

Coordination and digitalization among zakat institutions to strengthen social protection in Indonesia: An assessment of progress

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ABSTRACT

Zakat, a mandatory obligation for Muslims to disburse a portion of their wealth, has the potential to significantly alleviate poverty in Muslim-majority countries with large Muslim populations. Despite a 122% increase in zakat collection from 2015 to 2018, the national zakat collection in Indonesia remains proportionately low compared to its potential. This work intends to comprehensively elucidate on how zakat management coordination and digitalization in Indonesia have progressed to this moment. Through a content analysis of descriptive findings, the study assesses the coordination and digitalization improvement in Indonesia's zakat management. The results show that the coordination and digitalization of zakat management in Indonesia have improved, as indicated by the National Zakat Index and Digital-Readiness Index. However, there are still areas that need improvement, such as the integration of the zakat database, and the preparation of high-skilled amil or human resources in zakat management who can cope with information technology development to enhance zakat operational activities. This study highlights the importance of improving coordination and digitalization in zakat management to achieve the full potential of zakat in poverty alleviation in Indonesia.

1. Introduction

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The utilization of Islamic instruments in real-life situations has been a topic of interest among scholars. Zakat, in particular, has been deemed effective in alleviating poverty and has been recognized as having socio-economic functions that operate in tandem with formal social security programs implemented by the government (Shirazi, 2006). The payment of zakat is a compulsory obligation for Muslims, where a portion of their wealth must be spent once it has reached a certain threshold (*nisab*) and has been fully possessed for one year (*haul*). The Holy Qur'an mandates zakat payment at 32 different instances to Muslims who possess wealth exceeding the *nisab*. It is often mentioned in conjunction with *salat* (prayer) as a means of purification (Halimatusa'diyah, 2015). Given its significance, zakat serves as a potent tool for wealth redistribution within communities and can effectively reduce the poverty gap between the affluent and the underprivileged.

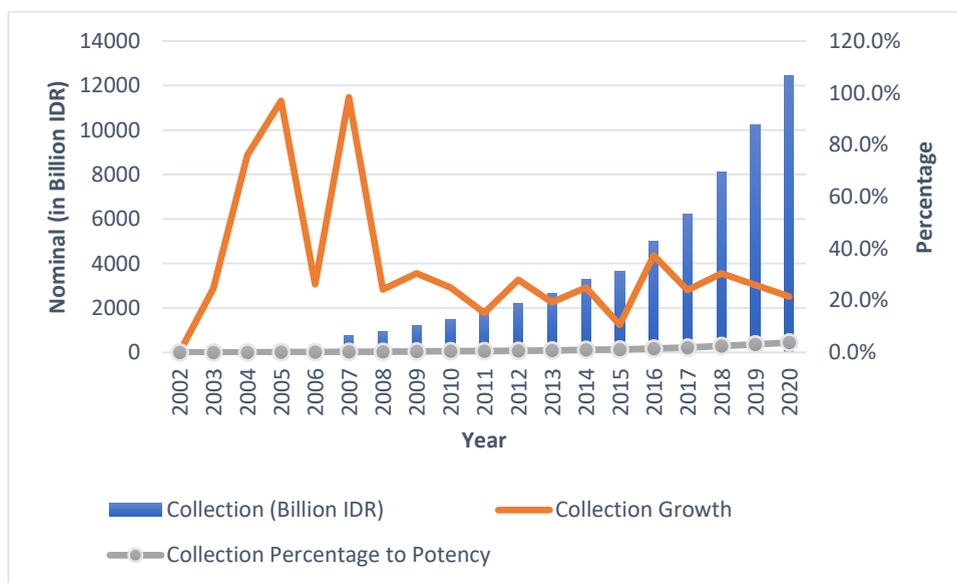


Figure 1. Indonesia's zakat collection 2002-2020 (in IDR Billion)

Source: BAZNAS (2022), processed by the authors

Instead of its function to alleviate poverty, zakat has tremendous potency, especially in Muslim-majority countries that have large Muslim populations. Due to its being mandatory for Muslims, zakat potency could be simply hypothesized from the various zakat assets which surpassed the *nisab*. Indonesia, as the largest Muslim country, has a zakat potential of IDR 233.8 trillion in 2018, or equivalent to 1.72% of GDP 2018 which is worth IDR 13,588.8 trillion (BAZNAS, 2020). According to figure 1, the actual collection amount of zakat nationally in Indonesia always increases every year and reaches almost 12,500 billion IDR in 2020. Despite that positive trendline, the collection ration compared to its potency is still very low as the collection percentage to potency in 2020 is only 3.8% with the total potential for zakat in Indonesia in 2020 is IDR 327 trillion (BAZNAS, 2020).

Nonetheless, despite a significant surge in zakat collection by 122% from 2015 to 2018, Heikal (2014) states that the national zakat collection in Indonesia remains proportionately low compared to its potential. More updated literature on recent Outlook from the National Board of Amil Zakat Indonesia (BAZNAS, 2022), it is targeted that national zakat collection during 2022 at IDR 26 trillion while it is only 7.95% of the amount of national zakat potency.

Possible problems behind this under-performed zakat collection in Indonesia are the low level of coordination among zakat's stakeholders and the lack of integration with the digital sector. Halimatusa'diyah (2015) emphasizes the coordination problem among zakat's stakeholders in Indonesia which leads to inefficient management of zakat for achieving its full potential. On the other hand, several studies conclude that there is still a lack of digital technology used to diversify the zakat collection channel for muzakki's (zakat payer) convenience (Kailani & Slama, 2020). This finding is supported by the previous research from Abidin et al. (2020) from Indonesia on measuring the zakat digitalization between 2016-2018 which reported that zakat collection through digital platforms was just only at 6.74%.

Within this background, this study attempts to qualitatively elaborate on how far the coordination and digitalization of zakat management in Indonesia go along up until the present day. Based on this limitation, this paper enhances the content analysis on several kinds of literature to be analyzed and also including from documents on zakat institutional reports in Indonesia via website. Although this study has some circumscriptions, it does not lower its main objective of providing an up-to-date depiction of zakat coordination and zakat digitalization in Indonesia. Hopefully, this study can be the reference for the zakat coordinator or any other stakeholders to improve zakat management in Indonesia.

The paper has been structured as follows: Section 2 provides the result of a comprehensive literature review on the theory of zakat as social protection and the urgency of coordination and digitalization improvement among zakat institutions. Section 3 comprehends the method used in this study. Main discussion and the analysis of updated empirical findings related to the issues are elaborated in section 4. Last, this paper concludes the general overview of the improvement of zakat coordination and digitalization in Indonesia while it is also added with some recommendations for further studies.

2. Literature review

2.1 Zakat and its role as a social protection instrument

Turning to Halimatusa'diyah (2015), this article specifically elaborates on the role of zakat to ensure social protection in Indonesia. Halimatusa'diyah (2015) investigates why the huge potency of zakat in Indonesia is still unutilized to complement the government program in alleviating poverty. This article expands the discussion to some advantages and obstacles that support and restrain the potential character of zakat. Halimatusa'diyah (2015) manages to obtain these hypotheses successfully because she utilizes the systematic literature review and in-depth interviews in the research methodology. She interviewed the main actors in each zakat's stakeholders such as several directors from LAZ institutions, the director of BAZNAS from 2004-2015, and several coordinators of anti-poverty programs from government parties. Thus, this article provides information about the conditions of zakat management in Indonesia in a comprehensive way with the highest validity level of results and certain arguments explain through this article.

Nevertheless, the article from Halimatusa'diyah (2015) has several spots to be improved compared to other related literature. From Bilo and Machado (2020), it can be seen that the discussion is more varied because it enhances the role of zakat both in Sudan and Jordan. Although the research objects come from the same region which is the Middle East and North Africa (MENA), the results from Bilo and Machado (2020) delivers an adequate comparison to overview the zakat management differences between Jordan and Sudan.

The findings from Bilo and Machado (2020) confirm the previous result from Halimatusa'diyah (2015) which concludes that the accountability and decentralization system of zakat is needed to maximize the zakat potential as a complementary to the social protection system in the country. Both Jordan and Sudan prove that the demonstration of local zakat committees plays an important role in collecting and distributing zakat until reaches the community level in the rural/village area. Bilo and Machado (2020) also find the

same situation as Halimatusa'diyah (2015) when specifying the coordination level among the zakat's stakeholder in Jordan and Sudan. No institution has the authority to coordinate all zakat interventions in Sudan, while the low coordination level among stakeholders hampers the optimum zakat distribution to the beneficiaries in Jordan. Bilo and Machado (2020) supply a useful recommendation to this discussion that open access to shared zakat database is crucial for all zakat's actors to enhance the zakat's role in social protection.

Meanwhile, Chotib (2021) enriches the role of zakat institutions that must be adapted to the current condition of the COVID-19 pandemic. Zakat institutions should implement strategies to help the government in handling the COVID-19 outbreak through health and economic recovery programs such as providing ambulances, and oxygen tubes, aiding the health workers with hazmat and mask, and also providing groceries and ready-to-eat foods. Zakat institutions should also assist the small-medium entrepreneurs with *qardhul-hasan* (loan without interest) or any other productive financing schemes to stabilize the real sector. Although this paper has fewer arguments to elaborate on the role of zakat institutions in Indonesia compared to Halimatusa'diyah (2015), Chotib (2021) emphasizes more feasible recommendations for zakat institutions to support governmental programs in COVID-19 recovery programs actively. Chotib (2021) also refers to his recommendations for the *maslahah hajjiyat* (public needs) with the Shari'ah basis of *maslahah al-mursalah* (public interest) which complements the recommendation from the Islamic perspective.

On the other hand, Ruhana (2019) delivers the idea of the integration of social protection instruments comprehensively by using the benchmark for social protection implementation in Australia. This article provides a wider spectrum of perspectives to look up the implementation of social protection from the developed countries, despite this country is not a Muslim-majority country. Ruhana (2019) argues that Australia could be taken as a benchmark on how to apply social protection system for poverty reduction and vulnerability, which is funded by various sources. After examining the practices of the benchmarked countries, Ruhana (2019) examines why the zakat instrument cannot utilize its potency to contribute to social protection. In conclusion, Ruhana (2019) also finds a similar result to Halimatusa'diyah (2015) and Bilo and Machado (2020) stating that the zakat system offers a significant potential the social safety fund, but its mismanagement or inefficiency in zakat institution, as well as political instability, can challenge it.

Instead of the consumptive allocation of zakat, there is another perspective to evaluate zakat disbursement which is from its allocation in the production program. A study from Riyadi et al. (2021) discusses the synergy scheme between zakat institutions and Islamic microfinance in maximizing the distribution of productive zakat to the public. Complementing the Halimatusa'diyah (2015) finding, the coordination level with other financial institutions such as microfinance is needed to optimize the disbursement of zakat both consumptive and productive programs. Using the qualitative method by assessing several literature and zakat institutions' reports, Riyadi et al. (2021) found that the productive Zakat funds management in Indonesia is still not maximized, as proved by the low distribution rate of productive Zakat funds. Hence, Riyadi et al. (2021) summarizes the robust recommendation so that zakat and microfinance institutions can strengthen their collaboration to spread bigger *maslahah* to ensure social protection, especially for the vulnerable community.

After enhancing the importance of consumptive and productive zakat programs, the zakat institution itself should collaborate under the Integrated Islamic Commercial and Social Finance (IICSF) framework. According to Ascarya (2021), IICSF with its instruments, especially zakat, infaq, (expenditure) and waqf (endowment) could help the government and the economy to recover from the crisis. Through assessing the qualitative content analysis method, Ascarya (2021) comes up with the conclusion that the IEF approach to dealing with the Covid-19 health and economic crises combines ISF (representing the Muslim society's involvement) and government support, prioritizing the poor as well as MSMEs, health insurance, household, business, and financial sectors. There is also an example of the significance of infaq

(expenditures) to ease the burden of rising fees and the cost of living for university students in Malaysia (Alin @ Nordin & Rahman, 2018).

Bringing other evidence of the impact of zakat on the economic variables can be seen in two kinds of literature which are Wahab and Rahman (2011) and UI Mustafa and Nishat (2017). Wahab and Rahman (2011) proposes a comprehensive framework for studying the efficiency of zakat institutions in Malaysia using Data Envelopment Analysis (DEA). Thus, the result from Wahab and Rahman (2011) is the economic influences of zakat can positively affect major economic variables such as consumption, saving, poverty alleviation, and economic growth. On the other hand, UI Mustafa and Nishat (2017) examines the role of social protection through different channels (education, health, social transfers, subsidies, etc.) which help reduce poverty in Pakistan by using the Autoregressive distributed lag model (ARDL). Hence, the result provides information that outreach of social protection via expenditures on education, foreign aid, and zakat plays a significant role in poverty alleviation (UI Mustafa & Nishat, 2017).

2.2 The importance of zakat coordination

Halimatusa'diyah (2015) completely puts on a detailed elaboration on how zakat takes the dominant role in social protection in Indonesia and how important zakat coordination is among its stakeholders. After the introduction part, she elaborated on all the main actors leading the zakat implementation in Indonesia. The government takes part by conducting the law to support the zakat execution through a legal-protection basis. There is also the National Board of Amil Zakat (BAZ) which is the zakat institution under the coordination of the Ministry of Religion. Similar to government bureaucratic structures, BAZ maintains its hierarchical structure down to regional and even subregional offices. The regional offices were commonly known as BAZDA (Badan Amil Zakat Daerah/Regional Institution for Zakat Fund), while the central office in Jakarta is officially known as BAZNAS. There is also Lembaga Amil Zakat (LAZ) which is established the earliest in the form of zakat organizations from the civil initiative. This institution has been established and developed by the Muslim communities outside the bureaucracy.

Government and zakat institutions have various zakat programs that cover crucial sectors in communities' lives such as food and agriculture, education, health, and also economic community empowerment through productive programs. The way zakat institutions derive the problem and the proposed alternative programs are to some extent influenced by national priority on the development agenda. In line with the government and international communities' concern with Millennium Development Goals (MDGs), the civil zakat communities are also committed to making some contribution to the realization of MDGs (Halimatusa'diyah, 2015).

Although both government and zakat institutions concern the same goal of alleviating poverty, Halimatusa'diyah (2015) employs a low level of relationship and minimum coordination between them. Three major arguments prevent coordination between the government and the zakat institutions. First, the portrait of bureaucracy in Indonesia is the biggest obstacle for the zakat institution to develop cooperative efforts with the government. Government coordination hierarchy and rigid planning have made it difficult and time-consuming for government to respond to zakat institutions' initiatives promptly. For instance, it is depicted in the article that BAZ, a zakat institution under the government, finds it difficult to disburse the scholarship tuition promptly for the poor because the budget from the government can be spent in certain months only.

A second problem that comes up in coordination between the government and zakat institutions is a lack of mutual trust. From the government's perspective, the doubtfulness of the zakat institution stability is the major concern for the public sector to rely on BAZ/LAZ source of income to fund the social protection programs. On the other hand, the government also suffers a sustainability issue related to its policy and political stability. According to some interview sessions that the authors conducted with the director of

several zakat institutions, the irregular nature of the replacement of government officials is a major obstacle to building a joint effort with the government. Hence, any programs which have been discussed and agreed upon with previous officials may be useless as the newly appointed officials may have different policy approach preferences (Halimatusa'diyah, 2015).

The third problem is related to the internal coordination in each institution both on government and the zakat institution itself. On the government side, there is an ego-sectoral problem in which different anti-poverty programs are run by different ministries so there is a lack of cooperative initiative to maximize the output of the programs. From the zakat institution side, coordination between BAZ and LAZ does not run smoothly either. The situation is getting worse after the new zakat law on No. 23/2011 has been launched which posits the LAZ under the BAZ coordination. According to LAZ representatives through Forum Zakat (FOZ), the new law made relations between BAZNAS and LAZ asymmetrical. Even though the Law still acknowledges the role of LAZ, BAZNAS will likely dominate the national zakat arrangement stipulated by Law 23/2011. (Halimatusa'diyah, 2015). In another word, LAZ thinks that this new law marginalized the position of civil zakat institutions and make the role among them is not equal.

For supporting the evidence, the findings from Khan and Servinc (2021) affirm most of the findings from Biló and Machado (2020) and Halimatusa'diyah (2015) which states the institutionalization of zakat does not follow one-size-fits-all solutions so that it should be country-specific and decentralized. Khan and Servinc (2021) also confirms the importance of coordination among the zakat stakeholders such as sharing databases to utilize the potency of zakat both in Turkey and Bangladesh. Khan and Servinc (2021) accentuate the zakat digitalization through the crowdfunding platform to distribute the funding effectively when social distancing is implemented for preventing the pandemic outbreak. This important finding is properly elaborated in Khan and Servinc (2021) while it cannot be found in Chotib (2021). Khan and Servinc (2021) also complement the findings from Halimatusa'diyah (2015) by concluding that the coordination among zakat stakeholders is not the only single issue for zakat implementation, but also there is another critical issue which is the lack of qualified workforce (*amil*) and the ineffectiveness in collection and distribution activities. Throughout the current issue in Bangladesh, Khan and Servinc (2021) enrich the recommendation for government and zakat institutions to support the zakat movement with the professional *amil* (zakat collector) to increase the collection rate of zakat and boost the effective disbursement to zakat beneficiaries.

2.3 The importance of zakat digitalization

Zakat, as one of the five Islamic pillars, has proven its role on the community level in alleviating poverty and improving the life quality of poor people from socioeconomic indicators (Ahmed, 2004). To aim this objective, many ways are accommodated including the adoption of digital to increase the zakat collection so that the distribution of zakat can reach a wider poor community to be empowered. Theoretically, digitalization refers to enabling or improving processes by leveraging digital technologies and digitized data, while digitization itself means creating a digital representation of physical objects or attributes (Gupta, 2020). Following the era, zakat institutions also started to acquire the presence of technology in implementing the operational activities in zakat management (Salleh et al., 2019).

A recent study from Hudaefi (2020) substantively confirms the role of financial technology (fintech) in promoting Sustainable Development Goals (SDGs). Hudaefi (2020) provides evidence that sampled Islamic P2P fintech lending in Indonesia has been financing SMEs, the agriculture sector, and conducting charity programs for disadvantaged groups. This finding invigorates Khan and Servinc (2021) research which clarifies the importance of digitalization to optimize the disbursement of any form of charity program including zakat.

In line with the study from Hudaefi (2020), Aji et al. (2021) examine Muslims' online infaq (expenditure) intention during COVID-19 by using a comprised model with the Theory of Reasonable Action (TRA) and Social Penetration Theory (SPT). Aji et al. (2021) exercise comprehensive quantitative models for extracting significant results which makes it different from the rest of the literature which only rely on qualitative method. Aji et al. (2021) provide the implication for online Islamic charity fundraisers in Indonesia, in which trustworthiness and "social touch" are important to drive Muslims in making a monetary donation. Hence, this study concludes that this online method for donation platform can be an efficient Islamic philanthropy feature to solve the socio-economic problems during the COVID-19 pandemic. Aji et al. (2021) similarly recommend the collaboration among zakat authorities to encourage the strategic implementation of online donation services and their disbursement.

3. Research methodology

3.1 Content analysis

This study enhances a qualitative method by analyzing related documents or any reports on zakat institutions' performance in Indonesia. Several journals works of literature are gathered in order to synthesize the significance of coordination and digitalization among zakat institutions in a theoretical manner. Therefore, the detailed information of literature highlighted and discussed in the previous section (literature review) is listed in the table below:

Table 1. Databases for Content Analysis

No	Title	Types	Language	Publisher	Authors	Year
1	Zakat and Social Protection: The Relationship Between Socio-religious CSOs and the Government in Indonesia	Article	English	Journal of Civil Society	Halimatusa'diyah	2015
2	The role of Zakat in the provision of social protection: A comparison between Jordan and Sudan	Research Paper	English	International Journal of Sociology and Social Policy	Bilo and Machado	2020
3	Zakat Management Concept to Accelerate Health and Economic Recovery during the COVID-19 Pandemic	Paper	English	Open Access Macedonian Journal of Medical Sciences	Chotib	2021
4	Role of Zakat in Strengthening Social Protection during COVID-19 and beyond: An Evidence from Bangladesh and Turkey	Proceeding Paper	English	The Proceeding of the International Conference on Islamic Economics and Finance (ICIEF)	Khan and Servinc	2021
5	The Effect of Utilizing Zakat Fund on Financing Production to	Article	English	Journal of Islamic Finance (JIF)	Riyadi et al.	2021

No	Title	Types	Language	Publisher	Authors	Year
	Achieving Social Welfare: in Indonesia as a Case Study					
6	Role of Social Protection in Poverty Reduction in Pakistan: A Quantitative Approach	Article	English	Pakistan Journal of Applied Economics,	ul Mustafa and Nishat	2017
7	The Role of Zakat in Social Protection In Islamic Developing Countries: A Contributing Instrument	Article	English	Ekonomi Islam Indonesia	Ruhana	2019
8	A framework to Analyse the Efficiency and Governance of Zakat Institutions	Article	English	Journal of Islamic Accounting and Business Research	Wahab and Rahman	2011
9	The role of Islamic social finance during Covid-19 pandemic in Indonesia's economic recovery	Article	English	International Journal of Islamic and Middle Eastern Finance and Management	Ascarya	2021
10	Investigating the determinants of online infaq intention during the COVID-19 pandemic: an insight from Indonesia	Article	English	Journal of Islamic Accounting and Business Research	Aji et al.	2021
11	The Role of Zakat, Infaq and Shadaqah (ZIS) in Reducing Poverty in Aceh Province	Article	English	International Journal of Islamic Economics and Finance (IJIEF)	Saputro and Sidiq	2020
12	Role of Infaq in Financing Students in Malaysian Public Universities	Article	English	New Developments in Islamic Economics	Alin @ Nordin and Rahman	2018
13	How does Islamic fintech promote the SDGs? Qualitative evidence from Indonesia	Article	English	Qualitative Research in Financial Markets	Hudaefi	2020
14	Act of Republic of Indonesia Number 23 of 2011	Law Document	Indonesia	National Government of Republic Indonesia	Jatim.Kemanag.go.id	2011
15	Outlook Zakat Indonesia 2022	Outlook Document	Indonesia	National Board of Amil Zakat Indonesia	BAZNAS	2021

No	Title	Types	Language	Publisher	Authors	Year
16	Outlook Zakat Indonesia 2021	Outlook Document	Indonesia	National Board of Amil Zakat Indonesia	BAZNAS	2020
17	Outlook Zakat Indonesia 2020	Outlook Document	Indonesia	National Board of Amil Zakat Indonesia	BAZNAS	2019
18	Outlook Zakat Indonesia 2019	Outlook Document	Indonesia	National Board of Amil Zakat Indonesia	BAZNAS	2018
19	Outlook Zakat Indonesia 2018	Outlook Document	Indonesia	National Board of Amil Zakat Indonesia	BAZNAS	2018
20	National Zakat Index 2.0	Conceptual Index Document	Indonesia	National Board of Amil Zakat Indonesia	BAZNAS	2020
21	Digital Readiness Index Region 1 - Sumatra	Index Report	Indonesia	National Board of Amil Zakat Indonesia	BAZNAS	2022
22	Digital Readiness Index Region 3 - Kalimantan	Index Report	Indonesia	National Board of Amil Zakat Indonesia	BAZNAS	2022
23	Digital Readiness Index Region 4 - Sulawesi	Index Report	Indonesia	National Board of Amil Zakat Indonesia	BAZNAS	2022
24	Digital Readiness Index Region 5 – Maluku, North Maluku, Papua, and West Papua	Index Report	Indonesia	National Board of Amil Zakat Indonesia	BAZNAS	2022
25	List of Unofficial Private Zakat Institutions in Indonesia	Official Government Report	Indonesia	Ministry of Religious Affairs Republic of Indonesia	Kemenag.go.id	2023

The process of literature review begins with the meta-analysis study by conducting a bibliographic search of the related literature on topics of zakat as a social protection instrument from the Shari'ah perspective. With a total of 13 works of literature gathered from the Google Scholar search engine, an article review is conducted to fill up section 2 and serves as the theoretical approach for the importance of coordination and digitalization matters in zakat management. Law document on number 23 of 2011 is also assessed to examine the zakat coordination between zakat institutions in Indonesia. The rest of the 11 documents were collected from several official websites of the zakat institution in Indonesia. Centre of Strategic Studies of the National Board of the Amil Zakat Republic of Indonesia (BAZNAS, 2021) has provided numerous updated reports on the performance report of zakat management in Indonesia. There are also some publications on conceptual literature of designated index including the national zakat index (NZI) to determine the zakat management performance in Indonesia and the digital-readiness index which assesses the preparedness stage of each zakat entities to adapt within the digital breakthrough in improving the zakat administration.

3.2 Review method

The population of the present work is the condition of zakat management in Indonesia from the discussion on its stakeholder coordination and the digitalization improvement on zakat management. To provide the up-to-date existing condition on all of these aspects, the following websites were used to access any form of recent studies, annual reports, outlook and projection, and any other documents related to zakat management in Indonesia:

- www.puskasbaznas.com (Centre of Strategic Studies, BAZNAS Republic of Indonesia)

- www.filantropi.or.id (Filantropi Indonesia; is an independent association of philanthropic activists and organizations whose aim is to advance philanthropy to contribute to the achievement of social justice and sustainable development in Indonesia).

4. Results & Discussion

4.1 *Coordination level among zakat institutions in Indonesia*

Based on the literature review part, it can be seen that Halimatusa'diyah (2015) depicted the low coordination level between zakat institutions in Indonesia during the 2011-2015 period. At that time, the implementation of Indonesia zakat Law on No. 23/2011 was still too immature to be evaluated. As can be inferred from an economic perspective, Greenlaw et al. (2018) explain that legislative lag and implementation lag appears in every common discretionary public sector policy. Theoretically, the legislative lag occurs because of the various processes which are needed to be done starting from congressional committees for hearings, negotiations, and votes, and then eventually agreed upon by the president. Meanwhile, the remaining time to socialize this new legislative product to all related stakeholders to be implemented is called implementation lag. Law No. 23/2011 posits BAZNAS as the national coordinator of zakat management in Indonesia while other zakat institutions initiated by the private sector support the collection and distribution programs to expand its outreach so that the poverty rate in Indonesia is reduced. Recently, several noticed improvements can be gathered from the coordination mechanism among zakat stakeholders in Indonesia.

First, BAZNAS leadership for every chairman (2015-2020; 2020-recent) points out coordination as one of BAZNAS's main key performance indicators as the coordinator of zakat management in Indonesia. For instance, from Indonesian Zakat Outlook 2022 document released by BAZNAS (2021), BAZNAS has declared nine missions to support the vision of becoming the primary institution for the people's welfare. It is stated on the 6th mission which is strengthening the system of planning, controlling, reporting, accountability, and coordination of zakat management nationally. The Chairman of BAZNAS is also supported by seven other commissioners who supervise specific coverage in zakat management. One of the commissioners in the 2020-2025 period, specifically supervises the national coordination among zakat institutions. Besides those eight commissioners, three ex-officio commissioners in BAZNAS are assigned from several institutions including the Ministry of Finance, the Ministry of Religion, and the Ministry of Internal Affairs. Therefore, those findings provide some improvement in zakat coordination based on BAZNAS' coordinator role as it is mandated by Law No. 23/2011.

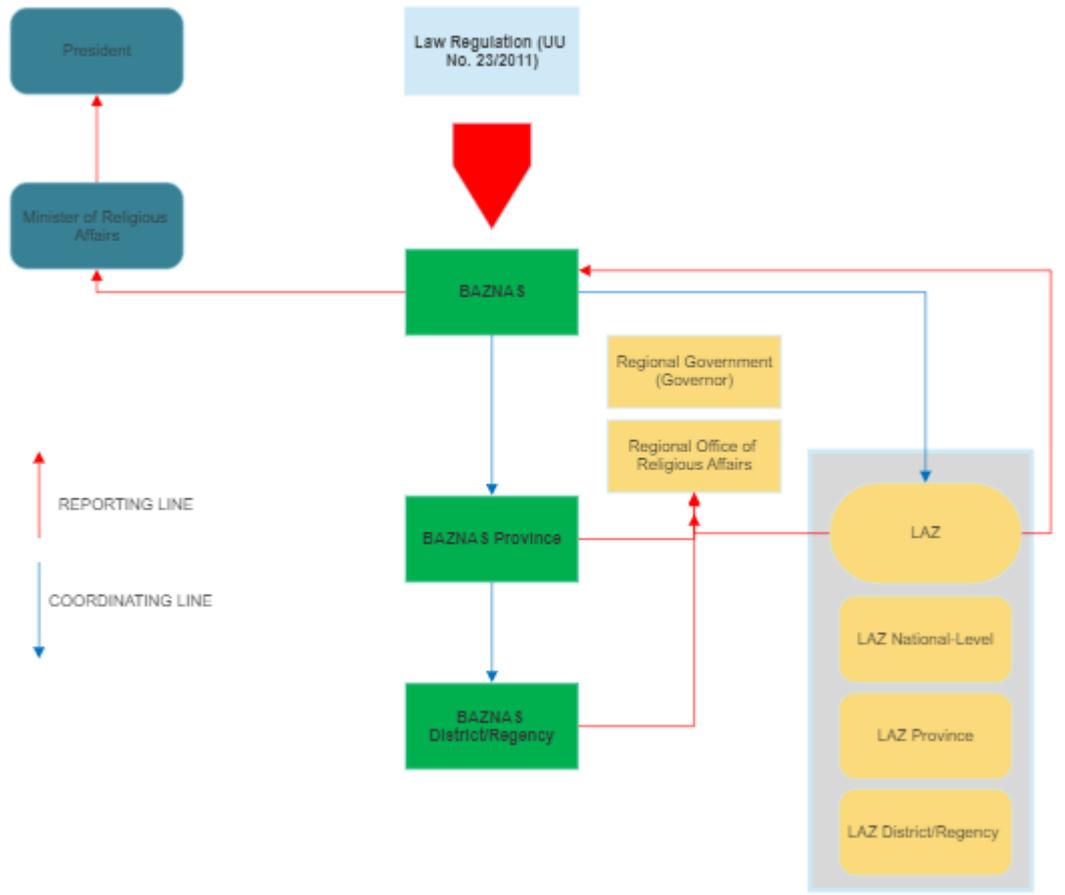


Figure 2. Structural coordination of zakat institution in Indonesia

Source: Authors (from interpreting Law No. 23/2011)

Based on figure 2, it is depicted that the coordination and report hierarchy among zakat institutions are elaborated in Law No. 23/2011. As the authors interpreted from several chapters covered in this Law, BAZNAS is mandated as the coordinator of the zakat management in Indonesia. As an implication, all of the zakat entities both coming from BAZNAS or LAZ in the province or district/regency regions are mandatory to report their management activities to BAZNAS to increase public transparency and accountability.

Also from this chart, it can be inferred that BAZNAS and LAZ should have good coordination as a partnership form to rise the zakat collection from the muzakki (zakat payer) by accommodating various innovative ways. This coincidence of BAZNAS and LAZ operation in the same region, for instance, should not be interpreted as a competitive form in the market competition in which its main objective is to maximize its profits. Although it seems inefficient because BAZNAS and LAZ operate at the same level of the region, we can stack up the benefit from this condition which means that the collection of zakat can be more utilized and alleviate the poor community from poverty. BAZNAS and LAZ should not compete for getting larger collection rates from an individual perspective from their entity only, but the common objective should be set for reaching a certain amount of zakat collection rate from zakat potential measurement.

Instead of the improvement in coordination and law implementation, previous studies (Halimatusa'diyah, 2015; Bilo & Machado, 2020) also stress the substance of decentralization in zakat management. Decentralization improvement also can be inferred from the extended scope of zakat institutions coverage in Indonesia. From figure 3, BAZNAS has coordinated with a total 661 of zakat institutions which consist of 34 BAZNAS provinces, 514 BAZNAS district/regency, 34 national-scale LAZ, 28 Province-scale LAZ, and 51 district/regency LAZ.

Although there is an improvement in zakat decentralization in Indonesia, regulation and governance requirements to be licensed as official zakat institutions are still the main problem in this area. As stated in the National Law of Zakat (Law No.23/2011) and government regulation (Peraturan Pemerintah/PP No. 14/2014) on the detailed implementation of Law No. 23/2011, every single zakat institution must obtain a legal permit from Ministry of Religious Affairs before collecting and distributing the zakat funds. Previous to obtaining this legal permit, the institution must obtain a recommendation letter from BAZNAS Republic of Indonesia as it is mandated through PP No.14/2014. Given those extensive requirements, it is possible for zakat institutions to not follow those phases properly due to a lack of socialization for this administrative procedure.



Figure 3. Distribution map of zakat institutions in Indonesia

Source: BAZNAS (2021)

On January 20th, 2023, the Ministry of Religious Affairs, through the official website, has recently published 108 zakat institutions that have operated without obtaining legal permission from their institution. In the press release, the Director General of Guidance of the Islamic Community emphasizes the importance of administrative rule through official zakat institutions to gain public trust and obey Law No.23/2011. The director general added that zakat institutions that still do not have licenses must immediately carry out the licensing process by the guidelines for granting permits for the establishment of official zakat institutions (Kompas, 2023).

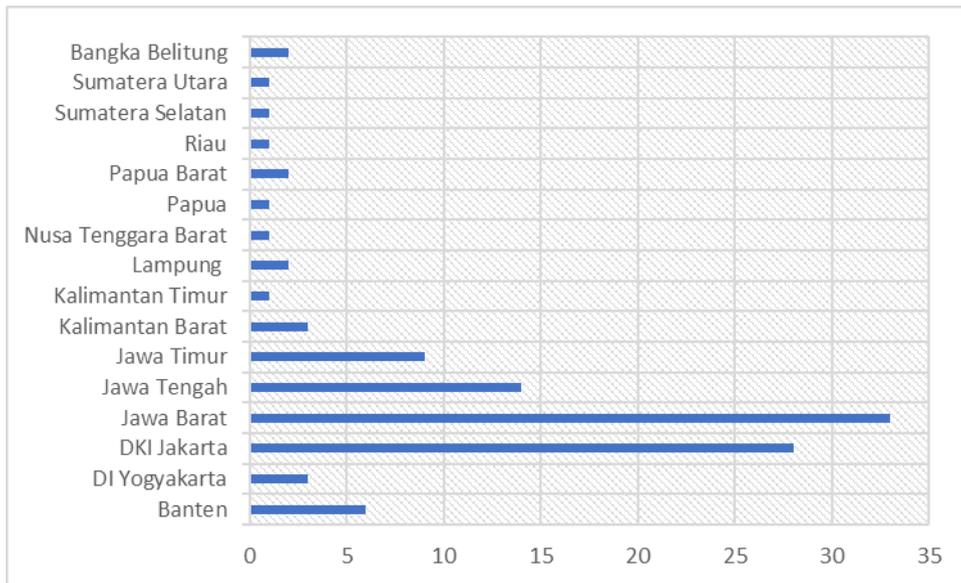


Figure 4. Provincial distribution of unofficial zakat in Indonesia

Source: Kemenag.go.id, 2023 (processed by authors)

By this, one of the Chairmen of the zakat association commits to guide and support these unofficial zakat institutions to obtain a recommendation letter from BAZNAS RI until granting the legal permit from the ministry of religious affairs (Permana, 2023). According to this situation, government institutions should obtain a more exclusive way of informing this kind of confidential findings about the status of each zakat institution. This kind of situation is potentially creating a dualism between BAZNAS and zakat associations that have been already existing earlier as the forum of LAZ because LAZ institutions could not gain more trust from their coordinator which through the Law is BAZNAS.

Before this case, it is urgent to set out these zakat associations as Self-Regulatory Organizations (SRO) with the role of assisting wide scope of BAZNAS's tasks such as coordinating and controlling all zakat institutions all over Indonesia. According to the International Security Commissions Organization (IOSCO) in Anwar (2019), states that SRO is implemented to increase capacity in regulation and encourage member compliance with existing regulations. For instance, the zakat institutions and regulations can adopt the implementation of SRO in the capital market nomenclature which has been successful by the existing role of SRO. Carson (2011) invigorates that SRO can also be directed as a form of capital market supervision by regulators. The application of SRO can encourage the creation of a more efficient capital market, and in the end, will improve the economy.

Another coordination level indicator that can be observed is the integration of the zakat database. As mentioned in (Khan & Servinc, 2021; Bilo & Machado, 2020), sharing databases among zakat institutions is really important to increase the efficiency both of the zakat collection and zakat distribution programs. Several studies (Nurzaman, 2016; Aedy, 2015) provide evidence that the absence of the proper database reduces the proper ability of zakat institutions to enhance their collection and distribution activities.

Zakat core principles (ZCP) also emphasize that the database of the zakat institution is essential to enhance collection and distribution activities in zakat management. The effectiveness and efficiency rates

of zakat fundraising and disbursement depend on the availability of the database especially the data related to the profile of mustahik (beneficiary of zakat) muzakki (zakat payer), and also for the potential muzakki.

In Indonesia, the database indicator has been measured in the National Zakat Index (NZI) which is annually published by BAZNAS to evaluate the macro dimension of zakat management. NZI itself measures both macro and micro dimensions which also include the database along with regulation, participation activity, and supporting budget from local government leaders from the macro indicators. NZI induces the multi-stage weighted index for the measurement method as database variables contribute 40% to the macro dimension. This database variable is valued by other three supporting indicators which cover the database of the total amount of official zakat entities, muzakki (zakat payer) and mustahik (beneficiary of zakat), the ratio of individual muzakki (zakat payer) concerning Muslim household number, and the ratio of muzakki (zakat payer) with the total firms in one region. The ratio of individual muzakki (zakat payer) concerning Muslim household members is weighted for 40% while the other two supporting indicators are measured with a 30% contribution. Value for database index has five classifications ranging from 0.0-0.20 (Not Good), 0.21-0.40 (Poorly Good), 0.41-0.60 (Slightly Good), 0.61-0.80 (Good), 0.81-1.00 (Very Good).

Based on the recent measurement in 2022, NZI covered the measurement for the 2021 period which also includes the database score for each zakat institution all over Indonesia. From 290 BAZNAS provinces and district agencies, the average index for database variable is at 0.55 which is slightly good. There are 10 zakat institutions that have Not Good scores ranging from 0-0.15 points. On the other hand, 18 zakat institutions achieved a perfect score of 1 for this database variable. It implies that many zakat institutions can accommodate and update their database toward several important data in their zakat management activity. These leading groups in managing the database can share tips and encourage the other zakat institutions on a certain forum to obtain a maximum level of database usage in zakat institutions.

4.2 *Digitalization of zakat institution in Indonesia*

Digital technology is also increasingly used by zakat entities all over the world, including Indonesia. All of the zakat activities can be adopted through digital ways such as collection or fundraising agenda, distribution programs both in form of consumptive and productive, zakat education, and even campaign activity on engaging the society to increase zakat literacy. By this reformation, BAZNAS as a non-structural government institution mandated by Law Number 23 of 2011 to manage national zakat is urged to reform and innovate to support the quality of zakat services as well as poverty alleviation programs. In the present era of digitalization, BAZNAS and other zakat management institutions need to adopt the latest technology so that the objectives of zakat management can be achieved effectively and efficiently.

Turning into BAZNAS's strategic plan for 2020-2025, BAZNAS has launched four strengthening programs on four components which are institutional, human resources, infrastructure and facilities, and networks. In terms of strengthening the infrastructure of facilities and infrastructure, one of the efforts made is to map the level of readiness for the digitalization of zakat management using the Digital Readiness Index (DRI) which has been compiled by the BAZNAS Directorate of Research and Development.

DRI measurement covered more than 300 zakat institutions all over 34 provinces in Indonesia as the samples. This measurement is separated into six geographical clusters based on certain provinces in Indonesia by assessing three dimensions including digitalization of fundraising activity, distribution activity, and reporting activity. These dimensions are further proxied with four variables which consist of digital infrastructure, digital application, culture and digital ecosystem, and amil's (zakat collector) digital skills. The value criteria in this DRI as elaborated in detailed components in the table below:

Table 2. Scoring for Digital Readiness-Index

Score	Category	Readiness-Level	Rank
0-0.20	Not Good	Traditional	C1
0.21-0.40	Poorly Good		C2
0.41-0.60	Slightly Good	IT-Developing	B1
0.61-0.80	Good		B2
0.81-1.00	Very Good	Digital Native	A

Source: BAZNAS, 2022

The measurement results show that the zakat institution Digitalization Readiness Index score nationally reaches a score of 0.653 in the *Good* category with the level of digital readiness being in the IT-Developing position and ranking B2. Another result that can be inferred from the national result is the strength of the level of digitalization readiness nationally lies in the activity of reporting zakat management (0.748), while the lowest level of digitalization readiness is in the activity of distributing and utilizing zakat (0.586). In addition, the score for digital fundraising readiness is at 0.653 which means that this activity still needs to be improved digitally by enhancing robust digitalization technology.

Nonetheless, there are still particular problems that can be concluded from this index measurement. Specifically looking at the first cluster, which covers 106 zakat institutions from Aceh, North Sumatera West Sumatera, Riau, Jambi, South Sumatera, Bengkulu, Lampung, Kepulauan Bangka Belitung, and Kepulauan Riau that most dominate the digitalization process of zakat management in region no. 1 are identified as obstacles related to human resource expertise of 37.7%, followed by financial obstacles of 20.8%, followed by a shortage of human resources of 19.8%, and other obstacles and internet network each of 12.3 % and 9.4%. Similarly, for the resistance measurement in other regions from regions 3 to 5, the largest percentage of an obstacle is lack of IT-skilled amil or human resource in zakat management which range 35.7%, 51.2%, and 58.3% respectively for regions 3 to 5.

Based on the survey results, it can be inferred that the digitalization of zakat management in Indonesia is still on average level. Some zakat institutions have already adopted the digital infrastructure and application comprehensively to enhance their zakat management performance. Despite that advantageous condition, most of the regions in this measurement face the main problem with the lack of human resource/amil capability to operate zakat digitalization within their main operational activities. Therefore, the DRI result is beneficial for zakat stakeholders to strive together by knowing their condition of current digitalization progress. Various reciprocal programs between zakat institutions can be initiated to share the common resources on digital infrastructure to gather the objective for enhancing zakat's usefulness.

5. Conclusion and recommendation

Indonesia, as the world's largest Muslim population country, holds tremendous potential for the collection of zakat with a total amount of more than ID 327 trillion. Despite a 122% increase in zakat fundraising from 2015 to 2018, the national zakat collection in Indonesia remains proportionately low. The insufficient coordination among zakat stakeholders and the lack of integration with the digital sector are significant contributing factors. Through the content analysis, this study found that the coordination and digitalization of zakat management in Indonesia have improved, as evidenced by the National Zakat Index and Digital-Readiness Index. Nevertheless, there is still ample room for improvement, including the development of an integrated dashboard of the zakat database and the cultivation of highly skilled human resources in zakat management capable of keeping pace with IT advancements.

Based on the analysis of related documents such as the National Zakat Index and Digital-Readiness Index, there are some possible factors that lead to the improvement of coordination and digitalization of zakat management in Indonesia. The advancement of zakat coordination can be achieved if there are certain conditions to be met including decentralized zakat management from the national level into more specific

regions, coordination mechanism as mandated by its national law, and the sharing-database platforms among zakat institutions so that zakat management can be more connected and enhanced. Meanwhile, the digitalization of zakat management is amplified based on several dimensions which are emphasized in the digital-readiness index such as digital infrastructure, digital application, culture and digital ecosystem, and amil's (zakat collector) digital skills.

From the analysis section, the authors highlight several recommendations to enhance zakat management in Indonesia with a focus on coordination and digitalization. Firstly, there is an urgent need to adopt the self-regulatory organization (SRO) role from other frameworks, such as the commercial finance framework, to aid in coordinating regulators such as the Financial Service Authority. Secondly, the various zakat associations in the zakat management ecosystem should clarify their roles in assisting BAZNAS (the national zakat agency) as zakat coordinators to provide technical support to other zakat institutions that may still be grappling with administrative issues. Thirdly, BAZNAS should lead the sharing or integration of the zakat database to create powerful metadata for zakat stakeholders, which would significantly enhance zakat management. Finally, the low IT capability of amil's (zakat collectors) represents the primary obstacle for zakat institutions. Therefore, BAZNAS should collaborate with the amil certification board to integrate IT management into the Amil certification curriculum. As a result, the certification process for amil (zakat collector) would ensure their proficiency in supporting the implementation of zakat digitalization in daily operational activities.

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Conflict of interest statement

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

References

- Abidin, H., Budiyanto, A., Rosyifah, S.N. (2020). *Amil di Era Digital*. Filantropi Indonesia.
- Aedy, H. (2015). Measuring the quality of zakat management of government-endorsed bodies (a case study on national zakat agency and zakat committee of mosque in the city of Kendari). *International Journal of Science and Research (IJSR)*, 4(8), 2047-2051. Retrieved from <https://www.ijsr.net/archive/v4i8/SUB157898.pdf>
- Ahmed, H. (2004). *Role of zakah and awqaf in poverty alleviation* (1st Edition). Islamic Development Bank Group.
- Aji, H.M., Albari, A., Muthohar, M., Sumadi, S., Sigit, M., Muslichah, I. and Hidayat, A. (2021). Investigating the determinants of online infaq intention during the COVID-19 pandemic: an insight from Indonesia. *Journal of Islamic Accounting and Business Research*, 12(1),1-20. <https://doi.org/10.1108/JIABR-05-2020-0136>
- Alin @ Nordin, N.A. and Rahman, A.A. (2018). Role of Infaq in Financing Students in Malaysian Public Universities. Rahman, A.A. (Ed.) *New Developments in Islamic Economics*. Emerald Publishing Limited, Bingley. <https://doi.org/10.1108/978-1-78756-283-720181003>

- Anwar, B. A. (2019). Karakteristik Bursa Efek Sebagai Self-Regulatory Organization. *Justitia Jurnal Hukum*, 3(1), 39-49. Retrieved from <https://journal.um-surabaya.ac.id/index.php/Justitia/article/view/2199/1873>
- Ascarya, A. (2022). The role of Islamic social finance during Covid-19 pandemic in Indonesia's economic recovery. *International Journal of Islamic and Middle Eastern Finance and Management*, 15(2), 386-405. <https://doi.org/10.1108/IMEFM-07-2020-0351>
- BAZNAS (2018a). Indonesia Zakat Outlook 2019. Center of Strategic Studies of BAZNAS. Jakarta.
- BAZNAS (2018b). Indonesia Zakat Outlook 2018. Center of Strategic Studies of BAZNAS. Jakarta.
- BAZNAS (2019). Indonesia Zakat Outlook 2020. Center of Strategic Studies of BAZNAS. Jakarta.
- BAZNAS (2020). Indikator Pemetaan Potensi Zakat (IPPZ). Center of Strategic Studies of BAZNAS. Jakarta.
- BAZNAS (2020b). Indonesia Zakat Outlook 2021. Center of Strategic Studies of BAZNAS. Jakarta.
- BAZNAS (2021). Outlook Zakat 2022, Badan Amil Zakat Nasional, available at <https://puskasbaznas.com/publications/outlook/indonesia-zakat-outlook-2022> (accessed January 26th, 2023)
- BAZNAS (2022). Hasil Pengukuran Indeks Kesiapan Digital LPZ 2022 Wilayah 1 Sumatera. Center of Strategic Studies of BAZNAS. Jakarta.
- BAZNAS (2022b). Hasil Pengukuran Indeks Kesiapan Digital LPZ 2022 Wilayah 3 Kalimantan. Center of Strategic Studies of BAZNAS. Jakarta.
- BAZNAS (2022c). Hasil Pengukuran Indeks Kesiapan Digital LPZ 2022 Wilayah 4 Sulawesi. Center of Strategic Studies of BAZNAS. Jakarta.
- BAZNAS (2022d). Hasil Pengukuran Indeks Kesiapan Digital LPZ 2022 Wilayah 5 Maluku, Maluku Utara, Papua & Papua Barat. Center of Strategic Studies of BAZNAS. Jakarta.
- Bilo, C., and Machado, A. C. (2020). The role of Zakat in the provision of social protection: A comparison between Jordan and Sudan. *International Journal of Sociology and Social Policy*, 40(3/4), 236-248. <https://doi.org/10.1108/IJSSP-11-2018-0218>
- Carson, J. (2011). Self-Regulation in Securities Markets. Policy Research working paper; no. WPS 5542. Retrieved from <http://hdl.handle.net/10986/3313> License: CC BY 3.0 IGO.
- Chotib, M. (2021). Zakat Management Concept to Accelerate Health and Economic Recovery during the COVID-19 Pandemic. *Open Access Macedonian Journal of Medical Sciences*, 9(E), 1213-1217. <https://doi.org/10.3889/oamjms.2021.7394>
- Greenlaw, S. A., Shapiro, D., and Taylor, T. (2018). Principles of Macroeconomics (2nd Edition). (*OpenStax*).
- Gupta, M.S. (2020). *What is Digitization, Digitalization, and Digital Transformation?*. Retrieved from <https://www.arcweb.com/blog/what-digitization-digitalization-digital-transformation> on February 1st, 2023.
- Halimatusadiyah, I. (2015). Zakat and social protection: the relationship between socio-religious CSOs and the government in Indonesia. *Journal of Civil Society*, 11(1), 79-99. <https://doi.org/10.1080/17448689.2015.1019181>

- Heikal, M. (2014). The intention to pay zakat commercial: an application of revised theory of planned behavior. *Journal of Economics and Behavioral Studies*, 6(9), 727-734. <https://doi.org/10.22610/jebis.v6i9.532>
- Hudaefi, F. A. (2020). How does Islamic fintech promote the SDGs? Qualitative evidence from Indonesia. *Qualitative Research in Financial Markets*. 12(4), 353-366. <https://doi.org/10.1108/QRFM-05-2019-0058>
- Jatim.kemenag.go.id (2011). *Undang-Undang Republik Indonesia Nomor 23 Tahun 2011*. Retrieved from <https://jatim.kemenag.go.id/file/file/Undangundang/bosd1397464066.pdf>
- Kailani, N., and Slama, M. (2020). Accelerating Islamic charities in Indonesia: zakat, sedekah and the immediacy of social media. *South East Asia Research*, 28(1), 70-86.
- Kemenag.go.id (2023). *Kemenag Rilis 108 Lembaga Pengelola Zakat Tidak Berizin Ini Daftarnya*. Retrieved from <https://kemenag.go.id/read/kemenag-rilis-108-lembaga-pengelola-zakat-tidak-berizin-ini-daftarnya-q9bbx>
- Khan, F., and Servinc, N. (2021). Role of Zakat in Strengthening Social Protection during COVID-19 and beyond: An Evidence from Bangladesh and Turkey. In the Proceeding of the International Conference on Islamic Economics and Finance (13th ICIEF). Jakarta, Indonesia
- Nurzaman, M.S. (2016). Evaluating the Impact of Productive Based Zakat in The Perspective of Human Development Index: A Comparative Analysis. *Kyoto Bulletin of Islamic Area Studies*, 9(March), 44-62. <https://doi.org/10.14989/210347>
- Permana, F.E. (2023, January 26). *Kemenag Rilis 108 LAZ tak Berizin, Ini Respons Forum Zakat*. Retrieved from <https://iqra.republika.co.id/berita/rp1bwg451/kemenag-rilis-108-laz-tak-berizin-ini-respon-forum-zakat>.
- Riyadi, A. H., Abdukad, A. A. S., Saif, B. M., Takow, H. A., and Sharofiddin, A. (2021). The effect of utilizing zakat fund on financing production to achieving social welfare: in Indonesia as a case study. *Journal of Islamic Finance*, 10(1), 19-029. Retrieved from <https://journals.iium.edu.my/iiibf-journal/index.php/jif/article/view/524>
- Ruhana, A. S. (2019). The Role of Zakat in Social Protection in Islamic Developing Countries: A Contributing Instrument. *Ekonomi Islam Indonesia*, 1(1), 80-89. <https://doi.org/10.58968/eii.v1i1.5>
- Salleh, W. N. A. W. M., Rasid, S. Z. A., and Basiruddin, R. (2019). Towards transforming zakat collection and distribution roles using digital wallet in support of social justice and social financing. *Open International Journal of Informatics*, 7(2), 95-103. Retrieved from <https://oiji.utm.my/index.php/oiji/article/view/69>
- Saputro, E. G., and Sidiq, S. (2020). The role of zakat, infaq and shadaqah (ZIS) in reducing poverty in Aceh province. *International Journal of Islamic Economics and Finance (IJIEF)*, 3(SI), 63-94.
- Shirazi, N. S. (2006). Providing for the resource shortfall for poverty elimination through the institution of Zakat in low-income Muslim countries. *International Journal of Economics, Management and Accounting*, 14(1), 1-27. <https://journals.iium.edu.my/enmjjournal/index.php/enmj/article/view/116>
- UI MUSTAFA, A. R., and Nishat, M. (2017). Role of social protection in poverty reduction in Pakistan: A quantitative approach. *Pakistan Journal of Applied Economics*, 27(1), 67-88. Retrieved from <https://ideas.repec.org/a/pje/journal/article27sumiv.html>

Ulya, F.N. (2023). 108 Lembaga Pengelola Zakat Tidak Berizin, Ini Daftarnya. Retrieved from <https://nasional.kompas.com/read/2023/01/21/12273191/108-lembaga-pengelola-zakat-tidak-berizin-ini-daftarnya> (accessed January, 26th 2023)

Wahab, N. A., and Rahman, A. R. A. (2011). A framework to analyse the efficiency and governance of zakat institutions. *Journal of Islamic Accounting and Business Research*, 2(1), 43-62. <https://doi.org/10.1108/17590811111129508>

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Muhammad Rizky Siddiq carried out the research, wrote and revised the article. Mohamed Aslam Akbar conceptualised the central research idea and provided the theoretical framework. Muhammad Rizky Siddiq designed the research, and supervised research progress. Mohamed Aslam Akbar anchored the review, revisions and approved the article submission.



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