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Economics Value's Of Informations In The Era Of Aritificial Intelligence

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Abstract. The rapid convergence of economics and information systems, accelerated by Artificial Intelligence (AI), has fundamentally transformed how value is created, measured, and exchanged in modern economies. Objectives, This study examines the relationship between economics and AI-driven information systems from a digital economy perspective, aiming to develop a framework for understanding information as an economic commodity and its transformative effects on markets and organizational structures. Methods, Employing a qualitative literature review approach, this research systematically analyzes studies from 1970 to 2025 sourced from Google Scholar, Research Gate, Sinta Database, and DOAJ, focusing on the theoretical foundations established by Romer (1990) and Shapiro & Varian (1999). Findings, This paper reveal that information possesses four distinctive characteristics—non-rivalry, high fixed costs with low marginal costs, quality uncertainty, and experience-good properties. Information systems serve as economic infrastructure facilitating coordination, decision-making, and value creation, while AI amplifies these functions through adaptive learning capabilities. Its identifies the "productivity paradox" phenomenon in AI investments, where tangible benefits require time to materialize and depend on complementary factors such as organizational culture and human capital. Digitalization-driven market transformation creates new business ecosystems which requiring adaptive regulatory. Implications, Based on this paper its suggest that organizations must develop new performance measurement frameworks, strengthen middle management roles in digital transformation, and adopt flexible yet protective macroeconomic policies that maintain competition and foster innovation.

Keywords: Artificial Intelligence; Digital Economy; Information Economics; Information Systems; Market Transformation.

1. INTRODUCTION

The relationship between the economy and information systems in the era of Artificial Intelligence (AI) has undergone significant structural changes in recent years. This relationship is characterized by the convergence of the roles of the economy and information systems. What began as a discussion about the extent to which information systems could influence the economy has now become a central topic for understanding markets, organizations, and the creation of value for a product (Parinov, 2025). The transformation of information has shifted from merely complementing economic activities to becoming a high-value tool, as evidenced by the emergence of Enterprise Resource Planning (ERP), the Internet of Things, online marketplace platforms, and other information-based platforms.

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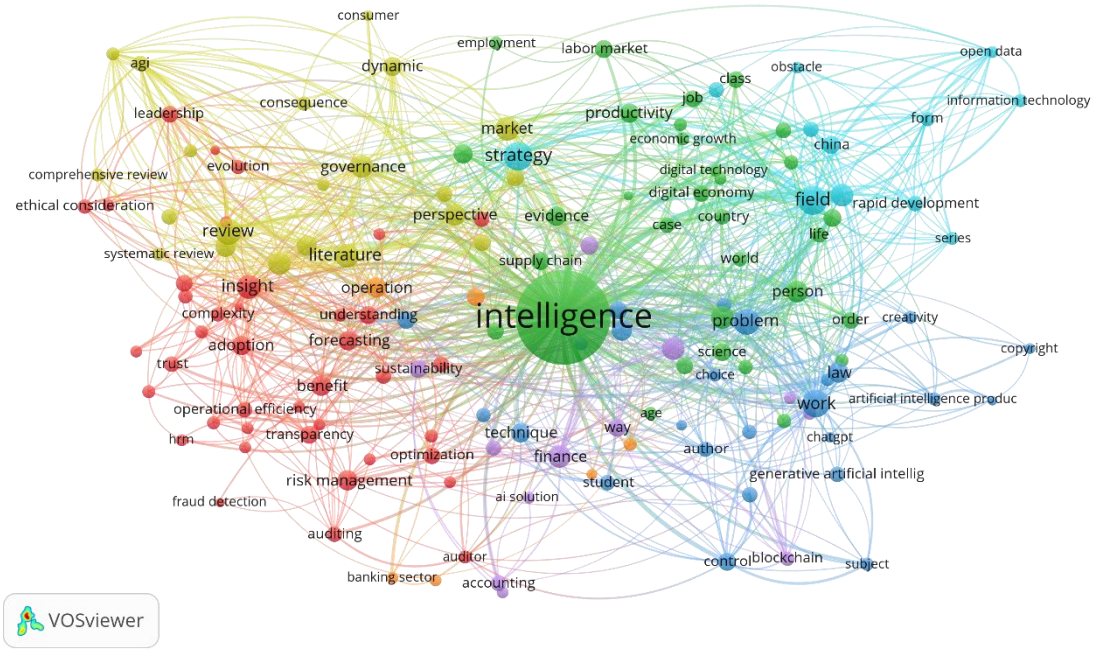


Fig.1. Paper That Researchs about AI and Economic Values

Today, the role of information systems has rapidly transformed into that of AI, creating an overlapping ecosystem and sparking debates over its benefits and social and environmental impacts (Raja Santhi & Muthuswamy, 2023; Shon, 2026). This study examines the relationship between the economy and AI-related information systems from the perspective of the digital economy. Previous theories suggest that information has evolved from merely being a supporting element of economic activity to becoming an economic commodity in its own right (Romer, 1990). Information systems have also transformed into an infrastructure that underpins how the economy is created, valued, and traded (Djunaedi et al., 2024). This study seeks to distinguish between the characteristics of information as an economic asset and its transformative effects on markets and corporate management structures. It also aims to analyze how the economic value of digitalization is formed and what underlying factors drive it. Furthermore, this study discusses projections regarding the extent to which AI systems and the digitalization of information systems are expected to transform economic markets.

As its shown in figure 1, this data comes from crossref with more than 1000 paper that conducted from 2000 to 2026. AI itself is mostly known to the world in 2021 from the launch of Chatgpt, looking at the result there is almost no clear research that talk about distintive pattern about how AI seen as economics value, and so begin on that premises this research is conducted.

2. THEORETICAL FRAMEWORK

Information as Economic Commodity

The concept of information as a commodity in the economy emerged when researchers recognized that knowledge and information had become central to the economic processes of production and value addition (Romer, 1990; Nelson & Romer, 1996). This recognition marked a shift in economic perception—from viewing information as merely a component of economic distribution processes to recognizing it as a commodity in its own right. Structural changes in information technology, along with its goods and services, have brought about an exponential shift; combined with increasing access to digital products, this has created conditions in which information-related activities have spread to all aspects of economic activity. Moghaddam, (2015) notes that this shift has given rise to a term known as the "information society," characterized by a society that utilizes information technology tools in all of its economic activities.

The Nature of Information as an Economic Commodity

Information has several characteristics that distinguish it from other economic commodities and create unique challenges in analyzing it. Understanding these characteristics is crucial for evaluating investments in information systems and digitalization strategies. First, information is a "non-rival good," meaning it can be consumed by one individual without diminishing its value for others (Casaburi et al., 2025). Because it is intangible, information can be shared and reproduced at virtually zero marginal cost. This characteristic affects the pricing mechanisms and market structure for information as a commodity.

Second, information has high fixed costs but low marginal production costs (Jing, 2000). The initial capital required for the information creation process often involves significant investment, whereas reproduction and distribution incur only minimal costs. This cost structure tends to foster monopolies and pose challenges for cost allocation. Third, information can be categorized as something of uncertain quality in terms of its use. The inherent nature of information's value is such that its quality can degrade if the value of the information itself is not immediately apparent (Shapiro & Varian, 1999). This can create conditions of information asymmetry and necessitates mechanisms of reputation and trust to support it.

Fourth, this commodity is one whose value is determined by the experience of using it. This characteristic means that the pricing, marketing, and design of digital platforms that facilitate the exchange of information can vary from one platform to another (Shapiro & Varian, 2008). It is these four inherent properties of information that allow it to be categorized

as a unique commodity requiring a distinct analytical approach, as well as consideration of the accompanying legal and ethical aspects. The same applies to AI, which meets these four criteria. AI gathers information from the internet, resulting in low distribution costs; it has a personalized impact on each individual; and each platform providing it offers unique services tailored to the specific niche market of that information.

The Role of Information Systems in the Economic Ecosystem

It can be said that information systems play a role at the infrastructure level, serving as the medium through which information is obtained, processed, stored, and distributed. In a digitized economy, these systems play a central role in coordinating and regulating economic activities (Parinov, 2025). Meanwhile, from an institutional perspective, numerous studies describe information processing as the very purpose of digitalization—a mechanism through which transaction costs are reduced, productivity is enhanced, and adaptability to external changes is improved (ITU, 2014; Volberda et al., 2021; Cranney et al., 2025). This view emphasizes that information systems are not merely technical in nature but play an institutional role that shapes how the economy interacts, coordinates, and how the value of products is formed. In the context of AI, this role becomes increasingly evident because AI learns and becomes smarter from every past interaction with all its users, thereby providing greater benefits to users in the future.

The economic functions of information systems can also be understood at several institutional levels, such as: information systems support organizational operational efficiency, facilitate strategic decision-making processes, enable coordination among stakeholders, and shape market structures (International Telecommunication Union-ITU, 2019; Myovella et al., 2020; Djunaedi et al., 2024). Each of these functions has its own impact and requires a different analytical approach.

3. RESEARCH METHOD

This study employs a qualitative approach, which aims to build, refine, and foster understanding. This can be achieved through reasoning by analyzing various existing studies. The literature for this study was obtained from various sources, including Google Scholar, Research Gate, the Sinta Database, and the Directory of Open Access Journals (DOAJ), using the keywords "Information Systems", "Artificial Intelligence", "Internet", "Digitization", and "Digital Economy" for papers published between 1970 and 2025.

The literature search and selection process followed a systematic approach consisting of several stages:

Identification Phase: Initial database searches were conducted using the specified keywords, resulting in 1,018 potentially relevant publications. Duplicates were removed, leaving 976 unique records.

Screening Phase: Titles and abstracts were screened based on relevance to the research focus-specifically, studies examining the intersection of information systems, AI, and economic value creation. This screening excluded papers focused purely on technical AI development without economic implications, resulting in 347 articles for full-text assessment.

Eligibility Phase: Full-text articles were assessed against inclusion criteria: (a) published in peer-reviewed journals or conference proceedings, (b) written in English or Indonesian, (c) containing empirical or theoretical contributions to the economics of information systems or AI. This resulted in 46 articles included in the final analysis.

Synthesis Phase: Thematic synthesis was employed to categorize findings into key themes: information characteristics as economic commodities, cost structures of digital investments, productivity measurement challenges, and market transformation dynamics.

The analytical structure of this study is based on previous research Romer (1990) and (Shapiro & Varian, 1999) in which according to the researchers, form the basis of the theoretical framework for the digital information economy in their subsequent research works. The researchers believe that these earlier works are capable of explaining the role of market connectivity and information itself.

4. ANALYSIS AND DISCUSSION

Managing The Economic Value Of AI And Information

Evaluating investments in information systems or digitalization is a challenge for researchers and practitioners. Traditional budgeting techniques developed to measure physical assets often fail to capture the true value of the benefits derived from investments in information systems. This is because these benefits include both tangible and intangible elements and involve uncertain outcomes. However, some studies have successfully measured these benefits using time-series analysis; several companies have demonstrated that adopting technology can drive innovation and transform work culture, leading to greater efficiency and effectiveness in performance (Warner & Wäger, 2019; Brekke et al., 2024; Ghosh et al., 2025). Several studies have measured the value of information systems using more quantifiable approaches such as cost-benefit analysis, game theory, and econometrics.

These diverse approaches represent the most up-to-date methods for measurement, but each is tailored to a different objective.

Cost-Benefit Analysis

Cost-benefit analysis remains the dominant measurement framework for evaluating the performance of information systems and AI adoption. This approach requires a more systematic identification and quantification of both the costs and benefits of investing in the digitization of information systems. However, the challenge lies in quantifying benefits that are difficult to measure such as improvements in decision-making quality, increased customer satisfaction, or enhanced organizational flexibility in which are often undervalued relative to their actual benefits. Although some studies have highlighted their long-term benefits (Khandani et al., 2010; Teng & Tsinopoulos, 2022; Samsuden et al., 2024).

The Econometric Approach

The econometric approach calculates the relationship between information system investment (digitalization) using statistical methods. This approach aims to obtain empirical evidence regarding the value of investment by analyzing patterns across various organizations over time-a process also known as panel data analysis (Vu, 2017; Alqahtani et al., 2024). As outlined by Tsiakis et al., (2014) understanding the costs associated with digitization facilitates pricing, investment valuation, and market-based business decisions.

The Game Theory Approach

The game theory approach is a computational model that analyzes strategic interactions among economic actors in contexts where information itself becomes a commodity within those interactions. This method is particularly well-suited for analyzing niche market platforms, pricing strategies for digital commodities, and competitive dynamics in information-intensive industries which their continuity based on the who has the most important information while the others didn't have it (Casaburi et al., 2025). In the context of country, informations may play roles as game changer which also contribute to create centralized economics that may also create core-periphery conditions with the area that lacks of informations (Djunaedi et al., 2025).

Cost Structure And Information Economics Models

Information systems present a distinct cost structure in economic impact analysis. The high fixed costs of development and implementation, combined with low marginal operating costs, create economies of scale that can enable early adopters to dominate all market competition (Marcin, 2020; Paula Monteiro et al., 2022; Asa et al., 2026).

Some costs that can be categorized as information system digitization costs include infrastructure, data management, and human capital costs.

Infrastructure Cost

Infrastructure costs represent the largest cost component in digital investments. The costs of hardware procurement, software development, integration of both, and post-installation maintenance are often difficult to estimate accurately (Avgerou, 2000; Boudreau & Robey, 2005), even so investing in this infrastructure may reduce disparities which may happen because of core-periphery conditions (Djunaedi et al., 2025). The emergence of cloud computing and artificial intelligence has also transformed cost structures (Omolola et al., 2024; Shon, 2026), but it can also shift many infrastructure costs from capital expenditures to operating expenses, though the scale of this shift remains uncertain. Some studies even highlight that the capital-intensive nature of the AI infrastructure supply chain can lead to unexpected operational costs, such as electricity and water consumption (Bhavna & Sirohi, 2026).

Data Management Cost

Data management and storage costs are among the factors that must be considered in digitization in the age of AI. Companies that make intensive use of data require data management systems that also consume the company's resources over time. The processes of collecting, storing, securing, and analyzing data present ongoing challenges for companies as long as they continue to utilize that data (Gessler, 2026; Shon, 2026).

Human Capital Cost

The human capital costs associated with implementing infrastructure and management processes are also indispensable. The recruitment, training, and career development of talented personnel are challenges that form part of the investment in digitalization and AI. The more sophisticated and modern the infrastructure to be implemented, the greater the need for personnel who understand how to install and use it optimally. The complexity of evaluating the return on investment in human capital must also be carefully considered (Jin et al., 2026). Even when the implementation is not fully supported by enough investment in learning its only created "*Productivity Pressure Paradox*", undermining the very productivity benefits that motivate adoption (Miller et al., 2025).

The Economics Of Information Security

The economics of information security has emerged as a distinct area from investment in digitalisation and the implementation of AI. Companies are often faced with decisions regarding investment in this area, where it is extremely difficult to measure the effectiveness

of the benefits, yet the costs are very substantial. Key areas of focus in the economic analysis of information security include measuring the cost-effectiveness of security measures, cost-benefit analysis of security investments, and behavioural dimensions relating to digital information. Aurigemma and Leonard, (2015) Stating that cost-effectiveness is a component whose requires attention as is well known, system breaches involving non-technical factors often raise questions about how effective expenditure on data security actually is. Different approaches may be adopted by companies with different organisational cultures.

Similarly, with regard to the cost-benefit analysis of investments in information systems or AI, the analysis involves several contexts that also require separate approaches, as each institution has different needs and risks relating to the information it manages. The greater the risk, the greater the benefits to be gained and the potential costs incurred for security measures (Aurigemma & Leonard, 2015; Chu & So, 2020). Next is the behavioural dimension of information security, which also contributes to the economic value of investment in this sector. The relationship between ethical behaviour in information security and organisational commitment will have an impact on two aspects: data breaches and the effectiveness of investment (Banna et al., 2021).

The Strategic Value's Paradox Of Economic Investments In Information Systems and Artificial Intelligence

Many people question whether information systems including AI (in this context) offer commensurate business value. This is because it is extremely difficult to obtain concrete evidence of the productivity gains generated by investment in information systems and AI within a short timeframe. Some studies have termed this the "productivity paradox" (Brynjolfsson, 1993), whereby investment is expected to boost productivity; yet, during the 1980s, massive corporate investment in computerisation in the United States did not correlate with US productivity statistics. This was only resolved several decades later, when productivity growth in the country surged. There is a time lag required for these technologies to reach a stage of maturity where their benefits are fully realised (David, 1990).

Although there is a paradox, the direct value of investment in information can be clearly seen through improved efficiency, cost reduction and better decision-making. AI and information systems automate routine tasks, reduce errors and provide more accurate and timely information. Meanwhile, indirect value is created through strategic advantages, differentiation, customer relationships and market positioning. Information systems and AI are also capable of creating new business models and supporting innovation. However, it is also important to understand that AI and information systems should act as complements rather than

replacements. As research by Bhavna & Sirohi, (2026) dan Shon, (2026) indicates, AI systems and humans should complement one another, given the excessive social and environmental costs of relying too heavily on AI alone.

The timeframe for addressing the paradox of AI's economic value and digital transformation involves factors such as organisational structure, work culture and organisational strategy, as well as the individuals playing the most significant roles in this process. Several studies on this topic suggest that for organisations that have already adapted to digitalisation or, as it were, are in a 'post-digitalisation' phase the challenge lies in how to create a structure and work culture capable of managing the overflow of data and the opportunities arising from it (Ekman et al., 2021). Organisations will be faced with demands relating to stability, exploration, flexibility and control over information. These factors require a well-organised management transformation, involving the creation of job descriptions that may be entirely different, with a new level of complexity. Furthermore, several studies have revealed that this process requires middle managers who are capable of balancing and integrating the demands from various essential areas to support employee performance, whilst remaining focused on the organisation's vision. (Hadi; & Hmood, 2020; Lu & Shaharudin, 2024; Ali Alqararah et al., 2025).

Performance Measurement Frameworks for AI Investment

Recent research developing the AIDI (AI and Digitalization Intensity) framework demonstrates that firms with stronger AI/digital adaptation shows measurably stronger cash flow efficiency ($\beta = 0.0029$, bootstrap $p = 0.004$) and operating margins ($\beta = 0.0188$, $p = 0.008$), with the payoff particularly pronounced during price turbulence suggesting digital capability may functions as operational shock insurance (Nagorskiy, 2026).

There is also research about dynamic modelling AI productivity, the model reveals that even fully informed decision makers position rationally using AI when short term productivity gains outweight long run skill costs, producing steady state loss, it's the condition that the worker ends up less productive than before adoption (Caosun & Aral, 2026). Its becoming cognitive offloading trap as the worker ends up worse off than if AI had never been adopted. That's why conventional budgeting may fail because they do not account for the decreasing of human capital that sustained AI use can cause.

Organizational Structure within AI adaptation

Economic values is not separating on how those value created, particularly on the institutional or organization level. Some research conducting Role Theory to automated leadership within AI adapatation, its reveals that AI agents positioned in middle management

are resulted to potentially conflicting roles between authority, collaborative co-leader, leader-assistant, and operator within the same organizational environment. This creates significant risk of role conflict and role ambiguity, which have been linked to increased job-related stress, lower organizational commitment, decreased job satisfaction, reduced performance, and heightened risk of burnout among employees (Jean-baptiste, 2025).

Meanwhile when using Activity Theory its captured a condition while middle managers frequently using AI experimentation without formal validation (Shadow IT), it may cause tensions between bottom up and centralized management. These managers increasingly act as mediators, translating uncertain directives into pragmatic actions while balancing the routine tasks while reinforcing human competencies such as critical judgment and ethical discernment (Jean-baptiste, 2025).

Some research also reflecting on findings that AI adaptation may result on the flattening of organization structure, like reducing management layers, eliminating junior roles, and relying on AI systems to handle tasks once performed by humans, a jobs that mostly administration level. However, some contrary to narratives of mass takeover, research suggests middle management roles are evolving rather than disappearing, where managers adapted with AI will grow in complexity and importance (Nolan, 2025). Other research proposes a new context structure centered on two pillars. First, a stable context layer that preserves human judgment, and second, temporary learning teams that use AI to generate new information. This form reframes organizational design around contextual judgment and learning rather than fixed conclusion function (Karp, 2026).

Digitalisation And Market Transformation

The market transformation brought about by the digitalisation of information and AI will undoubtedly create a new business ecosystem. The new market structure within this ecosystem will inevitably be accompanied by regulatory challenges. As highlighted in the research by Kurniati et al. (2026), the technology ecosystem tends to evolve more rapidly than the regulations governing it. A lack of governing regulations can sometimes hinder the pace of market transformation; regulations are often reactive and disproportionate as they follow the progress of a few dominant companies in the market.

Several ecosystems created by digitalisation can be seen in major platforms such as Apple, Google-Android, dominant online marketplaces and several other platforms. The Android and Apple ecosystems have given rise to market players such as software developers, game developers and content providers as a result of market transformation through supply and demand mechanisms (Yun et al., 2017).

The same phenomenon is evident in online marketplaces, which have given rise to the content provider and streaming industries. It is believed that the transformation of the AI market will also bring about similar developments through the role of AI agents (Lo, 2025), although the form of the economic ecosystem may not yet be particularly complex at this stage.

Those transformation also hitting the financial ecosystem in some countries, this tranformation become a foundation to give those countries a regulatory sandbox so the adaptation can be implemented with regulatory supervision, all of that in the hope of smooth transaction about the changing environment, facilitating both demand of industry and government (Longo et al., 2025; Prihandini Siti, 2025).

5. CONCLUSION AND SUGGESTION

This study examines the relationship between the economy and information systems, which have now undergone a significant transformation into AI. The researchers note that there is currently a need for a framework that can serve as a basis for assessing how AI has become a commodity and what the future prospects are for an economy that has now been transformed by AI.

This study highlights the findings of the research in several areas. Firstly, that information and all accompanying data possess unique value characteristics as non-rival economic goods, with high fixed costs, uncertain quality and an experiential nature, which necessitates a specialised approach to their valuation. Secondly, information systems also function as infrastructure encompassing processes of creation, storage, processing and exchange, all of which characterise the current economy. Thirdly, the valuation of the benefits of investment in this context requires a different benefits-based approach, given that the utility is difficult to measure compared to the costs. Fourthly, digitalisation and AI are creating new business ecosystems that may require a regulatory approach far removed from conventional regulation, as well as an increasingly shorter timeframe to respond to these changes.

Managerial Implications

Implications of this research is suggest that companies and managerial decision-makers need to recognise this and develop a performance measurement framework to adapt to the rapid changes brought about by the advent of AI-driven digitalisation. A period of “Productivity Paradox” will emerge as a result of the euphoria surrounding the rapid, massive and premature adoption of this technology.

However, in the context of information digitalisation, economic entities that are first able to adapt to these changes will be able to gain an economic advantage over others. Furthermore, these changes require a more dominant role for middle management, as they are in direct contact with the users of this digitalisation.

Corporate investment in digitalisation requires greater attention to the cost-benefit structure. It is also necessary to assess which departments' capabilities are most in need of support and to what extent their human capital is prepared. Furthermore, investment must take into account the complex balance between flexibility and the risks associated with information security, so as not to stifle innovation and the exploration of the benefits of the information itself.

Policy Implications

From a policy-making perspective, a flexible framework that safeguards the interests and security of all parties at the macroeconomic level needs to be established. This includes ensuring that smaller industries do not fall victim to regulation due to the powerful influence that large information technology firms exert on the market. This is essential to maintaining healthy competition and ensuring the long-term stability of industrial innovation. Adaptive regulatory approaches, may offer path to balance the innovation between consumer protection and market fairness.

This flexible policy is more likely adapted by some countries, including Indonesia. In the EU AI Act's mandate, European State consider to establish at least one fully operational Artificial Intelligence Regulatory Sandbox (AIRS) by August 2026 to provides a concrete regulatory model. These sandboxes create controlled environments where AI providers can test the systems under supervision, matching both business learning and regulatory adaptation demand. These mechanisms aims for reducing regulatory fragmentation and administrative resource inefficiency (Longo et al., 2025). Same approach was done by Indonesian government which encourages financial institution to accelerating digital transformation while safeguarding systemic stability (Prihandini Siti, 2025).

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