in conventional institutional or capability-based theories.

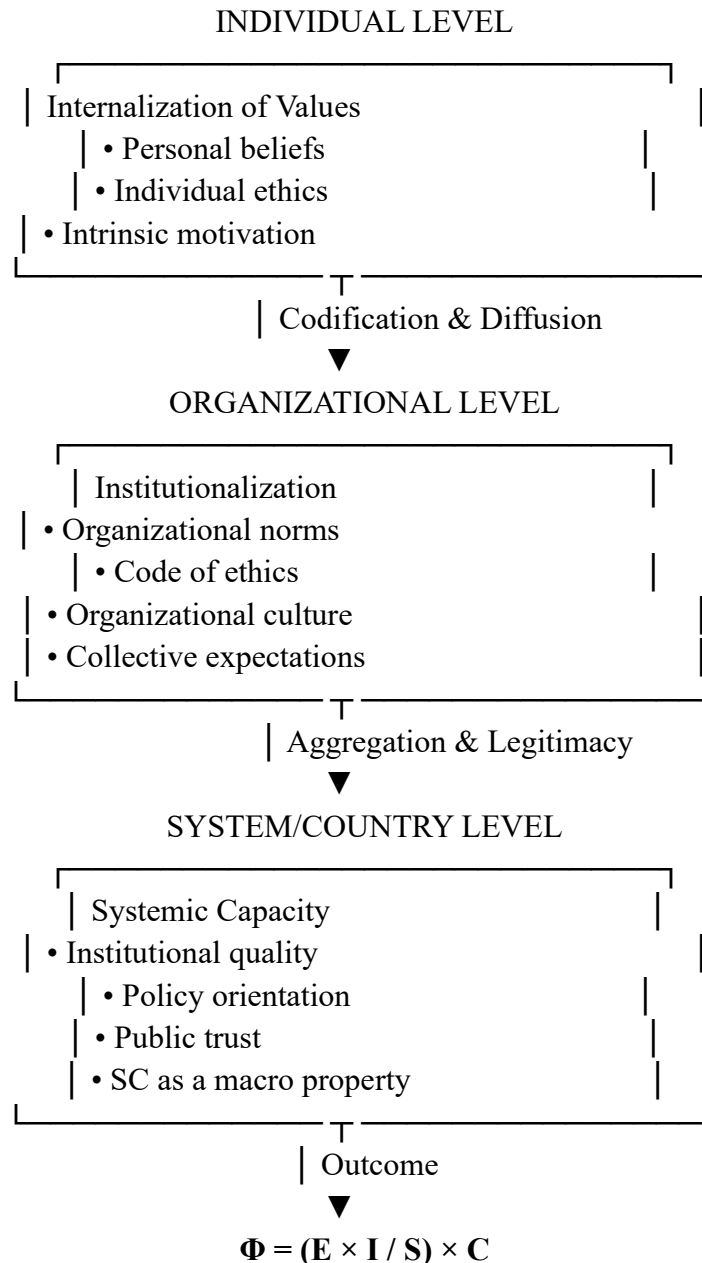
The Spiritual Capital literature has three main limitations: (1) conceptual overlap with social capital (Putnam, 2000), psychological capital (Luthans et al., 2007), and religious capital (Iannaccone, 1990); (2) the absence of a formal interaction model; and (3) difficulties in operationalization, particularly when integrating SC into evidence-based policy frameworks. Conversely, IRT has a limitation in its Consciousness variable (C), which remains abstract and requires a stronger theoretical foundation (Shoim, Mujanah, & Halik, 2026).

It is also important to clarify the conceptual status of SC. In this article, SC is not assumed to originate from a particular religion and does not require adherence to a formal religious tradition. SC may emerge in secular systems, including secular organizations or states with secular constitutions, provided that three conditions are present: (1) a transpersonal orientation that extends beyond short-term individual or group interests; (2) a commitment to long-term ethical principles that does not depend solely on material incentives; and (3) a sense of intergenerational responsibility for the sustainability of the system as a whole. Under this definition, SC is not tied to a specific theology and can be examined empirically within secular organizational and institutional contexts.

To avoid ambiguity, this article specifies that the Consciousness variable (C), including its Civic-Strategic Awareness (CSA) and Spiritual Capital (SC) components, is conceptualized at the meso-macro level, with organizations, institutions, and countries serving as the relevant units of analysis. Within IRT, C does not represent all dimensions of human consciousness. Rather, it refers specifically to systemic reflective capacity relevant to development coordination, including

a system's ability to monitor itself, evaluate its direction, and consciously select development trajectories.

The central question is how SC moves from an individual-level psychological phenomenon to a systemic property. This transformation is understood to occur through three sequential processes of institutionalization. The following diagram summarizes the transition across these levels:



First, value codification occurs when values such as honesty and trustworthiness, which initially operate at the individual level, are incorporated into organizational norms, codes of ethics, and standard operating procedures. Second, norms diffuse through repeated interactions. When actors within the system consistently apply these values in everyday practice, they gradually become stable collective expectations (Scott, 2008). Third, organizational culture is formed. Institutionalized spiritual values may constitute the deepest layer of organizational culture, namely, the basic assumptions that guide behavior without requiring explicit directives

(Schein, 2010). Through these three processes, SC is transformed from an individual-level psychological phenomenon into a collective reflective capacity that can be analyzed at the systemic level.

This article aims to demonstrate that IRT provides a formal framework for the conceptual operationalization of Spiritual Capital within systemic development analysis. Its contributions include: (1) providing a formal conceptual “home” for Spiritual Capital by positioning it as a core component of the Consciousness variable (C); (2) identifying three specific causal pathways; (3) formulating testable theoretical propositions; (4) establishing relevant boundary conditions; (5) presenting an operationalization framework for SC; and (6) providing a foundation for the development of Techno-Spiritual-Based Developmentalism (TSBD) as a policy-analytical framework.

The function $\Phi = (E \times I / S) \times C$ is treated in this article neither as a highly precise mathematical equation nor as a universal law, but as a heuristic conceptual interaction model—a structural representation of the relationships among systemic variables that provides a common analytical language and diagnostic tool. This positioning allows IRT to be empirically tested, theoretically revised, or potentially falsified by subsequent research, in accordance with the principles of a progressive research program (Lakatos, 1970).

METHOD

Synthesis Method

This article employed a critical conceptual synthesis approach based on Jaakkola (2020). The analysis involved deconstructing the core assumptions of each theoretical tradition, comparing their ontological foundations and causal claims, integrating Spiritual Capital into the Consciousness variable (C), and formalizing the relevant causal mechanisms.

Synthesis: Positioning Spiritual Capital in IRT

Ontological Foundations: Relations as Meeting Point

Both traditions share an ontological foundation: reality as relations, not substances. IRT is built on a processual-relational ontology (Whitehead, 1929), which is philosophically analogous to relational quantum mechanics (Rovelli, 1996)—without claiming a direct transfer of the laws of quantum physics to social systems. Spiritual Capital is also fundamentally about relations—the quality of human connection with something beyond oneself (Zohar & Marshall, 2004). This is the ontological bridge that makes integration possible.

Strict Definition of CSA: The Foundation of Technocratic Capacity

Before proceeding to the synthesis, it is important to provide a definition that is equivalent to SC's first component C: Civic-Strategic Awareness (CSA). CSA is defined as a system's capacity for knowledge-based collective strategic reflection, institutional coordination, and adaptive learning. The theoretical roots of CSA can be traced to three traditions: (1) state capacity theory, which emphasizes the bureaucracy's ability to formulate and implement policy (Evans, 1995); (2) adaptive governance theory, which emphasizes institutional flexibility in responding to environmental changes (Folke et al., 2005); and (3) systems intelligence theory, which emphasizes a system's capacity for reflective self-reflection (Hämäläinen & Saarinen, 2007). CSA is not simply a "technical competence," but rather a systemic capacity to integrate information, coordinate responses, and evaluate outcomes on an ongoing basis.

Why SC Cannot Be Reduced to Social Capital or Moral Culture

It is important to provide a clear conceptual clarification: SC is not simply social capital with a new label, nor is it simply organizational moral culture. Table 1 shows the fundamental differences between the three.

Table 1. Differences between SC, Social Capital, and Moral Culture

Dimensions	Social Capital	Moral Culture	Spiritual Capital (SC)
Base	Social networks and interpersonal trust	Social expectations and behavioral norms	Transpersonal orientation and sources of meaning
Focus	Coordination and collective action	Regulation of behavior through social pressure	Normative direction and long-term goals
Morality	Morally neutral, can be used for destructive purposes (e.g. mafia)	Depends on the prevailing social consensus	Having an intrinsic ethical orientation that goes beyond social consensus
Mechanism	Relational incentives and social exchange	Social sanctions and reputation	Voluntary commitment that persists even under weak external supervision
Time Horizon	Short to medium term	Medium term	Long-term and cross-generational
Outcome	Coordination efficiency	Behavioral conformity	Alignment of meaning and ethical commitment

Moral culture can regulate behavior through social expectations and reputational sanctions, but it relies on prevailing social consensus and can shift as dominant norms change. SC, in contrast, provides a transpersonal orientation and long-term meaning structure that generates voluntary ethical commitment—a commitment that persists even when external oversight is weak or when social consensus shifts. This is what distinguishes SC from simply an organization's moral culture.

Necessary Core of SC

To prevent concept stretching, SC needs to have a necessary core that clearly distinguishes it from all related concepts. SC only exists when a system simultaneously possesses all four of the following elements: (1) a transpersonal orientation—transcending short-term self- and group-interests; (2) resilience under weak external scrutiny—ethical commitments persist even in the absence of monitoring or sanctioning; (3) an intergenerational horizon—decisions consider the impact on unborn generations; (4) a source of existential meaning—collective activities are perceived as having significance beyond mere material gains. The combination of these four elements forms the necessary core of SC, making it irreducible to other concepts such as social capital, moral culture, or civic virtue.

Operationalization of Spiritual Capital

To address the measurement issues that have plagued the literature, Table 2 presents a framework for operationalizing SC. SC is rigorously defined as a collective reflective capacity that enables a system to direct its energies toward long-term, transpersonal goals. SC is not limited to religious organizations; it can exist in secular systems as long as the four necessary core elements are met.

Table 2. Operationalization of Spiritual Capital

SC Dimension	Mechanism	Potential Indicators	Data source
Collective Ethics	Reducing opportunism through internalizing the values of honesty and trustworthiness	Control of Corruption (WGI), Ethical Compliance Rate	World Bank, Transparency International
Collective Meaning	Alignment of individual-collective goals through transcendent orientation	Organizational Commitment Index, Employee Engagement	Institutional survey
Transpersonal Orientation	Expanding perspectives of time and responsibility beyond short-term interests	Public Trust Index, Civic Participation Rate	World Values Survey

Formalization: C as Emergent Capacity

Formally, this synthesis occurs in Variable C. C is defined as the emergent capacity of multiplicative interactions:

$$C = CSA \times SC$$

Where CSA (Civic-Strategic Awareness) is the technocratic-managerial capacity proxied by Government Effectiveness, and SC (Spiritual Capital) is the transcendent ethical foundation as operationalized in Table 2.

Why multiplicative? The multiplicative form was chosen because the relationship between CSA and SC is non-compensatory and interdependent. An extreme deficit in one dimension cannot be fully compensated by an excess in the other—if one approaches zero, the overall C will collapse. This differs from the additive model, where a weakness in one dimension can be offset by an excess in another. Systems with high technocratic capacity but no ethical orientation are still prone to predatory efficiency—exploitative efficiency. Meanwhile, systems with high moral orientation but low strategic capacity will experience implementation failure—the failure to translate good intentions into effective action. The multiplicative formulation captures this non-compensatory relationship precisely.

This formulation has clear theoretical implications which are summarized in Table 3.

Table 3. Implications of the Formula $C = CSA \times SC$

Condition	Outcome
High CSA, low SC	Cold technocracy — a technically efficient system but without value direction; prone to predatory efficiency
High SC, low CSA	Moralism without capacity — a highly motivated system but experiencing implementation failure due to weak managerial capacity
CSA × SC high	Coherent adaptive consciousness — a system that is simultaneously strategically intelligent and rooted in transcendent values

To clarify the position of SC in the broader conceptual landscape, Table 4 presents a distinction between SC and other often overlapping concepts

Table 4. Differentiation of SC from Related Concepts

Draft	Base	Outcome
Religiosity	Ritual practices	Symbolic obedience
Social Capital	Network & trust	Social coordination
Spiritual Capital	Transpersonal orientation	Alignment of meaning
IRT-C	CSA × SC	Systemic reflective awareness

Three Paths of Causal Mechanisms

Path 1: Ethics → Entropy Decrease (S). SC builds internal trust, lowers transaction costs, and reduces the need for formal contracts. This suppresses corruption and internal conflict (Fukuyama, 1995).

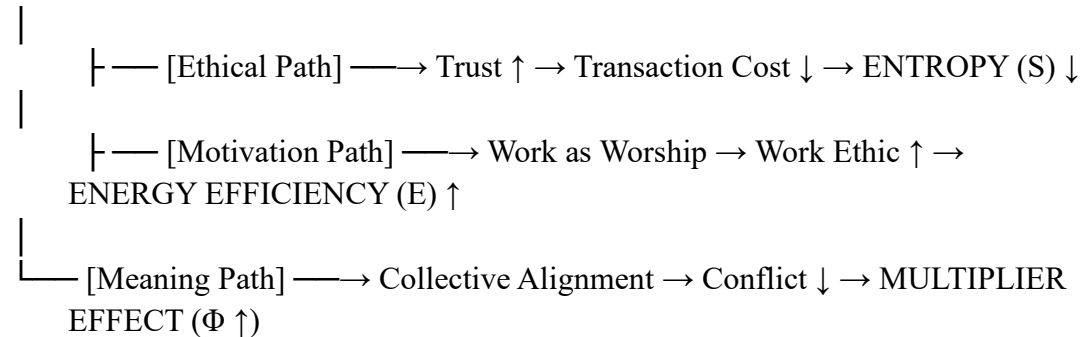
Path 2: Motivation → Increased Energy Efficiency (E). SC provides a framework of meaning that transforms work into worship, creating a work ethic that transcends material incentives. This reduces leakage due to opportunism.

Path 3: Meaning → System-Wide Multiplier Effect (Φ). SC creates collective alignment that aligns individual interests with shared goals, aligning with sensemaking (Weick, 1995) and collective intentionality (Searle, 2010).

Integrative Visual Model. The following diagram summarizes the causal architecture linking SC to IRT variables:

SPIRITUAL CAPITAL (SC)

(Authentic, Inclusive, Reflective)



$$C = CSA \times SC \text{ (EMERGENCY)}$$

$$\Phi = (E \times I / S) \times C$$

$$R(T) = \int_0^t \Phi(\tau)^v(\tau) d\tau$$

Theoretical Propositions

Proposition 1 (Entropy Effect): Under constant conditions of E and I, an increase in authentic SC decreases S through a reduction in transaction costs.

Proposition 2 (Mediation Effect): The effect of SC on Φ is mediated by CSA. SC without CSA produces moralism without capacity; CSA without SC produces technocracy without direction.

Proposition 3 (Exclusivity Effect): Exclusive SC—which applies only to the in-group—is positively correlated with increases in S through social fragmentation.

Proposition 4 (Nonlinearity Effect): The effect of SC on Φ is nonlinear and depends on the degree of authentic value internalization.

Methodological note: The relationship between SC and development outcomes postulated in the above propositions is likely to be recursive and co-evolutionary—SC can drive institutional improvements, but institutional improvements can also create conditions more conducive to SC development. Recognizing this potential endogeneity is important for the design of future empirical research, which will need to employ appropriate identification strategies (e.g., instrumental variables or longitudinal designs).

RESULTS AND DISCUSSION

Theoretical Contributions

This synthesis offers a twofold contribution: for Spiritual Capital, IRT provides the missing causal “engine”; for IRT, Spiritual Capital provides a solid theoretical foundation for Variable C.

Implications for TSBD

This synthesis paves the way for Techno-Spiritual Based Developmentalism (TSBD) as an analytical-policy framework with the following priority order: (1) reducing Entropy (S); (2) strengthening C through authentic SC; (3) integrating I and accelerating v; (4) adding E.

Boundary Conditions and Negative Cases

First, Spiritual Authoritarianism. When SC is used to legitimize absolute power, it actually increases S. Alignment imposed through dogma creates fear and suppresses innovation.

Second, Spiritual Exclusivism. SC accompanied by hostility towards out-groups increases horizontal conflict.

Third, Instrumentalized Spirituality. Spiritual rhetoric without internalization does not produce a multiplier effect.

Negative Case: High Religiosity–High Corruption Systems. Systems with high formal religiosity but high systemic corruption represent an anomaly that cannot be explained by theories that equate SC with religiosity. In such systems, spiritual symbols and rhetoric are used to legitimize power without the internalization of transcendent ethical values. As a result, S remains high despite high indicators of formal religious participation—a confirmation that surface religiosity is not synonymous with authentic SC.

Limitations and Further Research

Several limitations need to be acknowledged. First, this model is more relevant for systems with medium to high institutional complexity, where social coordination relies on a combination of organizational capacity, normative legitimacy, and adaptive learning. In small-scale communities or closed authoritarian systems, the dynamics described by IRT may operate differently. Second, this article is conceptual in nature and requires the development of SC measurement instruments that can distinguish authentic SC from instrumentalized SC, as well as empirical testing of the formulated propositions. Third, the causal relationship between SC and development outcomes needs to be tested with an awareness of the potential for recursive causality.

A roadmap to empirical research. Initial testing can be conducted through cross-country comparative studies using structural equation modeling (SEM) or panel regression approaches, using identified proxies: E from GDP per capita or fiscal capacity, I from Government Effectiveness, S from Control of Corruption and the Fragile States Index, SC from the Public

Trust Index and Civic Participation Rate (World Values Survey), and Φ from the Human Development Index or inclusive growth. Comparative case studies of spiritual-based organizations—such as BMT and AUM Muhammadiyah—can serve as qualitative validation of the postulated causal mechanisms.

CONCLUSION

This article demonstrated that IRT provides a formal framework for the conceptual operationalization of Spiritual Capital within systemic development analysis. Through three causal pathways—ethics, motivation, and meaning—Spiritual Capital was positioned as a core component of the Consciousness variable (C) within the IRT model, where $C = CSA \times SC$ represents an emergent capacity resulting from the multiplicative interaction between its two components. The four core elements of SC—transpersonal orientation, resilience under weak external supervision, an intergenerational horizon, and a source of existential meaning—distinguish SC from social capital, moral culture, and civic virtue. A rigorous definition of Civic-Strategic Awareness (CSA), grounded in theories of state capacity, adaptive governance, and systems intelligence, provides an equally robust theoretical foundation for the Consciousness variable. Four testable theoretical propositions, an operationalization framework for SC, a critical positioning of established theories, the identification of three anomalies that are difficult to explain through conventional approaches, and three boundary conditions incorporating negative cases strengthen the theoretical credibility of the model. The Φ function is treated as a heuristic conceptual interaction model—a structural representation rather than a high-precision mathematical equation—and therefore remains open to empirical testing and theoretical revision. This synthesis provides a foundation for Techno-Spiritual-Based Developmentalism (TSBD) as a policy-analytical framework and offers a clear roadmap for subsequent empirical testing.

REFERENCES

- Basedau, M., Gobien, S., & Prediger, S. (2018). *The Multidimensional Effects of Religion on Socioeconomic Development: A Review of the Empirical Literature*.
- Ang, L. M., Seng, K. P., Ijamaru, G. K., & Zungeru, A. M. (2019). Deployment of IoV for smart cities: Applications, architecture, and challenges. *IEEE Access*, 7, 6473–6492. <https://doi.org/10.1109/ACCESS.2018.2887076>
- Aqib, M., Mehmood, R., Alzahrani, A., Katib, I., Albeshri, A., & Altowaijri, S. M. (2019). Smarter traffic prediction using big data, in-memory computing, deep learning and GPUs. *Sensors*, 19(9), Article 2206. <https://doi.org/10.3390/s19092206>
- Basedau, M., Gobien, S., & Prediger, S. (2018). *The multidimensional effects of religion on socioeconomic development: A review of the empirical literature*.
- Dwivedi, A. D., Srivastava, G., Dhar, S., & Singh, R. (2019). A decentralized privacy-preserving healthcare blockchain for IoT. *Sensors*, 19(2), Article 326. <https://doi.org/10.3390/s19020326>
- Evans, P. (1995). *Embedded autonomy: States and industrial transformation*. Princeton University Press.
- Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annual Review of Environment and Resources*, 30, 441–473.
- Fukuyama, F. (1995). *Trust: The social virtues and the creation of prosperity*. Free Press.
- Hämäläinen, R. P., & Saarinen, E. (2007). Systems intelligence: A key competency for

- organizational life. *Reflections*, 7(4), 17–28.
- Huang, M., Liu, W., Wang, T., Song, H., Li, X., & Liu, A. (2019). A queuing delay utilization scheme for on-path service aggregation in services-oriented computing networks. *IEEE Access*, 7, 23816–23833. <https://doi.org/10.1109/ACCESS.2019.2899402>
- Iannaccone, L. R. (1990). Religious practice: A human capital approach. *Journal for the Scientific Study of Religion*, 29(3), 297–314.
- Jaakkola, E. (2020). Designing conceptual articles: Four approaches. *AMS Review*, 10(1–2), 18–26.
- Kumar, S., & Singh, M. (2019). Big data analytics for healthcare industry: Impact, applications, and tools. *Big Data Mining and Analytics*, 2(1), 48–57. <https://doi.org/10.26599/BDMA.2018.9020031>
- Lakatos, I. (1970). Falsification and the methodology of scientific research programmes. In I. Lakatos & A. Musgrave (Eds.), *Criticism and the growth of knowledge*. Cambridge University Press.
- Lau, B. P. L., Marakkalage, S. H., Zhou, Y., Hassan, N. U., Yuen, C., Zhang, M., & Tan, U. X. (2019). A survey of data fusion in smart city applications. *Information Fusion*, 52, 357–374. <https://doi.org/10.1016/j.inffus.2019.05.004>
- Leonelli, S., & Tempini, N. (2020). *Data journeys in the sciences*. Springer.
- Leydesdorff, L. (2021). *The evolutionary dynamics of discursive knowledge: Communication-theoretical perspectives on an empirical philosophy of science*.
- Luthans, F., Youssef, C. M., & Avolio, B. J. (2007). *Psychological capital*. Oxford University Press.
- Merton, R. K. (1968). *Social theory and social structure*. Free Press.
- Mosavi, A., Shamshirband, S., Salwana, E., Chau, K. W., & Tah, J. H. M. (2019). Prediction of multi-inputs bubble column reactor using a novel hybrid model of computational fluid dynamics and machine learning. *Engineering Applications of Computational Fluid Mechanics*, 13(1), 482–492. <https://doi.org/10.1080/19942060.2019.1613448>
- Nallaperuma, D., Nawaratne, R., Bandaragoda, T., Adikari, A., Nguyen, S., Kempitiya, T., De Silva, D., Alahakoon, D., & Pothuhera, D. (2019). Online incremental machine learning platform for big data-driven smart traffic management. *IEEE Transactions on Intelligent Transportation Systems*, 20(12), 4679–4690. <https://doi.org/10.1109/TITS.2019.2924883>
- Nguyen, G., Dlugolinsky, S., Bobák, M., Tran, V., López García, Á., Heredia, I., Malík, P., & Hluchý, L. (2019). Machine learning and deep learning frameworks and libraries for large-scale data mining: A survey. *Artificial Intelligence Review*, 52(1), 77–124. <https://doi.org/10.1007/s10462-018-09679-z>
- Palanisamy, V., & Thirunavukarasu, R. (2019). Implications of big data analytics in developing healthcare frameworks: A review. *Journal of King Saud University—Computer and Information Sciences*, 31(4), 415–425. <https://doi.org/10.1016/j.jksuci.2017.12.007>
- Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community*. Simon & Schuster.
- Rovelli, C. (1996). Relational quantum mechanics. *International Journal of Theoretical Physics*, 35(8), 1637–1678.
- Sadowski, J. (2019). When data is capital: Datafication, accumulation, and extraction. *Big Data & Society*, 6(1), 1–12. <https://doi.org/10.1177/2053951718820549>
- Saura, J. R., Herraiz, B. R., & Reyes-Menendez, A. (2019). Comparing a traditional approach for financial brand communication analysis with a big data analytics technique. *IEEE Access*, 7, 37100–37108. <https://doi.org/10.1109/ACCESS.2019.2905301>
- Schein, E. H. (2010). *Organizational culture and leadership* (4th ed.). Jossey-Bass.
- Schulz, S., Becker, M., Groseclose, M. R., Schadt, S., & Hopf, C. (2019). Advanced MALDI mass spectrometry imaging in pharmaceutical research and drug development. *Current Opinion in Biotechnology*, 55, 51–59. <https://doi.org/10.1016/j.copbio.2018.08.003>

- Scott, W. R. (2008). *Institutions and organizations* (3rd ed.). Sage Publications.
- Searle, J. R. (2010). *Making the social world: The structure of human civilization*. Oxford University Press.
- Shang, C., & You, F. (2019). Data analytics and machine learning for smart process manufacturing: Recent advances and perspectives in the big data era. *Engineering*, 5(6), 1010–1016. <https://doi.org/10.1016/j.eng.2019.01.019>
- Shoim, M., et al. (2026). Integrated Reality Theory (IRT) as processual-relational integrative framework: Synthesis, novelties, and methodological implications. *JFEB*, 5(1).
- Shorten, C., & Khoshgoftaar, T. M. (2019). A survey on image data augmentation for deep learning. *Journal of Big Data*, 6(1), Article 60. <https://doi.org/10.1186/s40537-019-0197-0>
- Sigala, M., Beer, A., Hodgson, L., & O'Connor, A. (2019). *Big data for measuring the impact of tourism economic development programmes: A process and quality criteria framework for using big data*.
- Sivaraman, K., Krishnan, R. M. V., Sundarraj, B., & Sri Gowthem, S. (2019). Network failure detection and diagnosis by analyzing syslog and SNS data: Applying big data analysis to network operations. *International Journal of Innovative Technology and Exploring Engineering*, 8(9S3), 883–887. <https://doi.org/10.35940/ijitee.I3187.0789S319>
- Song, Q., Ge, H., Caverlee, J., & Hu, X. (2017). Tensor completion algorithms in big data analytics. *arXiv*.
- Stylos, N., & Zwiegelaaar, J. (2019). *Big data as a game changer: How does it shape business intelligence within a tourism and hospitality industry context?*
- Vinayakumar, R., Alazab, M., Soman, K. P., Poornachandran, P., Al-Nemrat, A., & Venkatraman, S. (2019). Deep learning approach for intelligent intrusion detection system. *IEEE Access*, 7, 41525–41550. <https://doi.org/10.1109/ACCESS.2019.2895334>
- Weick, K. E. (1995). *Sensemaking in organizations*. Sage Publications.
- Whitehead, A. N. (1929). *Process and reality*. Free Press.
- Williams, M. (2016). *Key concepts in the philosophy of social research*. Sage.
- Wu, Y., Chen, Y., Wang, L., Ye, Y., Liu, Z., Guo, Y., & Fu, Y. (2019). Large scale incremental learning. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, 374–382. <https://doi.org/10.1109/CVPR.2019.00046>
- Xu, G., Shi, Y., Sun, X., & Shen, W. (2019). Internet of things in marine environment monitoring: A review. *Sensors*, 19(7), Article 1711. <https://doi.org/10.3390/s19071711>
- Yu, Y., Li, M., Liu, L., Li, Y., & Wang, J. (2019). Clinical big data and deep learning: Applications, challenges, and future outlooks. *Big Data Mining and Analytics*, 2(4), 288–305. <https://doi.org/10.26599/BDMA.2019.9020007>
- Zohar, D., & Marshall, I. (2004). *Spiritual capital: Wealth we can live by*. Berrett-Koehler.