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Agile Decision-Making as an Alternative for Decision Making's Complexities in Information Management to Flood Rescue and Recovery: A Systematic Literature Review

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ABSTRACT

There are several decision-making complexities that must be addressed in information management of flood rescue and recovery. All of these complexities lead to several complications, such as slow rescue operations, a rise in the number of victims, and numerous other flaws. As a result, in order to accomplish optimal decision making, the "agile concept" must be adopted. Therefore, this paper aims to explore the complexities faced by decision makers and identify the factors of agile decision making for an enhanced effectiveness of information management in flood rescue and recovery. 79 relevant articles published between 2014 to 2023 have been collected to go through systematic literature review. It includes the previous studies of complexities for information management in flood rescue and recovery Next, the findings showed that there eight significant factors of agile decision making that can enhance information management effectiveness in flood rescue and recovery. The factors are integrated collaboration, virtual knowledge, data quality, leadership role, person abilities, cost allocation, community engagement and real time data. The findings of this study further show that agile decision making can be alternative for reducing complexities of decision making by enhancing effectiveness of information management in flood rescue and recovery. The results of this study can be used as the fundamental to develop an effective model of agile decision making to enhance information management in flood rescue and recovery.

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1. Introduction

Decision making is the method of choosing by deciding on a course of action, acquiring data, and assessing potential solutions. The purpose of decision-making studies is to comprehend and examine the intricate mechanisms that underlie human decision-making skills, preconceptions, and strategies [1]. Numerous fields, such as psychology, economics, neuroscience, and management, are used in decision-making studies. In information management, decision-making is important because it allows efficient and effective use of information resources to accomplish the objectives of the organisation [2]. Currently, inefficient decision-making always become the issue, especially when it comes to information management for flood rescue and recovery. Making bad decisions can have major consequences and ineffective response action when it comes to flood rescue and recovery. Ineffective prioritisation and resource allocation may result in a shortage of essential materials, equipment, and manpower during rescue and recovery operations [3]. As a result, emergency responses can take longer, evacuation attempts might be less successful, and it might be more difficult to provide critical aid to the affected communities. Inadequate decision-making can also lead to an inadequate risk assessment and set of preparatory measures [4]. Failure to properly understand the possible risks and vulnerabilities associated with floods may result in inadequate planning and preparation for rescue and recovery operations [5].

The Malaysian flood disaster has resulted in a total loss of life and the devastation of homes, vehicles, businesses, the agricultural industry, the industrial industry, public assets, and infrastructure [6]. According to the Prime Minister's Department and Department of Statistics Malaysia's report, the cost of damages in Malaysia's Flood 2021 had reach RM6.1 billion, the total damages caused by floods were RM6.1 billion, or 0.40 percent of nominal Gross domestic product (GDP). The total living quarters losses are RM1.6 billion, commercial real estate losses RM0.5 billion, auto losses RM1.0 billion, agricultural losses RM90.6 million, industrial losses RM0.9 billion, and public assets and infrastructure losses RM2.0 billion. Improving information management in flood rescue and recovery is an ongoing attempt within flood management to reduce the impact loss caused by flood disaster. A lot of researchers have highlighted the importance of flood rescue and recovery in this matter. Muhammad *et al.,* [7] present a novel approach to flood response and recovery decision-making with the goal of creating resilient adaptation decisions. A recent study by Zhu *et al.,* [8] covered information management in flood rescue and recovery, with a focus on examining how disaster readiness training improves senior families' comprehension of flood disaster preparedness and handling.

Information management is critical in flood rescue and recovery, particularly in decision making. An improved information management will result in improve flood rescue and recovery and decision-making skills, for example, have improved. It will improve data accessibility, timeliness, and accuracy, enabling for more effective coordination and resource allocation during flood rescue and recovery operations [80]. The "agile concept" must be implemented in order to achieve the optimal decision making. As a result, for flood rescue and recovery, agile decision making should be applied to flood information management. Hence, the purpose of this paper is to identify and analyse the key challenges inherent in information management for flood rescue and recovery operations, with a focus on understanding the complexities and intricacies that decision-makers encounter. Then, this paper will also provide insight on agile decision-making's factors that affect effectiveness information management for flood rescue and recovery. The finding of the papers should contribute to the existing body of knowledge in term of helping in introducing a novel approach to decision-making in the context of flood rescue and recovery. By applying agile decision-making concepts, the research offers a fresh perspective on how decision-makers can adapt to rapidly changing conditions and

improve the efficiency and effectiveness of their actions. By examining information management through an agile lens, this paper will help to advance people's understanding of decision-making in flood rescue and recovery while also providing insightful analysis and useful practical advice to lessen the effects of flood disasters and improve overall disaster preparedness in an easy-to-understand manner. These structures are separated into three sections: Section 2 addresses the research questions while detailing the SLR procedure. The findings will be presented in Section 3. Section 4 concludes with a discussion of the conclusion and future projects.

2. Methodology

For comprehensive review is needed for better research ap finding. As implemented by [79], this paper also has set up protocol of review to search for relevant studies by using systematic review approach. Since the study will focus on decision making difficulties and agile decision-making variables, the fundamental steps are separated into three parts: planning, conducting, and reporting.

2.1 Planning the Review

In the planning phase, research questions are defined. The inclusion and exclusion criteria are created, relevant databases are found, search strings are created, the search is run, studies are chosen and screened, data are extracted, analysed, and synthesized, data quality and bias are assessed, findings are interpreted and reported, and limitations and future research directions are noted. The research questions are defined as in Table 1.

Table 1
Research Question

ID	Research Question
RQ 1	What are the decision making's complexities in information management for flood rescue and recovery?
RQ 2	What are agile decision-making's factors that affect effectiveness information management for flood rescue and recovery?

During SLR planning, the following questions were designed for data extractions as shown in Table 1. The SLR was conducted to address two main objectives: The first objective is to study the decision making's complexities in information management for flood rescue and recovery. The second objective is to study on the agile decision-making's factors that affect effectiveness information management for flood rescue and recovery.

The search method was carried out when the research questions were completed. Digital libraries and databases that were searched had been used and improved the search strings as their starting point. The collection of digital databases is based on the most popular and well-known databases in order to simplify and broaden the range of linked resources. Table 2 displays a list of the online resources that were utilised to search the publications in this study.

Table 2
Digital Database Library

Sources	Links
Scopus	scopus.com
Science Direct	sciencedirect.com
Google Scholar	scholar.google.com
Elsevier	Elsevier.com
ACM Digital Library	dl.acm.org
IEEE Xplore	ieeexplore.iee.org

The search keywords are "agile decision making", "Information Management" and other possible synonyms. Table 3 shows the search keywords used to achieve this objective. The search string is formulated based on the following keywords and Boolean operators: (Agile Decision Making OR Dynamic Decision Making" OR "Adaptive Decision Making" OR "Selection") AND ("Information governance" OR "Content Administration" OR "Information Handling" AND ("Flood Relief and Rehabilitation" OR "Flood Emergency Response" OR "Flood Crisis Management". The comprehensive search expressions ensure all the related articles are included.

Table 3
Synonym of the keywords

Words	Synonym term as keywords
Agile Decision Making	Dynamic Decision Making
	Adaptive Decision Making
	Decision making = Selection/Choice/Evaluation
Information Management	Information governance
	Content Administration
	Information Handling
Flood rescue and recovery	Flood Relief and Rehabilitation
	Flood Emergency Response
	Flood Crisis Management

The established criteria for inclusion and exclusion in the study are strictly followed when comparing and analysing the paper as part of the systematic literature review. The pertinent information is carefully extracted from each study after it has been determined that it satisfies these requirements, with an emphasis on publication information, study aims, techniques, important findings, and any pertinent statistical or qualitative data. Then, when appropriate, both quantitative and qualitative findings are combined and presented in a narrative fashion according to the determined themes. This method allowed the researcher to make insightful deductions, spot patterns, and provide a thorough evaluation of the chosen literature, guaranteeing the quality and robustness of the investigation.

2.2 Conducting the Review

The selecting process is covered by the key phases described in this section. It starts with a search for papers and ends with the final selection of papers for analysis and evaluation. For the purpose of this paper, relevant studies were gathered using the inclusion and exclusion criteria listed in Table 4. The unrelated papers are decided after reviewing the title, abstract, and conclusion of the primary identified studies.

Table 4
Inclusion and exclusion of criteria

Inclusion Criteria	Exclusion Criteria
Studies were considered if they had a direct related on flood rescue and recovery operations, information management, decision-making, or disaster preparedness in the context of flood disasters.	Irrelevant Topics: Studies that did not directly address flood rescue and recovery, information management, or decision-making were excluded.
Peer-Reviewed Publications: In order to maintain a high level of research quality, only peer-reviewed journal articles, conference papers, and academic publications were taken into consideration for inclusion.	Non-English Publications: Due to limitations in translation resources, non-English language publications were excluded from our review.
Publication Date: To reflect the most recent advancements in the discipline, papers published between January 2014 and September 2023 are taken into consideration.	Incomplete or Low-Quality Studies: Studies with insufficient information, incomplete datasets, or lacking rigorous research methodologies were excluded

After these procedures were used, 79 studies were kept as shown in Figure 1. Additionally, the study has examined and evaluated the publications by looking at their content. At this point, irrelevant papers were disregarded, and the pertinent studies will now be analysed. Only 60 of the 79 articles were selected for further review. The comparison analysis and reporting of the connected studies were being analysed in the next phases.

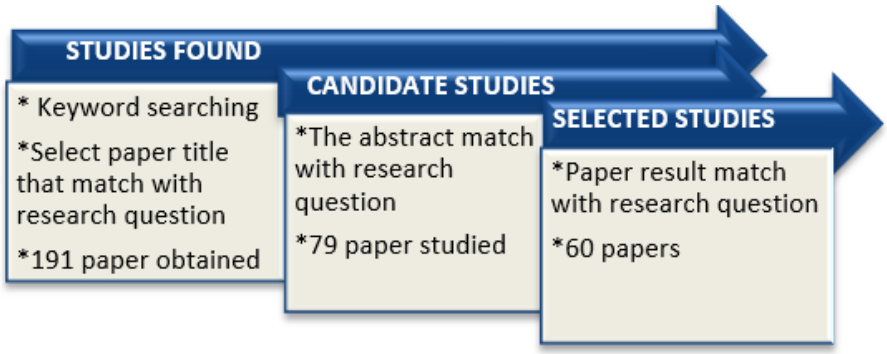

Fig. 1. Selected studies

For the conducting review stage, all the selected articles from the first stage were interpreted and analysed. The extraction of relevant data during this stage is essential in order to synthesize the evidence. The results presentation will be based on the analysis of research questions.

2.3 Reporting the Review

The data extracted from the 60 primary papers were used to formulate answers to the three research questions given. This paper closely followed the guidelines provided by Kitchenham when preparing the SLR report.

3. Results

3.1 What are the Decision Making's Complexities for Flood Rescue and Recovery (RQ1)

Due to a number of interrelated issues, the decision-making process in information management for flood rescue and recovery is challenging. Based on the matrix in Table 5, there are many studies that reveal the complexities of decision making faced by the decision makers in flood rescue and

recovery. Unique difficulties are brought on by the dynamic nature of flood events, the necessity for quick responses, and the requirement for precise information. According to Clar *et al.,* [10], decision-makers must decide quickly whether to evacuate affected areas and call in emergency response teams when heavy rains cause flash floods. Decision-making procedures become more difficult as a result of the urgency to reach vulnerable groups and distribute resources in a constrained amount of time [11].

Decision-makers must manage a significant amount of data from several sources during flood disasters, including rainfall statistics, river water levels, satellite imaging, and real-time social media updates [10-13]. It can be difficult to manage and integrate this variety of information in order to develop precise situational awareness. Additionally, making sure the data is accurate and trustworthy is essential for decision-making [14-16]. According to Esteban *et al.,* [17] in order to assess the severity of and potential effects of flooding, decision-makers must rely on precise rainfall data from meteorological authorities. However, problems like data discrepancies, gaps, or delays in data availability can make the decision-making process more difficult. Collaboration between numerous stakeholders, including government agencies, emergency responders, community organizations, and volunteers, is necessary for flood rescue and recovery activities [17]. Due to the various roles, responsibilities, and communication styles among these various organizations, ensuring efficient coordination and information exchange can be difficult. Resource allocation during flood disasters frequently involves trade-offs and prioritisation difficulties for decision-makers [10,12,13,18]. For instance, they need to prioritise sending rescue teams and supplies to the riskiest places, taking into account things like population density, accessibility, and the intensity of flooding. Decision-making is necessary to manage constrained resources and conflicting priorities. In the flood rescue and recovery process, decision-makers also face ethical conundrums [16]. A difficult ethical dilemma can be finding a balance between saving lives and meeting the demands of various populations [14]. In addition, Malaysian decision-makers work hard to modify their strategies in order to incorporate what they have learned from previous flood catastrophes [15]. For instance, they examine past flood responses to pinpoint areas that could be improved, such boosting early warning systems, boosting community involvement, or boosting infrastructure resilience. Effective flood management requires incorporating these acquired lessons into decision-making procedures and encouraging a culture of adaptation.

The lack of complete and reliable data is one of the main issues with information management for flood rescue. Information may be incomplete or unavailable in emergency situations, making it difficult for decision-makers to gain a complete knowledge of the flood occurrence. Implementing strong data gathering and reporting systems, such as real-time monitoring networks and standardised data protocols, can increase the accessibility and precision of information, claims Islam *et al.,* [19]. Collaboration amongst stakeholders can guarantee the accuracy and dependability of data. According to Zhu *et al.,* [8], decision-making during flood rescue efforts is sometimes hampered by severe time restrictions. Decision-makers must act quickly to prevent property damage and save lives. However, the pressure of the circumstance could cause hasty or ill-informed choices. Since standardised decision-making frameworks and protocols can help speed the process and permit quick but informed conclusions, Nakhaei *et al.,* [20] has undertaken Geographic Information System (GIS) and Analytic Hierarchy Process (AHP) in their research. The ability of decision-makers to make quick decisions while taking into account available information can be improved with regular training and simulations.

Since decision-makers require a comprehensive understanding of the situation in order to make wise decisions, integrating these various data sources is a substantial difficulty [21]. Enhancing decision-making capabilities can be achieved by implementing centralised data repositories or

platforms that permit the seamless integration and interchange of information [22]. For efficient decision-making in flood rescue, gaining a thorough situational awareness is essential. Decision-makers would find it difficult to allocate resources efficiently and organise rescue efforts without a good grasp of how the flood conditions are changing [23].

Table 5
Recent studies related to the decision making's complexities for flood rescue and recovery

Author	Country	Method / Theory	Type of complexities
[8]	China	Fuzzy-DEMATEL method	Difficulty in prioritizing information
[11]	USA	Case study method	Slow information data processing; Insufficient data analysis tools
[19]	USA	machine-learning approach designed	Information Data fragmentation; Limited information data sharing:
[18]	Germany	Survey & 366 experts review	Limited Resource allocation; Evacuation strategies; Prioritization of rescue efforts
[17]	Netherlands	Systematic Literature Review	Lack of Information filter; unreliable validation; Limited data-driven decision-making culture
[15]	Ghana	In-depth interviews, Focus Group Discussions 354-household survey	Decision-making under pressure; Access limitations; Contingency planning
[10]	Austria	a mixed-methods approach that integrates a discourse analysis with the evaluation of flood risk exposure, social vulnerability, coping skills, and adaptive capacity.	Decision-making under uncertainty; Difficulty of coordination; Bureaucracy; Emotional and psychological considerations; unengaged to community;
[21]	New Zealand	Social constructivist epistemology	Data Quality and Reliability; Uncertainty and Complexity
[12]	Bangladesh	Geographic Information System (GIS) and Analytic Hierarchy Process (AHP).	Prioritization in making decision
[13]	South Africa	Household surveys and participatory visual methods	Evacuation strategies; Prioritization of rescue efforts; victim preparedness
[16]	United Kingdom	Combining Fuzzy Cognitive Mapping (FCM) with a flood resilience measurement framework called Flood Resilience Measurement for Communities (FRMC).	Inadequate data security; Lack of data validation; Limited data-driven decision-making culture; Insufficient use of emerging technologies
[24]	Ethiopia	Systematic Literature Review	Lack of studies on previous flood rescue and recovery cases
[25]	Malaysia	Case study	Lack of training on flood management
[5]	Germany	Household survey (n = 744)	Time Sensitivity; Limited timeframe, limited resources
[26]	Malaysia	Case study	Limited up to date technology
[27]	France	Machine learning adaptation	Conflict with tradition decision making method
[28]	Ireland	Triaxial basis that considers expectation, probability quantile and expectation–quantile–investment (EQI) evaluation.	Information overload; Slow information filter; Lack of real-time data; Incomplete information
[29]	Nepal	Case study and focused group discussions,	Lack of manpower, low digital iteration among flood rescue agencies
[30]	Australia	Systematic Literature Review	Lack of training on flood management
[31]	Indonesia	Observation, interviews, focused group discussions, and a review of documents	Balancing short-term and long-term needs; Integration of technology

3.2 What are Agile Decision-Making's Factors That Affect Effectiveness Information Management for Flood Rescue and Recovery? (RQ2)

For this finding, the mapping need to analysed based on agile decision making's definition or characteristic that can be related with information management in flood rescue and recovery. This is because there is no specific study of agile decision-making's factors that affect effectiveness information management for flood rescue and recovery which has become the research gap of this study. Agile decision making is a flexible and adaptive approach to making choices and solving problems in a fast-paced and dynamic environment. It is closely associated with the principles of Agile methodology, which originated in software development but has since been applied to various fields, including business, project management, and beyond [32]. For developing the new agile decision-making model, the possible factors should be identified through these SLR. Based on the Table 6, altogether, there are 21 factors were identified from a total study related to the agile decision-making's factors that affect effectiveness information management for flood rescue and recovery. According to Table 6 which is the list of agile decision-making factors, integrated collaboration is the trait that has been studied the most frequently, accounting for 20 research in total. This is followed by virtual knowledge with 18 variables, data quality and reliability with 17 studies, person abilities with 17 studies, leadership roles with 16 studies, real-time data integration with 15 studies each, community participation with 15 studies, and cost allocation with 15 studies. The rest of this section provides a brief description of these findings. These studies play an important role in the effectiveness information management for flood rescue and recovery.

3.2.1 Collaborative integration

The Collaborative Integration explains the connections between the goals of collaboration, the different partner types, and the levels of integration of various human, organisational, or disciplinary partners into the processes and results of the collaboration [33]. In an integrated collaboration, a virtual team works together and communicates with one another. By utilising their current computers and network infrastructure for group and individual collaboration, these environments enable businesses to realise a number of competitive benefits [34]. These fully integrated settings combine the greatest elements of desktop video conferencing, web-based conferencing and collaboration, and instant messaging into a single user-friendly, intuitive setting [34]. This will facilitate seamless agile decision-making. For instance, in Malaysia, the National Disaster Management Agency (NADMA), the National Security Council Directive, Village Development Committee, the Royal Malaysian Police, non-profit organisations, State legislative assemblies, universities, and others are all involved in flood governance and must be coordinated in order for aid to be delivered to the victims efficiently. Decision-making will improve in agility, flexibility, and transparency by introducing collaborative integration across all agencies [36]. The information can be sent faster and the filtering process of data also will enhance significantly. Diverse parties, including emergency responders, governmental bodies, nonprofit organisations, and affected communities, must exchange information quickly and accurately during flood rescue and recovery activities [12]. By ensuring that pertinent information is easily accessible to all stakeholders, integrated collaboration enables them to quickly make informed decisions [36]. Assessing damage, setting priorities for rescue attempts, assigning resources, and coordinating relief activities are just a few of the many aspects of flood rescue and recovery [38].

3.2.2 Virtual knowledge

Apart from that, regardless of distance or availability, virtual knowledge offers access to a plethora of knowledge. Decision-makers can quickly make educated judgements by retrieving pertinent information from online platforms or databases, including statistics, reports, maps, and other resources. Because of this accessibility, regardless of where they are physically located, decision-makers always have access to the information they need. Situations involving flooding are dynamic, with conditions shifting quickly [39]. Decision-makers can access real-time data, such as weather patterns, water levels, and satellite photos, through virtual knowledge, which helps them keep up with the situation as it changes [40]. Access to the most latest information allows for agile decision-making and the capacity to respond rapidly to changing circumstances and new threats [41]. Even when physically separated, decision-makers can communicate, collaborate, and exchange ideas in real time. By utilising the virtual knowledge and skills of all stakeholders, this collaborative environment fosters synergy and enables agile decision-making. Decision-makers can evaluate numerous scenarios and potential outcomes using simulation and modelling capabilities that are frequently included in virtual knowledge resources [29]. They are able to evaluate the effects of various response tactics and determine the most efficient ones by simulating various flood situations. Decision-makers may anticipate problems, allocate resources more effectively, and make wise choices based on the expected outcomes of their choices thanks to these predictive capabilities.

3.2.3 Data quality & reliability

Accurate and reliable data are necessary for agile decision-making in order to make wise decisions. In the context of flood rescue and recovery, decisions concerning resource allocation, evacuation routes, emergency responses, and infrastructure management strongly rely on the reliability and quality of accessible data [42]. Ineffective response efforts can be hampered by poor data quality or incorrect information. An essential component of flood rescue and recovery efforts is evaluating and reducing hazards [43]. Accurately detecting and analysing risks depends heavily on the quality and dependability of the data. To evaluate the severity of the flood, probable impact zones, infrastructure vulnerability, and safety of impacted communities, decision-makers require reliable data. It is possible to create and put into practice effective risk mitigation plans with the help of high-quality and trustworthy data [44]. For improving future decision-making and learning from the past, data quality and reliability are essential. The examination of previous flood disasters, post-event appraisals, and lessons gained are all supported by accurate and trustworthy data. High-quality data can be used by decision-makers to spot trends, evaluate the success of prior choices, and apply changes to their methods and procedures.

3.2.4 Leadership role

According to Zegarra [45], leadership is one of the crucial element for cross-functional team to perform effective agile decision making with other three elements were identified as mediator which are communication, knowledge sharing, and collaboration. Agile leadership can emphasise adaptation, flexibility, and continual improvement [48]. Agile leaders excel at managing complexity, embracing change, and empowering their teams to make decisions and take responsibility of their work [58]. Agile decision-making is one of the primary adaptations through agile leadership. Agile leaders are skilled at obtaining information, analysing data, and making rapid choices based on the most up-to-date options available [12,46]. Agile leaders may tap into the collective intelligence of the

organisation and make better-informed decisions that are more aligned with the demands of the flood response and recovery scenario by allowing their teams to make decisions and take ownership of their work [44,47-49].

In order to ensure the smoothness of the aid or support provided to those affected by a disaster, government's leader who are in charge of coordinating disaster relief operations should be sensitive to the needs and difficulties of those who are affected which affect the decision making in rescue operation [27]. In case of flood response and recovery operation in the event of a flood disaster, leaders could employ agile decision-making in order to enhance coordination and synchronization [50]. The leader's concept is significantly different when it comes to agile decision making. According to Butdee *et al.,* [51], some individuals use the terms 'servant leader' or 'authentic leader,' meaning that the leaders are facilitators of decision-making rather than decision-makers themselves. As a result, the outcomes of agile decision making via agile leadership are adaptive, rapid, and successful. It is because choices were made collaboratively with the use of data and technology.

3.2.5 Person (rescuer) ability

Individuals that are flexible and agile in their ideas and behaviours are necessary for agile decision-making. They must be able to quickly analyse shifting circumstances, comprehend the ramifications, and take prompt action [52]. In the dynamic and unpredictably changing environment of flood rescue and recovery, this capacity to adjust to changing circumstances is essential. Strong problem-solving and critical thinking abilities are required of those involved in rapid decision-making for flood rescue and recovery [53-55]. They must examine intricate problems, spot patterns, take into account a number of variables, and provide innovative solutions. These abilities are crucial for risk assessment, weighing different strategies, and reaching well-informed conclusions when dealing with the difficulties presented by flood events [30,53]. High emotional intelligence allows people to control their own emotions and comprehend those of others, which improves communication and decision-making [30,53]. Effective information management during flood rescue and recovery efforts depends on the ability to remain composed, empathise with others, and deal with pressure.

3.2.6 Community engagement

By empowering and including community people in agile decision-making processes, community involvement fosters resilience [56]. They can support response operations by offering their knowledge, resources, and local networks. In the community's rehabilitation process, this collaborative approach promotes a sense of ownership, resilience, and sustainability [57]. Engaging the community improves communication and information sharing [58]. Decision-makers may convey evacuation plans, safety measures, and recovery updates more effectively by incorporating community members. Engaged communities serve as conduits for crucial information to be disseminated to other community members, improving overall information management during flood rescue and recovery [59].

3.2.7 Cost allocation

Cost allocation is an important factor for effective agile decision-making in information management during flood rescue and recovery as it allows decision-makers to efficiently allocate financial resources to address critical needs [1,54,60]. By accurately identifying and allocating costs associated with various response and recovery activities, decision-makers can ensure that funds are

allocated where they are most needed, optimizing the use of limited resources. According to many studies by several authors [55,58,61,62], effective cost allocation enables timely procurement of essential supplies, deployment of rescue teams, infrastructure repair, and support for affected communities, facilitating an agile and coordinated response that maximizes the impact of available resources in the face of flood-related challenges.

3.2.8 Real-time data

Because of its capacity to deliver complete, accurate, and up-to-date information for informed decision-making, real data integration is a vital aspect for successful agile decision-making in information management during flood rescue and recovery [63]. Real data integration is critical in optimising response efforts and minimising the impact on impacted populations during flood disasters, where time is of the importance and choices can have life-saving consequences [64]. Real-time data integration entails gathering, integrating, and analysing data from a variety of sources, such as sensors, satellite imaging, weather predictions, social media, and field reports. This integration provides decision-makers with a comprehensive perspective of the situation, allowing them to make timely and well-informed judgements [62]. Timely and reliable information is required for agile decision-making. Real data integration guarantees that decision-makers have access to the most up-to-date and relevant information, allowing them to make quick choices [60]. This involves deciding on evacuation plans, allocating resources, developing emergency response methods, and prioritising important activities [65]. The ability to incorporate real-time data accelerates decision-making, allowing for quick reactions to changing flood circumstances [66-68].

Table 6
Agile Decision-Making's factors that affect effectiveness information management for flood rescue and recovery

Authors	Factors of Agile Decision-Making																			
	Effective planning	IT literation	Rapid info response	Virtual knowledge	Ethical Considerations	Agiler mindset	Predictability	Collaboration	Technology	Integrated collaboration	Coordination	Community engagement	Communication	Cost resources allocation	Training Preparedness	Data quality & reliability	Risk management	Real-time Data	Person(rescuer) Abilities	Iterative feedback	Leadership role
[1]		X		X			X								X	X		X			X
[57]		X	X			X			X	X						X	X		X		X
[52]	X		X	X						X				X	X	X		X		X	
[54]		X					X		X	X						X		X	X		
[69]			X	X					X			X			X		X			X	
[70]		X		X			X			X			X	X		X		X			
[30]			X			X				X			X			X		X	X		X
[48]				X					X		X	X			X			X			X
[54]			X			X	X			X			X				X		X		X
[28]			X							X	X			X	X			X			
[71]				X			X			X		X	X				X		X		
[7]	X		X			X				X		X			X			X	X		X
[72]				X		X	X		X		X			X			X				
[61]				X						X	X		X			X			X		

[60]	X		X				X			X		X			X	X		X			X
[55]				X			X				X		X	X		X			X		
[73]			X			X				X		X					X	X	X		X
[59]				X		X	X				X		X		X		X		X		
[61]				X		X				X			X	X		X		X		X	
[56]	X		X		X		X			X	X	X			X	X			X		
[53]			X	X		X			X	X			X			X		X			
[74]	X		X		X		X			X	X			X			X		X		X
[75]				X				X			X	X			X	X		X	X		
[66]				X			X		X	X			X	X		X		X			
[63]	X		X		X					X		X			X		X		X		X
[77]			X	X				X		X	X			X				X		X	
[64]				X				X			X	X			X		X				X
[78]							X		X	X			X		X	X			X		
[62]					X					X			X			X					
[58]				X				X				X				X			X	X	
Total	6	4	13	18	4	9	12	4	8	20	11	15	12	15	13	17	10	15	16	5	16

4. Conclusions

Finally, this research has thrown light on the complex decision-making challenges that information managers face in the context of flood rescue and recovery. Many problems, including as uncertainty, resource allocation, and community engagement, frequently result in sluggish response operations and increased vulnerability. Recognizing the importance of agile decision-making, the researcher conducted a systematic assessment of 79 relevant articles published between 2014 and 2023. The analysis identified eight important agile decision-making characteristics that have the potential to improve the effectiveness of information management in flood rescue and recovery. These factors include integrated collaboration, virtual knowledge, data quality, leadership roles, individual abilities, cost allocation, community engagement, and real-time data. Importantly, these results indicate that agile decision-making is a promising option for minimizing the difficulties of decision-making in this crucial sector. By embracing agile concept, decision-makers can quickly adjust to changing conditions and make educated, timely decisions, thereby improving the efficiency and efficacy of flood rescue and recovery operations. These findings constitute the foundation for the creation of an effective agile decision-making paradigm, with the potential to alter information management in flood rescue and recovery, minimize risks, and improve community resilience in the face of flood disasters.

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