

Determinants of Pentahelix Model in Developing the Halal Industry in Indonesia: Analytic Network Process (ANP) Approach

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Abstract: The development of an industry cannot be realized without the role of stakeholders, and this also applies to the halal industry. This paper aims to examine the determinants of the pentahelix model in developing the halal industry in Indonesia. Qualitative approach by using the Analytic Network Process (ANP) used in this study. Ten respondents, including practitioners, academics, and policymakers, are selected to gather experts' opinions about developing the halal industry through the pentahelix model. The findings of this study show that business actors, who play a major role as producers and providers of halal products and are responsible for meeting halal standards, are the first priority determinant found in the pentahelix. An increase in understanding of halal knowledge, consistent discipline and professionalism, and having product development access of business actors will increase their role in developing the halal industry. The second priority determinant found is media, followed by government, academia, and community. The most prioritized sub-elements of the pentahelix aspect indicators, according to the respondents' agreement, are government support (government element) and knowledge and understanding of halal (business actor element). It indicates that government assistance is a priority due to its significant regulatory role in ensuring simple procedures and compliance with halal standards. In conclusion, the priority rank of determinant of pentahelix found is business actor (first rank), media (second rank), government (third rank), academia (fourth rank), and community (fifth rank). The study suggests that business actors play a crucial role in developing the halal industry, which may be enhanced in terms of their halal literacy and knowledge of halal products. The government's role in halal certification needs to be enhanced in order to ease the halal register for business actors.

Keywords: analytic network process, halal industry, halal knowledge, pentahelix

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1. Introduction

The State of the Global Islamic Economy Report (SGIE) results indicate that Muslims spent US\$2.29 trillion in 2022 on food, pharmaceuticals, cosmetics, modest fashion, travel, and media. Islamic finance assets are estimated to have reached US\$3.96 trillion in 2021 and are projected to grow to US\$ 5.96 trillion by 2026. The import of halal-related products by OIC member countries is set to grow by 7.6% to US\$492 billion in 2027, up from US\$359 billion in 2022. Imports by OIC member countries represent a significant majority of halal products traded globally, including food and beverages, fashion (apparel and footwear), pharmaceuticals, and cosmetics. Rafiuddin Shikoh, CEO and Managing Director of Dinar Standard stated that the SGIE report, now in its 10th year, has evolved into a global reference point for evaluating the Islamic Economy's annual developments across the seven sectors covered while highlighting potential areas of growth. Over the past decade, the report has reached over 101,000 readers across 85 countries, with over 14,150 report downloads and over 1,570 media mentions. Muslim spending has increased from US\$ 1.62 trillion in 2012 to US\$ 2.29 trillion a decade later (Ozturk & McClements, 2016).

The thought is exceptionally clear: By creating halal food in Malaysia, they can expand the market to the Middle East, which is currently the top destination for the halal product market. Not only countries in Southeast Asia but also New Zealand and Australia have quickly responded to the demand for halal products. New Zealand, recognized as a meat exporter to various parts of the world, has been promoting halal certification for many years. About 80% of meat companies in New Zealand have received halal certification, primarily because most of their export destinations are in the Middle East. It is never too late for local producers to enter the global halal market by certifying their products. By certifying a product as halal, it gains the opportunity to enter the halal food market, which is estimated to be worth around (Tjitroesmi & Suhodo, 2014).

The halal industry comprises various sectors such as food, pharmaceuticals, fashion/modest wear, cosmetics, media, recreation, tourism/travel, and finance. The report states that the halal industry and Islamic lifestyle are expected to reach US \$3.2 trillion by 2024. As the most populous Muslim-majority country in the world, Indonesia is strategically positioned to be a trendsetter in the halal industry. Unfortunately, the development of halal lifestyles in Indonesia has remained stagnant compared to other countries. According to the Central Bank of Indonesia, Indonesia's halal market contributes only 10% of global halal spending, primarily in the food and beverage sector. The report reveals that Indonesia is currently the largest consumer of halal products, while its role as the largest producer is still far from expectations (Rafiki et al., 2023). The halal industry can be classified into ten different clusters. Knowledge-based workers (K-Workers) represent one of these clusters, and their purpose is to ensure that K-Workers are fully prepared for halal industries. The Penang International Halal Hub recognizes the considerable importance of capable human resources as a crucial component of any business or industry. It is essential for the halal industry to closely collaborate with scholars and training providers, such as the Penang Skills Development Center, to enhance skills and key elements within the halal management system, quality assurance certifications, and auditing. This strategy aims to develop a group of skilled knowledge workers and specialists, preparing them for halal industries (Aziz & Zailani, 2017).

The halal logo is irreplaceable because it indicates a crucial symbol of consumption: safe, clean, and trusted products. It has been used as a sales (Islam et al., 2023) strategy; thus, many factors influence the decision to purchase halal products. However, due to some abuses of halal certification, Muslim consumers have difficulties distinguishing between authentic halal logos and those that are not. Based on demographic factors, the potential of the halal industry in Indonesia is considered very large, with typical consumers being young and productive, educated, and possessing a significant disposable income (Syahrial, 2022). A study conducted by Indonesia Halal Lifestyle Center in 2022 showed that Indonesia ranks first out of 10 countries with the largest amount of halal food spending globally. With the most significant Muslim population, this vast market has not been matched by the availability of locally produced products. The Global Islamic Economy Report in 2021 states that Indonesia tends to be the world's leading consumer of halal products, with a reasonably high consumption value.

For the halal food and beverage sector in 2022, the position remains a net import (with export value lower than import value). It indicates that food and beverage consumption is still primarily met by imported commodities (Vanany et al., 2019). In the pharmaceutical and cosmetics sector, 95% of the source of medicinal raw materials is still imported from overseas, including countries that do not necessarily produce halal raw materials. Furthermore, most available halal cosmetic and medicinal products in the market are limited to basic items (Kasri et al., 2021). In the tourism sector, foreign tourist visits are still dominated by tourists from Malaysia, China, Singapore, and Australia. The dominance of

these tourists has not been matched by visitors from the Middle East, indicating that Indonesia has yet to become a major tourist destination for Middle Eastern travelers (Mastercard-CrescentRating, 2022). In the media sector, no less than 50% of national entertainment and film shows are still dominated by imported content (Tarigan et al., 2020).

The inability of the domestic halal industry to meet needs is due to several players in Indonesia's halal industry still facing many problems. These issues range from a lack of knowledge and awareness of halal products (Yunos et al., 2014), limited ownership of halal certification (Haleem et al., 2020), low production processes that do not meet halal standards (Khalique et al., 2013), and marketing problems (Alserhan et al., 2022). Halal industry development is a strategy that needs to address these challenges through cooperation among stakeholders. According to the National Strategy for the Development of the Indonesian Halal Industry by the National Islamic Finance Committee, an ecosystem capable of developing the halal industry involves three approaches: supply, demand, and support. Nasution (2020) explained that the halal industry ecosystem can develop well by ensuring the supply of halal products, increasing public awareness of the importance of halal products, and providing the necessary support and infrastructure.

The development of an industry is not possible without the intervention of stakeholders (Aviso et al., 2022). The policy actor is a policy subsystem that influences the policy network between the organization of the international system, the organization of society, and the organization of the state (Howlett & Ramesh, 2003). Tonkovic et al. (2015) stated that it involves the participation of academia, business, the community, government, and media as a strategy for economic development. However, the lack of collaboration among stakeholders, which is predominantly conducted by industry and government, may insufficiently involve the community, academia, and media- these are issues that may occur in traditional models. Given these problems, the aforementioned model may not fully address the multidimensional nature of the halal industry in Indonesia. Therefore, the pentahelix model, with a collaborative approach, offers a more effective framework for overcoming the complexities of the halal industry.

The pentahelix model is a framework that highlights the collaboration among five key sectors: government, academia, business, community, and media. Pentahelix is a methodological model of socio-economic development through the use of knowledge to pursue innovation (Zhironkin, 2022). An important conceptual framework in the helix model is knowledge and innovation (Cai & Lattu, 2022). The development of the helix model can function as either an analytical model or an innovation model (Carayannis & Campbell, 2010). The integration of the pentahelix model strategy aims to create innovation through the 4C (Command-Coordination-Connection-Collaborate) approach (Hidayatullah, 2022). The pentahelix serves to maximize the inclusion of eco-innovation and eco-entrepreneurship (Zhou & Etzkowitz, 2021). Smith & Leydesdorff (2014) show that the innovation ecosystem produces an inclusive concept by emphasizing ecological, economic, and social aspects and sustainability. Cai and Ahmad (2023) stated that the innovation ecosystem is defined as a network of co-innovation, where actors interact with each other in forming co-evolution and interdependent relationships.

In a collaborative forum, interactions among stakeholders (Academia, Business, Community, Government, and Media) are critical because they help solve problems, formulate developments, facilitate decision-making, and strengthen networks and system innovation (Kuntias, 2022). Five helixes are the main actors driving the emergence of creativity, ideas, science, and technology through close relationships, mutual support, and symbiotic mutualism (Megits et al., 2022). The Pentahelix ecosystem (Carayannis et al., 2012; Carayannis & Campbell, 2010) is viewed as a complex adaptation (Cai & Amaral, 2021; Lew & Park, 2021; Ranga & Etzkowitz, 2013; Tonkovic et al., 2015) that increases innovation dynamics in the form of new knowledge creation, innovation-based products, and innovation-driven economies. König et al. (2021) reflect the helix model to realize sustainable development (SDGs). Utomo et al. (2020) concluded that the helix model contributes to the development of Islamic finance in Indonesia through collaboration and synergy among Islamic financial institutions, Islamic social institutions, government support, industry investment, academic research and education, and community engagement.

Although many studies related to the pentahelix model have been conducted, few studies mainly focus on how the pentahelix model operates within Indonesia's halal industry. One study by Herdiyanto and Munir (2024) examined the role of the pentahelix model in the development of halal tourism. Purnomo (2021) analyzed the pentahelix actors' roles and contributions in maintaining the tourism sector during the COVID-19 pandemic. Additionally, Rachmiatie et al. (2024) investigated the

components of a halal tourism ecosystem and how to establish a model for an effective halal tourism ecosystem.

Most studies may cover the halal sector and pentahelix model. However, to the best of our knowledge, few, if any, studies have applied ANP analysis in the pentahelix model and halal research. Therefore, this study seeks to determine the extent of the pentahelix model's role in developing the halal industry in Indonesia by using the Analytic Network Process (ANP) as the analytical technique. ANP analysis is employed to identify the highest priority among the criteria of the pentahelix dimensions to implement the best strategy for optimizing the halal industry.

The current global market conditions, based on the needs and preferences of many Muslims around the world, have led to intense competition in the industry. This competition creates opportunities for companies, especially in emerging markets, to take advantage of the halal product market. This sector is increasingly attracting the attention of policymakers and entrepreneurs as an industry with significant growth potential. According to the State of the Global Islamic Economy Report 2017-2018 by Dinar Standard, current halal business and industry trends continue to show progress, including businesses in the halal food sector, halal travel, halal media and recreation, halal pharmaceuticals, and cosmetics. Thus, the concept of halal includes any product that complies with Islamic law, starting with drinks and food. According to the National Strategy for the Development of the Indonesian Halal Industry by the National Islamic Finance Committee, the concept of halal also encompasses banking and finance, tourism, cosmetics, pharmaceuticals, employment, travel, technology, and transportation services, among others.

Over time, the global halal industry has experienced substantial growth, marked by various national initiatives to position themselves as leaders in different sectors. The United Kingdom, with London as its focal point, has declared its role as the center of Islamic finance in the Western world. China has emerged as the largest exporter of Muslim fashion to the Middle East, while South Korea has expressed ambitions to become a leading destination for halal tourism. Similarly, the United Arab Emirates is actively promoting Dubai as the capital of the Islamic economy. Thailand aims to establish itself as the global hub for halal cuisine, and Malaysia set forth a vision to become the international center for both the halal industry and Islamic finance by the year 2020. However, Indonesia still occupies the position of a large market rather than a player in the global halal industry. Indonesia's role in the global halal industry remains far behind that of other countries where Muslims are actually a minority (Supandi et al., 2022). To address these issues, collaboration among halal stakeholders is important.

The development of synergized concept collaboration began with the emergence of the Triple Helix idea by Etzkowitz and Leydesdorff in 1995. This concept emphasizes the relationship between universities, industry, and government. In 2009, Carayannis developed a new concept, namely the Quadruple Helix, by adding elements of local communities (Civil Society) as an effort to complement the already established Triple Helix concept. Meanwhile, the Pentahelix concept was developed by Etzkowitz in 2013 by including the media, which currently plays a very significant role in developing social capital. The Helix model is popular in the world of innovation, but that does not mean it does not have weaknesses. For example, there is criticism that the model is Western-biased, as it cannot be applied in developing countries due to the lack of readiness of universities, the business sector, the government, or the social community to carry out development. In developing countries, efforts need to be made to strengthen institutions first so that the synergy between the helix parties can later play an active role in productive collaboration (Fitriani et al., 2020).

A review of early studies documented that the pentahelix model has been employed and well-supported across various fields. It has been used extensively to examine collaboration in tourism development (Hidayatullah, 2022; Kagungan et al., 2022; Purnomo, 2021), the health sector (Caraka et al., 2021; Forss et al., 2021), the food and agriculture sector (Pratama et al., 2023; Yunas, 2019; Zuhri et al., 2024). In tourism, Kagungan et al. (2022) examined a model of pentahelix collaboration in the development of the village of Harapan Jaya, Way Ratay District, Pesawaran Regency. A qualitative approach using interviews and FGDs was employed in this research. The study found that the collaboration of the pentahelix model in developing the Harapan Jaya Tourism Village requires particular attention. The pentahelix model collaboration, involving academics, private sectors, the community, government, and media, is crucial to support future tourism. However, to date, this collaboration remains suboptimal, as measured by the interdependence between actors and the overall unification of ideas. Hidayatullah (2022) examined creative tourism economic development strategies that were analyzed through pentahelix collaboration in Batu City, Malang. A qualitative method employing a SWOT analysis was utilized for this study. It showed that local governments, managers,

and entrepreneurs of creative economy businesses in Batu City face considerable challenges. Yunas (Yunas, 2019) assessed the implementation of the pentahelix concept in developing village potential through the Village Economic Barn Model in East Java Province. The study revealed that synergy among stakeholders through pentahelix collaboration, particularly between government, community, industry (business actors), and academics, plays a vital role in realizing the welfare of rural communities in East Java Province in the form of Village Economic Barns.

Another study related to pentahelix was also conducted in the health sector. Forss et al. (2021) examined how the pentahelix collaboration worked for health promotion from the perspectives of all partners, including the citizens. By using qualitative content analysis, this study indicated that health promoters are essential for building trust between different sectors of society; the shift of power and system changes take time. The study also showed that the pentahelix collaboration worked well at the local level in a governance-related model for pentahelix cooperation. Caraka et al. (Caraka et al., 2021) analyzed the relationship between communicable disease, social factors, and climate towards pentahelix. They showed that to overcome health problems, the role of regional government can be an effective means of dealing with political pressure by accommodating and articulating local interests, becoming a medium for political education for people who feel the implementation of government functions directly.

Meanwhile, Pratama (Pratama et al., 2023) studied the application of the pentahelix model in the food and agriculture sectors. They investigated how to address food security in Indonesia by implementing the pentahelix model. This study found that the involvement of pentahelix actors would enhance efforts to achieve food security in Indonesia, which is included in SDG number two. Zuhri (Zuhri et al., 2024) aimed to determine the extent of the role of the actors involved in accelerating the reduction of stunting rates in Indonesia. This study indicated that collaboration between stakeholders in the Bekasi district is effective in accelerating the reduction of stunting. In the entrepreneurship sector, Mardiatmi (2021) analyzed pentahelix support for MSME management performance in Serang City. Using a quantitative approach through Partial Least Squares (PLS) data analysis, they found that business actors and the community significantly influence the management performance of MSMEs. It indicates that as the involvement of business actors and the community increases, the management performance of MSMEs also improves.

Ali et al. (2020) investigated the determinants of Islamic financial inclusion in Indonesia. By using the Analytic Network Process (ANP), the study found that the level of Islamic financial inclusion in Indonesia is influenced by two main drivers: supply and demand. Financial literacy ranks highest among the demand factors for Islamic financial inclusion, followed by religiosity level, socio-economic factors, and social influence. On the supply side, the main factors of Islamic financial inclusion are ranked as human capital, products and services, infrastructure, and policy and regulation.

The study related to pentahelix collaboration in developing the halal industry is still considered to be limited or even nonexistent. Furthermore, the use of the Analytic Network Process (ANP) as an analytical technique in related studies is still rare as well. ANP framework is an effective way to analyze complex and interdependent relationships in the pentahelix model. ANP's ability to model network structures, handle interdependencies and feedback, accommodate complex influences, and prioritize factors through pairwise comparisons is in line with the core principles of the pentahelix model. Thus, this motivates the current study to examine the determinants of the pentahelix model in developing the halal industry in Indonesia by using ANP.

2. Materials and Methods

This study employs a qualitative approach using the Analytic Network Process (ANP). Initially introduced by Thomas Saaty in 1996, ANP is an advancement of the Analytic Hierarchy Process (AHP) that offers enhanced applicability to diverse qualitative studies, including decision-making, forecasting, mapping, strategizing, evaluation, and resource allocation (Saaty, 1999). ANP addresses the limitations of AHP by accommodating interrelationships between criteria or alternatives, utilizing a structure that comprises a control hierarchy, clusters, elements, and various linkages to comprehensively assess the overall influence of elements within and between clusters (Saaty & Vargas, 2013). The SuperDecisions software was used to apply the Analytical Network Process (ANP) method for data analysis.

This study utilized the Analytic Network Process (ANP) to assess the pentahelix indicators for developing the halal industry, employing a comprehensive decision-making framework that avoids the assumption of independence between variables. Ascarya (2005) emphasizes the importance of identifying these determinants for effective government strategy. ANP, in contrast to econometric models, overcomes statistical challenges, as stated by Saaty and Vargas (Saaty & Vargas, 2013), and

shares the same conceptual foundation as traditional composite indicator methods, facilitating indicator selection throughout the economic process. Designed for decision-making, ANP enables stakeholders to make well-informed choices based on expert opinions. Recognizing the need for a qualitative approach in addressing halal industry issues, ANP is integrated into multi-criteria decision-making (MCDM) methodologies, as shown in the study by Widiastuti et al. (2020), which predicts obstacles in the purposing of the halal industry development strategy in Indonesia. Ali et al. (Ali et al., 2020) also applied ANP to identify distinctive factors that influence the level of Islamic financial inclusion in Indonesia.

2.1. Data Source

In this study, the essence of the research lies in the careful selection and categorization of data sources. Two distinct components contribute to a comprehensive data foundation: primary data sources and secondary data sources. Primary data sources are characterized by direct provision from key stakeholders, which is in line with the principles of the Pentahelix model. However, there are no strict rules regarding ANP sample size. Ascarya (2015), in his study about the real causes of the financial crisis from an Islamic economic perspective, employed seven respondents consisting of scholars and experts in Islamic economics and finance. Supporting this, Prevett and Anderson (2017) used ten respondents to study the use of an analytic network process model to incorporate qualitative factors into multi-criteria global modal choice decisions. According to Saaty (1999), in ANP, the quality of experts is better than the quantity. Explicitly, ANP does not require a large sample size (statistical power) but relies on representative power (Gonzalez-Urango et al., 2021). According to Lin et al. (2009), the number of experts is generally not too large, with 5-15 people being the ideal average. The number of experts is not too large because involving many experts can lead to the repetition of information (inconsistency) without significantly improving the quality of the priorities obtained (Tarei et al., 2018). On this basis, this study selects ten experts from three different groups, five practitioners, two regulators, and three academics, to complete the simplified ANP pair-wise comparison questionnaire.

Primary data were carefully collected through in-depth interviews with experts and practitioners who possess a deep understanding of the subject matter. Furthermore, questionnaires were administered during the second meeting with the respondents to enrich the data. On the other hand, secondary data sources obtained from second or third parties enhanced the research landscape. These secondary sources, drawn from various media such as books, journals, websites, and documents, provided additional layers of insight and understanding to complement the primary data, forming a robust and diverse basis for the analyses in this study. The study's expert respondent profiles are presented in Table 1.

Table 1. Analytic Network Process (ANP) Respondent Profile

No	Name	Institution	Designation
1	ZZ	Sebelas Maret University	Academic (Researcher at Halal Research Centre and Services)
2	HT	Brawijaya University	Academic (Researcher at Halal Qualified Industry Development)
3	SH	The Indonesian Association of Islamic Economist (IAEI)	Academic (Expert at the development of Halal Industry & Creative Industry Division)
4	AS	Yumeda Pangan Sejahtera	Practitioner (Business Owner)
5	GS	Kauman Trade Company	Practitioner (Chairman)
6	MY	Paguyuban Kampung Wisata Batik Kauman (PKWBK)	Practitioner (Human Resources Department)
7	JS	Republika Newspaper	Practitioner (Managing Editor)
8	NA	Halal Corner	Practitioner (Head of Division)
9	AS	Halal Product Assurance Organizing Body (BPJPH) Cooperatives and Micro	Regulator (Coordinator in the Halal Certification Division)
10	E	Business Division of Local Government	Regulator (Head of Division)

2.2. Extraction of DNA

This study follows a structured approach in Analytic Network Process (ANP) modeling, consisting of three phases. The initial phase focuses on constructing or decomposing the model by understanding and structuring complex problems through literature reviews, questionnaires, and expert interviews. It includes the creation and validation of the ANP network. The second phase involves model quantification, employing pairwise comparisons through designed questionnaires tested on experts

and/or Islamic bankers. The final phase, synthesis and results analysis, utilizes the ANP software SuperDecisions for data processing, calculating the geometric mean, and assessing rater agreement. Validation and interpretation of the results are also integral to this phase.

2.2.1. Model Construction

The ANP model involves creating a hierarchical network using theoretical and empirical references and integrating insights from interviews with experts, regulators, and pentahelix stakeholders. The study comprises three stages: 1) in-depth interviews with halal industry practitioners and academics to identify factors affecting sub-optimal performance, 2) formulating the ANP framework and questionnaires based on these interviews, and 3) conducting ANP analysis to identify priorities, solutions, and optimal strategies for halal industry optimization (Saaty, 2003; Saaty & Vargas, 2013). The incorporation of the ANP framework into the software involves three sequential stages: a) Create a cluster; b) Create elements; c) Create a network.

2.2.2. Model Quantification

In the quantification phase of the model, the ANP questionnaire utilizes pairwise comparison questions within the cluster elements to determine their relative influence and magnitude of difference on a numerical scale of 1 to 9. The collected assessment data is then entered into the SuperDecision software for processing, resulting in a supermatrix output. Each respondent's results are subsequently incorporated into an individual ANP network (Ozdemir & Saaty, 2005).

2.3. Result Analysis

2.3.1 Geometric Analysis

An evaluation is conducted by computing the geometric mean to ascertain individual assessments from respondents and aggregate group opinions (Saaty & Vargas, 2013). The pairwise comparison responses from respondents are consolidated to establish a consensus.

2.3.2 Rater Agreement

Quantifying the consensus among respondents (R_1 - R_n) within a cluster regarding a particular issue is assessed using Kendall's Coefficient of Concordance (W ; $0 < W \leq 1$), where $W = 1$ indicates perfect agreement among respondents. A value of $W = 0$ signifies perfect disagreement among respondents. An intermediate value of $0 < W < 1$ indicates a greater or lesser degree of agreement among raters or respondents (Ali et al., 2020). A higher value suggests a higher level of agreement. To calculate Kendall's W , the first step is to assign ranks to each response. If object i is given rank r_{ij} by judge j , with n objects evaluated by m judges in total, then the overall rank for object i is determined using the formula presented by Marozzi (2014).

(Marozzi, 2014) shown in the following formula.

$$R_i = \sum_j^m = 1r_{i,j}$$

When the mean from the total ranking is:

$$R = \frac{1}{2}m(n + 1) \quad (1) \text{ Total ranking}$$

The following formula calculates the sum of squared deviations (S):

$$S = \sum_i^n = 1(R_i - \bar{R})^2 \quad (2) \text{ Squared deviations}$$

Thus, Kendall's W is obtained as follows:

$$W = \frac{12S}{m^2(n^3 - n)} \quad (3) \text{ Kendall's coefficient}$$

Where W is Kendall's coefficient, n is the total number of objects, m is the total number of judges, and S is the sum of the standard deviation.

3. Results and Discussion

3.1. Synthesis Result Analysis of the Role of the Pentahelix Elements

The overall ANP results show that, based on their degree of involvement in the development of the halal industry, the key components of the pentahelix model are ranked as follows: business actors (0.291), media (0.260), government (0.223), academia (0.122), and community (0.103). All respondents from

the three different groups have relatively diverse views regarding the priority of involvement of the pentahelix model in developing the halal industry.

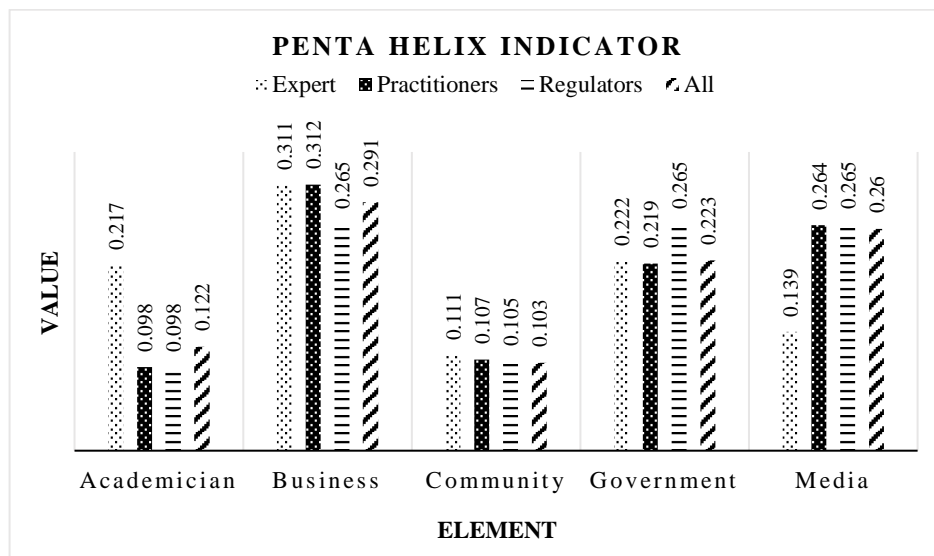
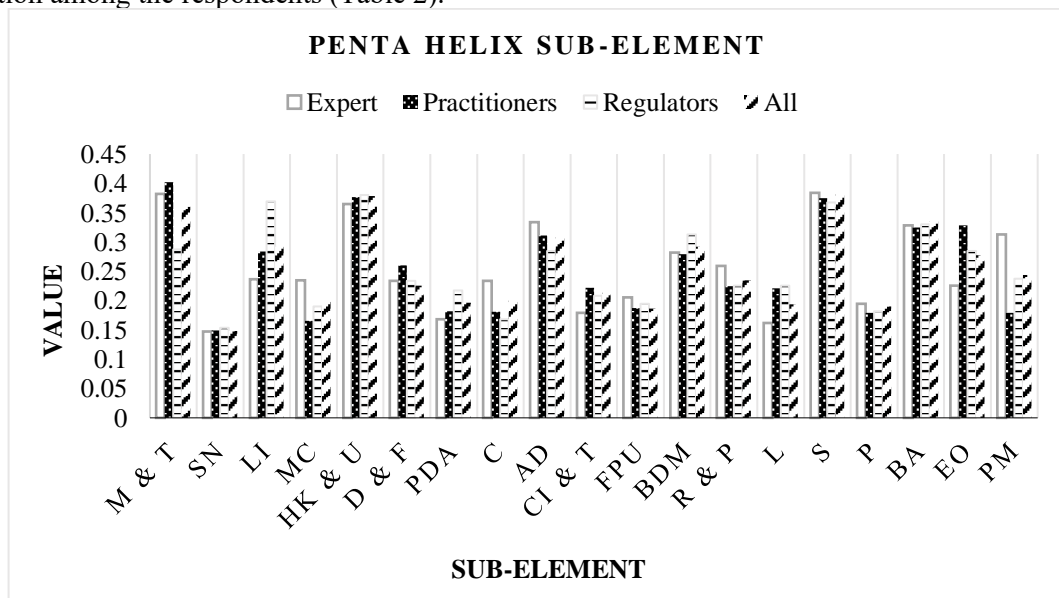


Figure 1. ANP Priority Synthesis Results of Pentahelix Indicator

3.2. Synthesis Result Analysis of the Role of the Pentahelix Sub-Element

As shown in greater detail, the priority of each sub-cluster of pentahelix indicates that the three most crucial factors of the pentahelix strategy for the involvement of halal development in the business actors cluster are halal knowledge and understanding, discipline and professionalism, and product development access. The agreement among raters in this cluster is relatively low at 0.378, indicating a high level of deviation among the respondents (Table 2).



Note: M&T= Mentoring & Training; SN=Service Network; LI=Literacy Innovation; MC=Management Concept; HK&U=Halal Knowledge & Understanding; DF=Discipline & Professionalism; PDA=Product Knowledge & Access; C=Cooperation; AD=Activity Drivers; CI&D=Contribution Idea & Thoughts; FPU=Facilitator of Potential Users; BDM=Business Development Mediator; R&P=Regulation & Policy; L=Licensing; S=Support; P=Partnership; BA=Branding Accessibility; EO=Education Outreach; PM=Promotion Media

Figure 2. Combined Priority Synthesis Results of the Role of the Penta Helix Element in the Development of the Halal Industry

Figure 2 reveals that the three major components of media are branding accessibility (BA), education outreach (EO), and promotional media (PM). Meanwhile, the three main components of government are support (S), regulation and policy (R&P), and licensing (L). The three key components of academia are mentoring and training (M&T), literacy innovation (LI), and service networks (SN). Additionally, the three most significant factors under the community cluster are activity drivers (AD),

contributing ideas and thought (CIT), and facilitators of potential users (FPU). All groups of informants indicate divergent opinions of the importance of community, with a value of 0.30.

As presented in the previous section, the geomean results of pentahelix indicators show that business actors are the most significant factors in determining halal industry development in Indonesia. Business actors play an important role in developing the halal industry in Indonesia. Halal compliance and certification, innovation and development, and economic contributions are the main areas where business actors can affect halal industry development in Indonesia. Sa'adah and Asnawi (2022) support these findings, indicating that businesses have a crucial role in advancing the halal industry. Businesses need to invest in research and development to create products that meet halal standards. Business includes ensuring that raw materials, production processes, and the entire supply chain comply with Islamic law. They emphasized the critical role that businesses play by investing in research, ensuring halal standards, promoting fairness for workers, and contributing to industry growth.

Based on the Geomean results, the second important factor in determining the halal industry is the media cluster. The role of the media in facilitating access to the brand is crucial to the overall development of the halal industry. As the main communication channel, the media shapes consumer perceptions, preferences, and behavior toward halal products. This finding aligns with a study conducted by Zamrudi and Il-Hyun (2022), which revealed the importance of clear reporting on halal products, production processes, and certifications so that the public can understand their nature. Purwanto and Haque (2021) emphasized the central role of media accessibility in branding to promote innovation in the halal industry and to disseminate information on research, technology, and trends. Kartika (2020) added that positive media coverage helps to build a positive image and generate public interest in halal products. Media accessibility in branding increases market reach for halal products through digital marketing, connects to a global consumer base, and improves competitiveness (Nidah et al., 2022).

Moreover, Latifah et al. (2021) stressed the importance of businesses in maintaining good working conditions and equality. Without strong business initiatives, the growth of the halal industry is limited; business actors uniquely drive innovation, create jobs, and meet consumer needs (Mahsun et al., 2023). While the economic thrust and competitiveness of business actors support sustainable halal industry growth (Fard & Amiri, 2018), they also foster innovation, ensure product integrity, raise awareness, and build strategic partnerships for accelerated industry growth and harmonized standards (Rajapathirana & Hui, 2018). The explanation above is the result of the following Table 2.

Another finding showed that the government plays an important role in the halal sector, making it the third factor in determining the halal industry in Indonesia. By providing regulations and certification, promoting the industry, and ensuring consumer protection, the government creates a conducive environment for the halal sector to attract both domestic and international demand. The primary aspect of government support involves utilizing various forms of assistance to promote the growth of the halal industry (Krisna et al., 2023). These include non-fiscal and fiscal incentives for industry participants, such as streamlined business license applications, lower import duties, and tax exemptions. Likewise, Rachman and Sangare (2023) proposed the establishment of special institutions to oversee the halal industry, while Dermawan et al. (2020) suggested government support for research and development centers, as well as logistics for the distribution of halal products. In other words, government support- including incentives, regulations, education, global promotion, infrastructure, and partnerships- shapes the entire economic ecosystem and fosters the growth of the halal industry, which positively impacts the economy, job creation, and improved welfare.

Besides, the academician role provides significant involvement in developing the halal industry. Looking at the variables of each cluster, training and mentoring and conducting research and development play important roles in shaping the diverse halal industry in areas such as food, beverages, pharmaceuticals, finance, and tourism. This result is consistent with previous studies (Agus & Herminingsih, 2023). Muhammad et al. (2020) emphasized the importance of training in halal compliance, supply chain management, and product authenticity, while mentors assist in decision-making, growth strategies, and overcoming business challenges. Therefore, training and mentoring are crucial for ensuring that employees in the halal industry understand its principles, promote technical expertise, and foster collaboration with other companies. This is essential for achieving an ideal understanding of the halal industry.

Table 2. Pentahelix Indicators Priority Geomean Result

Element	Expert	Practitioners	Regulators	Total	Priority	
Pentahelix Model	1. Academician	0.2171	0.0983	0.0985	0.1224	4
	2. Business	0.3112	0.3124	0.2654	0.2913	1
	3. Community	0.1112	0.1066	0.1052	0.1033	5
	4. Government	0.2218	0.2191	0.2654	0.2234	3
	5. Media	0.1387	10.2636	0.2654	0.2596	2
Element	Expert	Practitioners	Regulators	Total	Priority	
Academia	1.1 Mentoring and Training	0.3820	0.4020	0.2877	0.3604	3
	1.2 Service Network	0.1469	0.1491	0.1535	0.1479	
	1.3 Literacy Innovation	0.2366	0.2834	0.3691	0.2918	
	1.4 Management Concept	0.2345	0.1655	0.1897	0.1999	
Business	2.1 Halal Knowledge & Understanding	0.3643	0.3766	0.3806	0.3788	2
	2.2 Discipline and Professionalism	0.2340	0.2604	0.2341	0.2253	
	2.3 Product Development Access	0.1678	0.1818	0.2169	0.1962	
	2.4 Cooperation	0.2340	0.1812	0.1684	0.1997	
Community	3.1 Activity Drivers	0.3334	0.3113	0.2849	0.3082	5
	3.2 Contribute Ideas and Thoughts	0.1794	0.2223	0.2084	0.2135	
	3.3 Facilitator of Potential Users	0.2056	0.1873	0.1942	0.1864	
	3.4 Business Development Mediator	0.2817	0.2791	0.3125	0.2919	
Government	4.1 Regulation and Policy	0.2592	0.2247	0.2257	0.2348	
	4.2 Licensing	0.1619	0.2209	0.2257	0.1935	
	4.3 Support	0.3841	0.3750	0.3671	0.3813	1
	4.4 Partnership	0.1949	0.1795	0.1816	0.1903	
Media	5.1 Branding Accessibility	0.3283	0.3250	0.3297	0.3357	4
	5.2 Education Outreach	0.2251	0.3279	0.2851	0.2776	
	5.3 Promotional Media	0.3128	0.1788	0.2378	0.2438	

An important factor driving the growth of the halal industry through the role of the community is the final aspect of developing this industry. It is crucial for identifying demand, monitoring standards, gathering customer feedback, and supporting small and medium enterprises to ensure societal needs are met while achieving significant economic gains. A study by Fathan and Basit (2022) revealed how the community can improve the quality and authenticity of halal products, monitor industry compliance with standards, and stimulate demand through concerted initiatives. It emphasizes that constructive feedback from the community is essential for developing the halal industry (Akyani, 2023). Furthermore, Suryadi (2021) highlights the global role of the community in positively portraying the halal industry, focusing on ethical values, safety, and quality in production and supply.

4. Conclusion

This study aims to investigate the determinants of the pentahelix model in fostering the halal industry in Indonesia. It specifically examines how the components of the pentahelix- business actors, academics, the community, media, and government- significantly influence the development of the halal

industry in the country. The primary priorities for the role of the pentahelix that can maximize their influence in developing the halal industry are as follows: the business actors aspect is 0.2913 (29%); the media aspect is 0.2596 (26%); the government aspect is 0.2234 (22%); the academics aspect is 0.1224 (12%); and the community aspect is 0.1033 (11%). Regarding the highest priority results for each sub-element within the pentahelix indicator that plays a major role in developing the halal industry, the following results are obtained: the halal knowledge and understanding sub-element in the business actors aspect is 0.3788, and the support sub-element in the government aspect is 0.3813, both sharing the same priority value of 38%; the mentoring and training sub-element in the academic aspect is 0.3604 (36%); the branding accessibility sub-element in the media aspect is 0.3357 (34%); and the activity drivers sub-element in the community aspect is 0.3082 (31%).

As the business actors are the most important factor in the involvement of developing halal, the study suggests that the government establishes regulatory standards and a conducive business environment, and academia focuses on research, technology, and skilled labor training. At the same time, industry innovates, complies with halal standards, and ensures the quality and sustainability of the supply chain. The community raises consumer awareness and promotes ethical practices, and the media disseminates information on halal products, certification, and industry progress, thus fostering a positive industry image. Synergy among these stakeholders is essential for the overall development of the Halal industry, meeting market needs, and contributing to sustainable economic growth.

Moreover, academia should conduct multidisciplinary research that emphasizes technological innovation, halal manufacturing, and raw fabric improvement to advance the halal industry. It is important for academic applications to integrate the ethics of commercial and halal companies. To establish trust, the business world must prioritize product integrity, transparency, and firm halal certification. It is advisable to consult environmental innovation guidelines and collaborate with academic and government institutions. The government must establish clear and supportive regulations, offer financial incentives, and simplify the halal certification process, including expanding BPJPH's *Sertifikat Halal Gratis* (SEHATI) program for MSME products. Public education about halal and its benefits enhances consumer perceptions. The community acts as informed consumers, promoting halal goods and fostering local satisfaction. The media plays a crucial role in showcasing the industry's success stories, providing accurate halal records, and collaborating with the sector to achieve significant exposure.

This research report also identifies potential future research directions to understand further and optimize the pentahelix model in developing Indonesia's halal industry, exploring the evolving impact of digital technologies, analyzing barriers and enablers of stakeholder collaboration, investigating the long-term effects of priority sub-elements, conducting comparative studies with other nations, integrate sustainability and ethical considerations, examine the influence of government policies, understand consumer behavior and trust, and develop metrics to evaluate the pentahelix model's overall effectiveness. These future studies aim to provide valuable insights for academics, policymakers, and industry practitioners to foster the sustained growth and global competitiveness of the Indonesian halal sector.)

CRedit Authorship Contribution Statement

Hartomi Maulana: Writing – Review & Editing, Formal Analysis, Methodology. **Mohamed Asmy Bin Mohd Thas Thaker:** Writing – Review & Editing, Methodology. **M. Ridlo Zarkasyi:** Writing – Review & Editing. **Mochammad Kharits Taufani:** Writing – Original Draft, Formal Analysis, Methodology. **Soritua Ahmad Ramdani Harahap:** Writing – Review & Editing, Methodology.

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