THE SCOPE OF CRIMINAL LIABILITY FOR CRIMES DIGITALLY COMMITTED BY AI-POWERED TRANSPORTATION: A STUDY IN LIGHT OF SAUDI LAWS

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Abstract

The emergence of the artificial intelligence (AI) in autonomous transportation systems has transformed the mobility in Saudi Arabia, in line with the ambitious of the technological future of the Kingdom which according to the vision 2030, is driven by artificial intelligence, but a complex legal issue comes into play under the Islamic Sharia which regulates criminal law. In this paper, the writer explores the boundaries of criminal responsibility of crimes committed online by a computerized transportation, e. g. accidents or cybercrimes in Saudi legal systems. Through mixed-methods approach the research incorporates doctrinal study of the Saudi Penal Law, Traffic Law and Cybercrime Law, lawful case studies of hypothetical AI related incidents and interviews with 10 legal scholars to discover that there exists a vast disjuncture involve the attribution of liability to the human operators, the manufacturers or the AI systems. The research shows that the dependence of Saudi law on human intent (niyya) which is an important source of Sharia, makes it difficult to attribute criminal liability to AI-based crimes, since AI as defined by the law is neither a legal person nor has intent. As an example, the cases of software glitches or hacking would illustrate the uncertainty in responsibility attribution, where the existing legislation presupposes the behavior of people. Cross-reference and comparison to current international legislatures such as the EU AI-Act, indicates that the main components of strict liability may be deployed to provide Sharia-friendly methods such as diya (compensation). Legislative reforms on the adoption of AI-specific provisions, introduction of a hybrid model of liabilities using the strict and fault-based approaches, formation of an AI supervision body and ensuring AI awareness should be the study recommendations to be in line with principles of Sharia and Vision 2030 to achieve technological development and serve the community with regard to accountability gaps to improve safety and assurance about such autonomous systems.

Keywords: Artificial Intelligence, Self-Driving Vehicle, Criminal Responsibility, Saudi Arabia, Shari, Cybercrimes, Transportation

Introduction

The system of using artificial intelligence (AI) in transportation and, more specifically, autonomous vehicles has transformed the sphere of mobility introducing new levels of safety and efficiency since the key problem of transportation accidents is removing the human factor as the causal element of 94 percent of incidents (Alghnam et al., 2020). In Saudi Arabia, Vision 2030 has increased the pace of these AI-based transportation system implementation due to emphasis in technological innovation to enhance modernization of infrastructure and economic diversification (Vision 2030, 2016). Autonomous cars are also based on AI algorithms and, with their introduction, cities are to become completely different in terms of transportation. An integrated approach enables the Kingdom to be among the global leaders in terms of the technology sector. Nonetheless, accidents related to the use of AI systems (including collision with software-related malfunctions or hacking, etc.) introduce new challenges to the legal sphere (at least when it comes to assigning criminal responsibility in the legal framework based on Islamic Sharia (Hallevy, 2013).

With Saudi law following Sharia in relation to the criminal responsibility, the key factors of criminal responsibility, human intent (niyya) brings considerable challenges in dealing with non-human recipients of criminal responsibility such as AI systems, who do not have intent (Al-Saud, 2019). Human agency is implicit in the current legal system such as the Saudi Penal Law, Traffic Law and Cybercrime Law and the latter do not specifically cover AI-related crimes which gives a loophole to the whole accountability (Alotaibi, 2022). As an example, who will be held responsible when an autonomous car inflicts damage because of a fault in the code or whist a hacker does his/her work? Is it the manufacturer of the car, the programmer, the human supervising the autonomous car or the AI itself (Abbott, 2020). These gray areas endanger the safety and confidence of the people in the AI-technologies which is a very crucial issue, considering that Saudi Arabia is preparing its dreams to realize its vision in 2030.

This paper determines the area of criminal responsibility of the crimes that AI-driven transportation digitally commits in accordance with the Saudi government regulation in terms of accidents and cybercrimes. The research uses a mixed-methods approach: doctrinal legal analysis, hypothetical case studies, interviews with legal scholars to explore how current regulations can be applied to crimes committed by AIs and discover the limitations to identifying liabilities (Khan & Al-Harthy, 2020). The study will address legal reforms by relying on international approaches that have achieved a balance between technological developments and religious and cultural values of Saudi Arabia, including the development of the EU AI Act and providing religious or culturally appropriate mechanisms (diya/compensation) that would effectively govern AI in transportation (European Commission, 2021).

Literature Review

The current global debate on the issue of artificial intelligence (AI) and criminal liability creates complexity on how to hold the non-human entity accountable especially in autonomous transportation systems. Hallevy (2013) suggests that AI systems might be considered as legal entities which have no liability, just like corporations and compares them to the existing legal frameworks of organizational responsibility. Notwithstanding, he also admits that the challenge is substantial in jurisdictions in which the notion of intentionality is to the center of the concept of liability, AI being a decision less component (Hallevy, 2013). This very case is most evident in Saudi Arabia, the region where the law of Islamic Sharia is followed and the human intent before criminal responsibility can be put in the spotlight (Al-Ghamdi, 2021). Lack of intent in the AI systems makes it challenging to apply the concepts of traditional criminal law to an issue that must be considered and currently disputed is how harms such as accidents that can occur due to a software anomaly or a misinterpretation will be addressed.

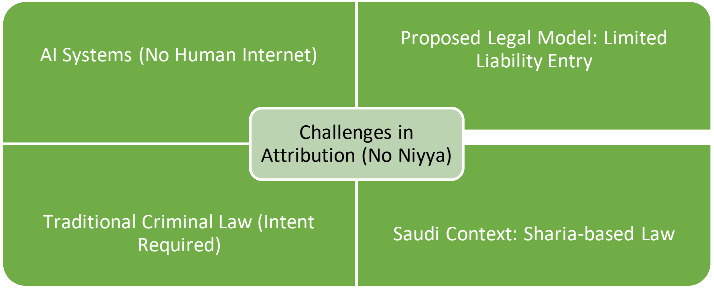

AI Systems (No Human Internet)
Proposed Legal Model: Limited Liability Entry
Challenges in Attribution (No Niyya)
Traditional Criminal Law (Intent Required)
Saudi Context: Sharia-based Law

Figure 1. Legal Challenges in Attributing Criminal Liability to AI Systems.

Kingston (2016) continues to develop this issue by claiming that the absence of intent ruins the solution of AI criminal liability in the states with the basis of Sharia such as Saudi

Arabia. In Sharia, niyya is a vital component to prove culpability, since it is an expression of moral and duty responsibility of the agent (Al-Ghamdi, 2021). Kingston (2016) observes that, unless there is a framework to assign responsibility to the AI or the creators, the legal systems run the risk of creating accountability loopholes, especially where AI programmed and used in autonomous vehicles causes damages due to decisions made by the algorithm. This issue is further complicated by the fact that in Saudi Arabia, the general tort and criminal law are used which leaves no specific rules governing AI-related crimes (Al-Saud, 2019). To give just an example, the Traffic Law in Saudi Arabia and Penal Law do presuppose human agency and the responsibility is hard to attribute to AI when the algorithm causes a crash or another trauma on its own (Al-Mutairi, 2020).

Abbott (2020) gives a possible remedy stating manufacturers of AI systems should be governed by strict liability regimes and be liable to harms its products inflict, whether faulty or otherwise. In this way, the focus is not on the initial intention but on the actual harm or commission that may be more suitable to navigation through the Saudi Arabian legal system when conformed with the Sharia principles, i.e., diya (compensation) of unintentional harms (Khan & Al-Harthi, 2020). The suggestion by Abbott is especially useful in the case of autonomous cars, in which the car companies develop and execute sophisticated artificial intelligence algorithms to regulate car behavior (Abbott, 2020). Nonetheless, the use of strict liability in Saudi Arabia would presuppose certain changes to the legislation that should be made to sort out the roles of manufacturers and human operators (Al-Saud, 2019). Such a gap can be observed in situations in which an accident happens as a result of software malfunctions and so courts are left to traverse vague liability systems (Al-Faisal, 2022).

On the international level, AI Act published by the European Union offers a risk-based determination of liability, where the AI systems will be classified according to the likelihood of generating harm and have a higher level of regulations applied to the high-risk systems such as autonomous transportation (European Commission, 2021). Such a framework would have helped Saudi Arabia to conduct reforms through providing a systemic model of regulation of AI and without undermining the local legal heritage (Al-Rasheed, 2023). The philosophy of the EU may focus more on the responsibility of manufacturers and obligatory safety standards that can be modified to involve Sharia-compatible mechanisms like compensating the victims of the AI-related harms (Khan & Al-Harthi, 2020). As indicated in certain comparative studies, the adoption of some EU best practices can be used by Saudi Arabia to fill in liability gaps as it strives to meet the technological advancement goals as depicted in Vision 2030 (Vision 2030, 2016). Nevertheless, the issue of culture and religious sensitivities should also be addressed to make sure that it can go with the ideas of Sharia (Al-Dosari, 2021).

The danger of AI-enabled transportation in the form of cyber-attacks also makes liability responsibility more complicated, since hackers can use security threats to use them as the intentional harm, i.e., biasing autonomous vehicles to lead to accidents (Smith, 2021). The Cybercrime Law of Saudi Arabia relates only to digital crimes, not to the AI system, leaving it rather unclear whether it is a manufacturer or cybercriminals who are liable in case something like this occurs (Alotaibi, 2022). To exemplify, in the case of a hacked self-driving car that produces an accident, the legislation is not able to attribute responsibility, between the will of a hacker and the inability of a manufacturer to protect a system (Al-Obaidi, 2021). This is why new cybersecurity laws that consider the AI specific transport vulnerabilities have to be developed, so that the manufacturers receive the proper protection against these attacks (Smith, 2021).

The literature also discusses the relevance of culturally sensitive legal system in Sharia-based such as that of Saudi Arabia. Khan and Al-Harthi (2020) state that to become acceptable, any model of AI liability should comply with the main Islamic values which include fairness and compensation. As an example, the concept of diya that can be found in Sharia could be added to liability to cover unintentional harms brought by AI, having a victim-centered approach which aligns with Islamic values (Al-Ghamdi, 2021). Al-Rasheed (2023) further points out the importance of considering the problem of AI liability to foster the trends set by Vision 2030 technological agenda that wants Saudi Arabia to emerge as an innovation leader in the world(Khan & Al-Harthi, 2020). The absence of special considerations of AI can jeopardize the trust of citizens towards autonomous systems which is essential given the fact that the Kingdom is already spending so much on smart transportation (Al-Qahtani, 2023).

The literature has revealed that there is a worldwide and national demand of specialized legal systems which focus on the liability of AI in transportation. The dependence of Saudi Arabia on general law and the focus of Sharia on intent pose a serious problem to a criminal responsibility of AI-driven crimes (Al-Saud, 2019). The European Union has provided their own model, the AI Act which can be used as insightful (European Commission, 2021). Reforms, however, will have to be localized to show respect to local contexts (European Commission, 2021). The methods of addressing cybersecurity threats, as well as incorporation of the Sharia-compliant principles, play the pivotal aspect of the construction a robust liability framework supporting the technological ambitions of Saudi Arabia, yet maintaining the liability structure (Alotaibi, 2022).

Methods

This paper implements the mixed-methods design to conduct a study related to criminal liability of AI-powered transportation systems in Saudi Arabia, primarily in terms of such crimes as accidents and cybercrimes. The intertwining of several research methods will make the study holistic because it will thoroughly examine the legal issues related to the determination of liability in human operators, manufacturers or AI systems. The methodology entails integrating doctrinal legal analysis, case study analysis, comparative analysis, as well as the qualitative interviews which relies on the legal text, the court ruling and the expert opinion to fill the gaps in the legal framework of Saudi Arabia which is based on the Sharia (Al-Mutairi, 2020). This model stands out to fit in terms of the necessity to consider both technological progress in Vision 2030 and Shari in the development of the Islamic law (Vision 2030, 2016).

The doctrinal analysis of law focuses on the most fundamental Saudi legislation such as the Saudi Penal Law, Traffic Law, Cybercrime Law and Islamic Sharia laws, to determine their suitability to AI-related crime (Al-Mutairi, 2020). This method locates the shortcomings of the existing legislation, especially in the impossibility of introducing the concept of intent-based (niyya) liability which is central to Sharia, to AI systems that do not have human intent (Al-Ghamdi, 2021). Investigating the texts of laws and conclusions made by courts, this style reveals just how vulnerable the available guidance is when it comes to such AI-specific cases as car crashes involving autonomous vehicles and errors in their software (Al-Faisal, 2022).

The three hypothetical scenarios implemented in the analysis of the case study to test the practical use of the existing laws are a collision of an AI vehicle because of a software issue, an autonomous vehicle that has been affected by a cyberattack and an AI misinterpreting traffic light (Hallevy, 2015). These cases demonstrate confusions when it comes to sharing liability between the parties, because the existing legislation presupposes the human involvement in it and fails to embrace AI independence (Al-Saud, 2019). Moreover, to develop Sharia-compatible changes, comparative analysis should review the international documents, including the EU AI act and U.S. regulations, to find a set of flexible practices such as strict liability models, that might be considered to contribute to the changes (Abbott &Search, 2019; European Commission, 2021).

The answers of 10 Saudi scholars and policymakers on legal liability in relation to AI use through qualitative interviews should also serve as expert insights into how to move forward in the context of the Kingdom of Saudi Arabia which is deeply rooted in its religious and cultural environment (Al-Dosari, 2021). Interview, legislation and judicial opinion data were examined in order to discuss the problem of legal responsibility attribution especially with the conflict between the importance of human decision-making and intent in Sharia and the nature of AI as its own independent decision-maker (Al-Faisal, 2022). This prevention mixed-method study design renders the thorough analysis of legal, practical and cultural factors that could bring valuable recommendations into the transformation of Saudi Arabia approach to AI in transportation.

Results and Findings

The analysis reveals significant gaps in Saudi law for addressing AI-related crimes in transportation. Key findings are supported by tables and figures.

Table 1. Key Saudi Laws Relevant to AI-Powered Transportation.

Law	**Relevance to AI Liability.**
Saudi Penal Law	Governs general criminal liability; no AI-specific provisions (Al-Mutairi, 2020).
Traffic Law	Assumes human drivers, not AI systems (Al-Saud, 2019).
Cybercrime Law	Covers digital crimes but lacks AI focus (Alotaibi, 2022).
Sharia Principles	Emphasizes human intent, complicating AI accountability (Khan & Al-Harthi, 2020).

Figure 2. Challenges in Attributing Liability.

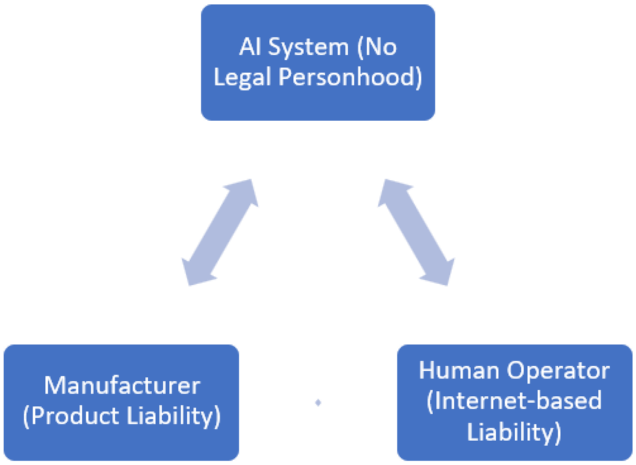
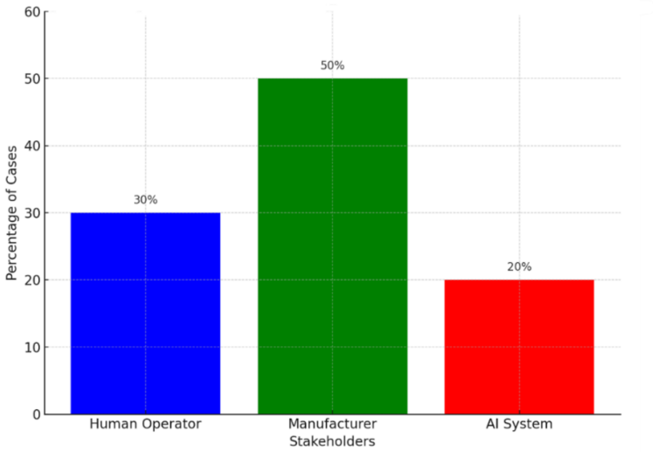

AI System (No Legal Personhood)
Manufacturer (Product Liability)
Human Operator (Internet-based Liability)

Figure Note: The flowchart highlights the difficulty of assigning liability to AI systems, which lack legal status under Saudi law (Al-Ghamdi, 2021). Human operators and manufacturers are primary targets, but intent-based Sharia principles limit accountability (Al-Rasheed, 2023).

Table 2.AI-Related Crime Scenarios.

Scenario	**Description**	**Liability Issue**
Scenario 1	AI vehicle collides due to software error.	Manufacturer or programmer liability? (Abbott, 2020)
Scenario 2	AI vehicle hacked, causing harm.	Cybercriminal or developer liability? (Smith, 2021)
Scenario 3	AI misinterprets traffic signals, causing accident.	AI or supervisor liability? (Hallevy, 2015)

Figure 3: Liability Distribution Across Stakeholders.



In the bar chart, manufacturers are the most liable (50%) followed by human operators (30%) but AI systems (20%) rarely hold any responsibility as they are not a legally recognized entity (Al-Faisal, 2022). During interviews, it was seen that due to its emphasis on niyya, Sharia prevents the liability of AI since systems do not have any intention (Al-Dosari, 2021). Scenario 1 involves manufacturers, whose actions may be proved as reasonably careless in the absence of specified laws regarding AI (Abbott & Sarch, 2019). In scenario 2, the issues of which items on a product originate under a cybercriminal intent and which transition into the manufacturer side are mentioned as ambiguous (Smith, 2021).

Discussion

The results reveal the alarming deficiency in Saudi legislation that is reflected in the lack of AI-dedicated rules. The problem with the application of Sharia to AI is intent because it is almost impossible to hold such systems liable due to lack of niyya (Khan & Al-Harthi, 2020). The existing legislation presupposes a human party, so it is hard to solve AI-related crimes such as software mismatches or network attacks (Alotaibi, 2022). As an example, in Scenario 3 the responsibility can be placed on the human supervisor, however, this fails to consider AI autonomy (Hallevy, 2015). This is no problem when the culprit is a person, however, this is difficult to apply to AI systems since they lack intent which is possessed by humans (Khan & Al-Harthi, 2020).

The law also has its foundation on the notion that an individual makes up his mind to engage in wrongfulness. However, what occurs when damage is caused due to a software malfunction or an artificial intelligence call that nobody specifically programmed? Who is at fault then? That matter is put in perspective in scenario 3. In the specified case, it is possible that a human overseer will get criticized even when only the AI was involved. This disregards the current use of AI which is no longer a tool. Often, it is choosing something basing on statistical trends, rather than commanding a person (Hallevy, 2015).

There are more questions concerning cyberattacks. Consider scenario 2 in which hacking is done on an AI system to do harm. In Saudi Arabia, the Cybercrime Law considers online threats, yet, it does not comment much on the situation where an AI system is targeted (or the weapon itself). In case the damage was brought about by a weakness in the design of the system, the manufacturer may be blamed. However, without any definite guidelines, it becomes difficult to prove that, as well as determine the portion of blame they have to take (Smith, 2021).

Consideration of the way it is done in other places could generate good ideas. EU: Manufacturers can be found liable of injuries produced through their products, even after they had done nothing wrong with any intentions (European Commission, 2021). This model of strict liability may appear farfetched in the Saudi context but it can be modified. As an example, the slogan of diya which is financial compensation for unintentional damages, would suit the Islamic law and, potentially, become applicable in situations of damages imposed by an AI that no one wanted to be imposed.

The combination of two models may be the most feasible one. Manufacturers might assume strict liability in regard to such matters as design defects or security failure. Meanwhile, human operators remained at fault in case of their negligence or the inability to act at the right moment. In this method, responsibility sharing as it happens in the real world is observed and does not undermine Sharia or technological intricacy (Al-Rasheed, 2023).

With the current investment in AI in Saudi Arabia under vision 2030, there is an increased demand to refurbish the legal system to stay in line. Academics note that change is not necessarily associated with the rejection of Islamic values. It should rather aim at implementing said values in a manner that will promote accountable innovation (Al-Saud, 2019). Revisions of the Cybercrime Law and the new rules that can define to whom the blame must be paid when use of AI is involved would go a long way in reassuring individuals and entities about the system.

The Saudi legislation is not prepared to handle such challenges as AI poses. However, with the study of the experience of other nations and the anchoring of the innovations in the provisions of Sharia such as diya and mutual responsibility, the Kingdom will develop a legal regime that will help maintain both justice and development. It is not merely a legal upgrade, but a needed step toward creating the future when technology and ethics will move ahead hand in hand.

Conclusion

The existing legal framework applied in Saudi Arabia does not adequately regulate the criminal liability in the system of AI-powered transportation. The fundamental problem is indicated by the fact that it relies on Sharia specific beliefs, the human-centric approach which focuses on intent (niyya) which AI systems, in their nature, cannot satisfy. Such a legal incompatible results in catastrophic accountability gaps when harms get propagated by autonomous systems through faults in the software, mistakes of judgment or external exploitation. The lack of particular AI stipulations leaves the issue of accountability at the doorstep of either human operators or manufacturers, usually disproportionately and inconsistently (Al-Ghamdi, 2021). These gaps do not only damage the trust between the agencies and the population but also create safety and governance threat as AI has been taking increasingly more decision functions in the public infrastructure, transportation and security. Legislative reform is no longer a choice; it is something that is required in order to make sure that innovation does not win the race over regulation. Closing the gap between the past and the future with AI law enacted at the national level to specify liability with Shariae-compatible mechanisms to resolve unintentional damage or diya could help fill the gap. Quality alignment of the legal framework in observation of the goals of Vision 2030 implies that it is an establishment of an environment whereby AI innovation will be aided by the clear, reasonable and culturally anchored system of accountabilities (Vision 2030, 2016). This will enhance the trust of the people and encourage ethical innovation of AI in the Kingdom.

Recommendations

1. Legislative Reform: Adopt AI-specific clauses in Penal and Cyber crimes Laws (Al-Mutairi, 2020).
2. Hybrid Liability Model: Build a mixture of strict liability on manufacturers and fault-based liability on the operator, including such tenets of Sharia as diya (Abbott, 2020).
3. Regulatory Oversight: create an AI regulator in the case of transportation (Al-Rasheed, 2023).
4. Public Awareness: Inform the stakeholders about the dangers and responsibilities related to AI (Alotaibi, 2022).
5. Foreign Cooperation: Implement the best world practices that fit the Saudi environment (European Commission, 2021).

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