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Social Cost-Benefit Analysis (SCBA) of Islamic Insurance (takaful) Drone-Assisted Disaster Victim Identification: Emotional Management

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Abstract: Islamic insurance (*takaful*) companies have continuously used the latest technology to serve their customers better. One of the potential technologies that *takaful* operators can consider is drones. Nonetheless, the adoption of drones has shown an imbalanced pattern between regions, with some countries displaying more commendable experiences than others. In the context of Malaysia, such adoption can be regarded as negligible, if not minimal. While drones have numerous positive effects, this study focuses on emotional management through the lens of social cost-benefit analysis (SCBA) based on disaster victim identification (DVI). DVI is the process of identifying corpses (often in large numbers) following a disaster, either natural or man-made disaster. This study provides preliminary findings that support the need for drones to be integrated into *takaful* operations, based on the SCBA method focusing on emotional management. The findings indicate that emotional management affects not only the family of the victim but also the first responders involved in the search and rescue (SAR) operation and their families. Hence, proper consideration must be given to using drones in *takaful* operations with the government disaster agency.

Keywords: D*rone; Islamic insurance; takaful; disaster; victim, insurance*

1. Introduction and Background

Disaster victim identification (DVI) refers to the rigorous process of recognizing dead bodies as a result of a disaster. While the responsibility of identifying the dead bodies is not part of insurance companies or *takaful* operators' mandate, drones are commonly used by insurance companies in advanced economies such as Japan, the United Kingdom, the United States of America and even China (Muhamat et al., 2022). Hence, there is uneven adoption of technologies between the Northern and Southern Hemisphere particularly in the context of *takaful* operators that are expected to champion the social cause due to the inherent religious tenets that guide the business operation. This paper is from a series of publications from our research grant that explores the potential of *takaful* operators to be part of the disaster management cycle or procedure to enhance the recovery aspect of the impacted disaster area.

Interestingly, drone-assisted DVI is one of the latest approaches that have been used in disaster management, especially during search and rescue (SAR) missions. Previous studies in this field demonstrated a significant research gap concerning *takaful* operators, against the landscape of Industrial Revolution (IR) 4.0. The crux of this study is to explore the social cost-benefit analysis (SCBA) specifically on emotional management during disasters, and the potential use of drone technology by *takaful* operators for DVI to address such concerns.

The paper is structured as follows: it begins with an introduction to the *takaful* sector, followed by a discussion of DVI and the standpoint of *takaful* operators. Furthermore, a detailed perspective on the DVI program is presented with a drone as the medium/apparatus in the process. The methodology section includes a social cost-benefit analysis (SCBA) in the context of DVI specifically on emotional management and finally, the conclusion.

2. Literature Review

This section discusses the contemporary and essential studies relevant to this paper's research.

Disaster victim identification (DVI) and drone that is linked to *takaful* operators

The *Takaful* industry has recorded a strong performance, USD 27.6 billion globally in 2021, and is expected to grow

to USD 49.8 billion by 2027 (Imarch, 2022). However, there is a considerable variation in the penetration rate for insurance and *takaful* businesses in the Asia-Pacific, with life insurance or family *takaful* exhibiting a trend reduction. In contrast, general insurance and *takaful* businesses increased steadily (EY, 2020). In another global report, the Islamic Financial Services Board (IFSB) has informed that Iran, Saudi Arabia, Malaysia, the UAE, and Indonesia as the main contributors (91%) of the *takaful* industry from 2011 to 2018 (IFSB, 2020).

In the context of Malaysia, the Fitch Rating has forecasted solid growth for 2022 accompanied by improved penetration rates, business models and technology capabilities amid higher *takaful* awareness, digitalization innovation and government initiatives (Fitch, 2022).

In essence, the *takaful* sector is expanding, particularly during the post-pandemic Covid-19 recovery phase, and technology is one of the driving forces behind this increasing trend. During the pandemic, the need to accept the newest technology for the *takaful* sector is much greater. Such adaptation during the stressful period has led most *takaful* operators to use the latest system in their operations.

Drones are one of the technologies accessible for the insurance and *takaful* sectors; nevertheless, their acceptance has been inconsistent, with certain sections of the globe adopting them more than others, and *takaful* being one of the latter. Drones can be operated in various settings, including fertilization, search and rescue (SAR), intelligence, and other tasks.

Likewise, in the context of DVI, this technology has been employed for S&R to identify the disaster region or locate missing individuals. DVI is a way to identify disaster victims, which may involve a small or large number of victims and is critical to fulfilling legal and humanitarian conditions via a rigorous scientific and forensic process (Black & Hackman, 2009).

Such disasters or catastrophes may occur due to environmental, medical, automobile, industrial, or even terrorist factors (Brough et al., 2015). This technique has the potential to be used to an even broader degree, such as recognizing deceased corpses, albeit this application is presently inconsistent and lacking especially in developing countries (Daud et al., 2021).

If we can recall the 2018 earthquake in Palu, Indonesia, resulted in a tsunami that killed hundreds and rendered the disaster area inaccessible. When a massive disaster like this hits a country, disaster victim identification (DVI) is required.

Furthermore, the golden rule of forensics states that the first 48 hours after a disaster are critical for identifying victims, since this is before the remains decay and become hard to identify (Dillon, 2021). Even a country remotely affected by natural disasters like Malaysia was also affected during the tsunami that hit Acheh in 2004 which caused many fatalities or damage to human life or property. Man-made catastrophes, on the other hand, may also have comparable detrimental consequences.

Takaful as mentioned earlier is an Islamic-based protection mechanism. The participation of *takaful* operators in the framework of DVI is critical, especially for monetary recompense to policyholders who have been victims of the disaster. Muhamat et al. (2022) emphasize the importance of *takaful* in disaster management, especially the *takaful* operators are critical in the last phase of catastrophe management, the victim recovery phase. This is accomplished by compensation paid to impacted policyholders, enabling them to rebuild their lives, companies, and homes.

Drone's potential linked to *Takaful*

However, their function may emerge sooner if *takaful* operators provide aid to the government's relief organizations or first responders in the case of a disaster. Any delay or failure to identify the victims would impact their policyholders. While *takaful* operators are obligated to compensate their policyholders, meeting this requirement correctly implies that they should also engage in the disaster management process, with DVI being a significant area.

This possible endeavor will be explored from the standpoint of SCBA in this article. SCBA is a method for methodically weighing benefits and costs. It can be viewed as a forecasting exercise (Treasury of New Zealand, 2015). However, other aspects cannot be quantified in monetary terms, namely the psychological and well-being

effects. These are the components that require careful consideration.

With that as a foundation, this research investigates the SCBA, focusing on emotional management as the premise of discussion for this initiative to be supported collaboratively by *takaful* operators.

3. Research Methodology

This project adopted a qualitative approach to appraising the objective laid down; to gather the SCBA analysis based on the potential adoption of drones by the *takaful* operators. The interviews with the key informants were conducted in several phases due to the lockdown period that the government had implemented to address the outbreak of the Covid-19 pandemic.

Some of the interviews were conducted online, and the rest were face-to-face with strict adherence to the SOP of the Ministry of Health. Likewise, the last data collection phase was executed in a simulation exercise. Therefore, the data used in this research is based on a simulation exercise in Melaka from November 9 to 12, 2021.

The first responder agency, Angkatan Pertahanan Awam Malaysia (APM) or Malaysia Civil Defence Force, Aerodyne (a renowned drone consultant), Ministry of Health Malaysia, Analisa Resources (M) Sendirian Berhad, National Institute of Forensic Medicine Malaysia, and Universiti Teknologi MARA institutes and faculties, including the Institute of Pathology, Laboratory, and Forensic Medicine (I-PPerforM), College of Engineering, and Faculty of Business and Management, all took part in the simulation.

4. Results & Discussion

Drones can be used mainly in four (4) stages of the disaster management lifecycle, which are:

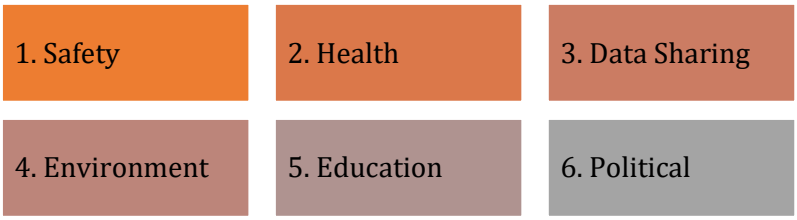
Figure 1: Disaster Management Lifecycle

Disaster victim identification (DVI) is one of the response processes in the disaster lifecycle. In normal practices in the industry, the rescuer will go to the site for the victim's identification through DNA and other necessary methods. But when technology is used, drones will be much more helpful in figuring out who the victims are.

The Cost Benefit Analysis (CBA) from the point of view of time was found in a previous study. It is proven that adopting drones could give advantages in the fast process of victim identification compared to going to disaster sites. It can be measured with a monetizable factor in which the benefit-cost ratio is around 1.5.

In line with that study, social cost-benefit analysis is done to identify other factors that can contribute to the adoption of drones in disaster victim identification. In total, six (6) main factors were identified in the SCBA involving:

Figure 2: SCBA components of *takaful* operators' drone adoption



The focus of this paper is on the health component; emotional management.

Emotional Management

Unmanned Aerial Vehicles (UAVs) or drones are increasingly recognized as potential devices that can reduce the impact of immense stress and trauma due to the conditions to which they are exposed, especially to the disaster management team, as well as the victims and their next of kin.

While drones have been mentioned as able to provide fast identification of the victims - hence the immediate release of information of the details to the family members and the authorities including the *takaful* operators and insurance companies for compensation.

Still, there are consequences for first responders and crisis management teams that have not been considered. For example, the usage of drones, which have been described as swift and dependable by many, contributes to improved decision-making for the crisis management team while also decreasing stress and pressure on them during the search and rescue (SAR) operation. The SAR operation is essential for relocating, recovering, and rescuing casualties, but it is extremely risky for them.

Providing and accessing adequate mental health care is crucial in cases of such trauma to minimize the risk of developing conditions such as post-traumatic stress disorder (PTSD), moral injury, or high emotional distress.

The adoption of drones will help in improving mental health not only among first responders but also among the family members involved. To assess mental health, a test named the Depression Anxiety Stress Scale (DASS) was developed. The indicators of DASS results are as follows:

Table 1: Depression Anxiety Stress Scale (DASS)

Score			
	Depression	**Anxiety**	**Stress**
Normal	0-5	0-4	0-7
Mild	6-7	5-6	8-9
Moderate	8-10	7-8	10-13
Severe	11-14	9-10	14-17
Extremely Severe	15+	11+	18+

Source: Psychology and Counseling Unit (UPsK)

It is important to highlight here that this study does not survey in-depth on the DASS and does not include a significant number of respondents. Nevertheless, during the interview, various questions were posed to the key informants (members of the crisis management team/first responders), summarizing their responses in Table 2.

Table 2: Suggested Depression Level With or Without Drone

Without Drone (Human)	**With Drone**
Probability of DASS Score: Extremely Severe	Probability of DASS Score: Mild

As per Table 2, the key informants who were part of the first responder team believed that using a drone would minimize the DASS on them.

In the context of victims, all the key informants from various backgrounds can be considered potential victims and family members. Thus, their feedback has been published as findings from this research project by Muhamat et. al (2021) and Muhamat & Ali Azizan (2022) as the key informants perceive a significant contribution to the potential to better fulfillment of the maqasid Shariah due to the impacts on religion, life, progeny, intellectual and property.

Specifically, for emotional management, due to the impact brought by drones, if being used by the *takaful*

operators in their operations, the key informants reckoned it as essential during the disaster or calamity situation, the pressing need to know the whereabouts of the loved ones and his or her condition is so critical. Hence, DASS for them is better with the drone.

5. Conclusion & Recommendations

In a nutshell, this research provided critical information on the possibility of drone adoption, reinforced by the SCBA results about emotional management.

Having peace of mind during a stressful situation is essential to emotional management. Furthermore, this is the primary motivator for people to purchase the *takaful* policy. Emotional management encapsulates every critical component of a person, beyond the health requirements, as it also involves the security and well-being of the victim and the family members.

For instance, a mother's unstable mind due to stress from an accident or disaster involving her husband; who is still missing, might cause a physical and emotional disturbance that may be directed to her kids.

Such a situation is unhealthy because the mother might hit and abuse excessively by scolding her children due to stress (Muhamat & Ali Azizan, 2022), or worse, she might kill her kids and herself (Alexandri et. al, 2022). Many cases involved parents with unstable minds who ended up taking their kids' lives (Friedman & Resnick, 2007). The impact of the Covid-19 pandemic specifically with regards to mental health due to economically affected as well as medically sick due to the pandemic (Mamun, Bhuiyan & Manzar, 2020). A similar trend was recorded in Peru where homicide cases sharply increased (Calderon-Anyosa, Kaufman, 2021).

Nevertheless, other components of SCBA still need to be mentioned in this study and may be further investigated for future research. The comprehensive SCBA from the lens of *takaful* operators will provide a comprehensive assessment of this noble research project. It will facilitate further discussion and policy papers in this area.

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