Towards a Design of Resilience Data Repository for Community Resilience

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ABSTRACT

Community resilience is coming under scrutiny recently because of its need to support communities in preparing and protecting lives against risks and bouncing back to normal operations after disruptions. However, community resilience is an intricate concept that is arduous to capture and turn into explicit knowledge. This motivated us to propose a general architecture for a resilience data repository that enables communities to adopt a general methodology for collecting, storing, managing, and sharing resilience-based information. To ensure that the repository is useful and practical, we started with in-depth literature review and conducted survey with practitioners to obtain their insights into community resilience and potential data sources from local communities. Furthermore, we presented the utility of the repository by describing several potential applications. Information systems professionals of community stakeholders and disaster management agencies can construct their own resilience repositories by utilising the proposed design of the architecture.

Keywords

Community resilience, resilience data repository, resilience dimension, static and dynamic indicator.

INTRODUCTION

Community resilience (Norris et al. 2008; Kameshwar et al. 2019) concentrates on depicting the capacities of a local community as a complex system, involving actions and interactions of local agencies, natural and built environments, critical infrastructures, and citizens, to mitigate, withstand, and even recover from impacts of hazards (Cutter, Barnes, et al. 2008; Summers et al. 2018), as well as the competence to develop themselves to be less vulnerable to future disasters and emergencies. Towards pre-disaster, we focus on predicting risks proactively in order to reduce detrimental effects. Furthermore, the ability to recover reasonably and sufficiently is a crucial purpose during the post-disaster. Recently, there are many studies attempting to build community resilience for different perspectives, some of which are tourism (Cheer et al. 2019), biodiversity management (Kuhlicke 2019), and mental health (Masson et al. 2019) in both global scope and regional levels (e.g., Brazil (Leite et al. 2019), Greece (Apostolopoulos et al. 2019), and United Kingdom (Ntontis et al. 2019)). Research studies about community resilience can help us in alleviating disaster risks (Alexander 2013; Porębska et al. 2019), adjusting for climate changes (Ristino 2019),

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and developing pragmatic strategies to grow in a sustainable and efficient manner. Nonetheless, this research topic still requires significant efforts from researchers and practitioners in diverse disciplines.

Due to the complexity, we find it difficult to have an accurate and complete picture of community resilience as well as potential elements that communities should focus on to mitigate potential harm and hazards. Besides, different communities can face similar difficulties. If we are able to provide a common architecture for collecting data from different sources across communities, the communities can analyse and learn from each other, then reducing their efforts in coming up with strategies that are well suited to their own problems at a starting point. Prior research has given limited attention to the design of such data repositories. Thus, in this paper, our objective is to design a general architecture of a community resilience data repository based on the following research questions:

1. What are the main components that shape resilience at the community level defined from existing studies, projects, and tools?
2. How do we design a repository architecture that can be used to gather community resilience-related data from different communities and who are potential users involved in the use of gathered data?

To address these research questions, we surveyed with practitioners, as well as literature review guidance, to capture their current understanding of community resilience, highlight their needs, and identify available data sources at the community level. The insights derived then directed our design and helped us identify, categorise, and prioritise repository components for practical use. Our resilience repository aims to support communities in resilience-based data collection from various sources at the local level suitable for different end-users, such as local authorities, experts, and citizens. These end-users can access a massive amount of resilience information from the repository, and then, develop capabilities to predict potential hazards and risks for creating and optimising their resilience strategies for proper preparedness and prevention. Our main contribution in designing this resilience repository is to assist communities to determine potential risks that have to be considered, highlight their available resources to build community resilience regarding different dimensions for optimised management and share. To ensure our repository is usable and practical, we placed communities at the centre by considering the needs of practitioners and professionals involved in emergency services and other critical community functions directly. Several studies have been conducted to consolidate and organise resilience data but they more concentrated on family (Burnette et al. 2020), workplace (McLarnon and Rothstein 2013), or suicide resilience (Osman et al. 2004). In (Yoldaş and Tılıç 2019), the authors aimed at generating a local organisational inventory for disaster; nonetheless, their case studies targeted on earthquakes only.

Communities can leverage the data repository designed in this paper for managing, sharing, and understanding the information and insights of resilience and valuable practices with others. We describe potential use cases to help end-users to leverage and utilise the resilience repository. In addition, there are often persistent latent risks to the communities that are severe but challenging to be recognised in advance due to the lack of timely information extracted from the data and experience. For example, several risks can correlate with each other (e.g., heavy snow not only causes avalanches but also leads to other hazardous conditions and hidden problems such as transport delays, roof collapse, power outages, and even high public stress levels). By collecting an adequate amount of data through our resilience repository, we could further leverage data analysis and machine learning methods to discover underlying patterns for interdependent risks.

The rest of the paper is organised as follows. In the next section, we will provide vital insights from the literature reviews and survey conducted for the design of resilience repository. Further, we will describe the overview of the resilience repository and its primary components. In the following section, we will provide different scenarios to utilise the resilience repository. Finally, we will draw essential conclusions and state future directions.

METHODOLOGICAL APPROACH

To ensure the usefulness and practicality of the resilience repository, we carried out the in-depth literature review and survey with practitioners and professionals to identify essential requirements for the resilience repository design.

Literature Review

By performing in-depth literature reviews in (Nguyen and Akerkar 2020; Patel et al. 2017), a list of various resilience dimensions that was defined from 77 different literature records published from 2000 to 2020, are visualised in the Figure 1. The resilience dimension is a synthetic representation of community resilience as different components.

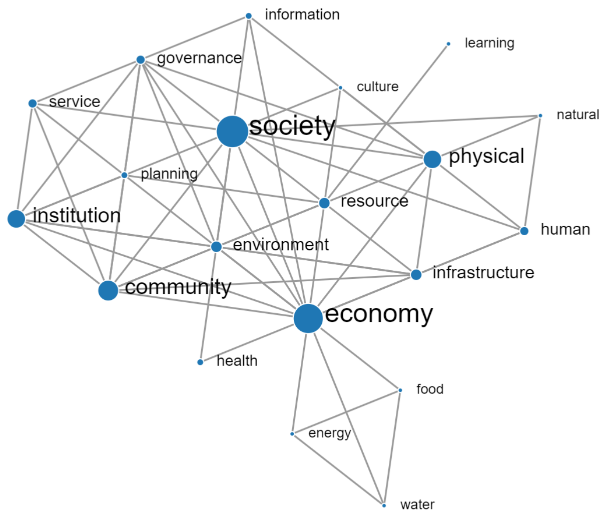

Figure 1. Community resilience dimensions and their relations.

Furthermore, a resilience dimension can be constituted from a set of resilience indicators based on a mathematical formula or a clustering methodology.

This diagram, which is simplified based on the figure proposed in the previous research in (Nguyen and Akerkar 2020), includes nodes and edges representing resilience dimensions and their relations respectively. A connection exists between two dimensions if they co-appear in a model. Besides, A bigger node means that this dimension is more times defined in literature than the others. For details on how to extract nodes and generate the network, we can refer to this study.

We have also learned from our literature review that we should not define too many dimensions because they can overlap and be arduous to divide into lower-level elements. Besides, stakeholders and other end-users may find it difficult to comprehend and control many dimensions for giving precise decisions, especially in the time of adversity.

Therefore, we start with the top four resilience dimensions in this paper: social, economic, physical, and institutional dimensions, where the detail definitions of these four resilience dimensions are given below. We decided to skip the community dimension because this work aims at building community resilience; hence, all the definitions basically placed the community at the centre. Through resilience dimensions, communities can understand their potential hazards and assess community resilience to have good preparation and proper activities. We have also learned from the literature review that the order of dimensions does not reflect their importance.

- **Social dimension:** this type of dimension portrays the ability of communities to protect themselves from being negatively impacted by various stresses (Peacock and Ragsdale 1997) due to different characteristics inherent in *i*) social relationships, networks, and interactions or *ii*) bonds that establish cooperation.
- **Economic dimension:** lack of resources to construct sturdy structures can lead to significant economic losses at the community level; therefore, the economic dimension aims to mitigate future economic impacts (Noy 2009) in terms of housing capital, equitable incomes, or business capacity.
- **Physical dimension:** physical dimension can also be referred to biophysical dimension (Adger et al. 2005). This type of dimension demonstrates efforts to prevent physical attacks that target overall ecosystems and critical infrastructures that support societal functions in our communities.
- **Institutional dimension:** institutional dimension depicts institutional contexts that affect community resilience characterising in resisting, planning and recovering from hazardous events (Cutter, Burton, et al. 2010), some of which are legislation, regulations, and participation options.

From a hierarchical perspective, a resilience dimension constitutes a set of resilience indicators. Resilience indicators are observable and measurable elements that can support different communities in reducing disaster risk, adapt to climate change, and construct a sustainable community. To define and build a completed list of resilience indicators, we should consider multiple types of hazards from chronic stresses (e.g., deficiency of food and water, overtaxed or inefficient public transportation system, and high unemployment) to acute shocks (e.g., severe economic recessions, natural disasters, and infrastructure-related emergencies) (Blades et al. 2017), instead of focusing only on a specific circumstance.

Survey

We conducted a survey to study the practitioner's and researcher's view of the resilience repository. We curated a list of questions based on three primary categories. The categories and questions are introduced based on our prior knowledge in the resilience domain and the related work. Those three categories are:

- **G1**: Understand and assess community resilience.
- **G2**: Sources and availability of data at the community level.
- **G3**: Potential applications of the community resilience repository.

There are 23 questions in this study that belongs to one of the above three categories. Apart from the categories aforementioned, we have two questions about the experience and role of the respondents. Table 1 illustrates the categories of questions (column G#), question identifiers (column Q#), and the questions in our survey. Category G0 indicates the questions related to the experience and role of the respondents.

Table 1. List of questions provided in the survey.

G#	Q#	Question
G0	Q01	Which of the following organisations related to community resilience do you believe to be affiliated with the most?
	Q02	Which of the following roles describe your work related to community resilience the most?
G1	Q03	Do you currently know how to assess the resilience of your community?
	Q04	Do you currently know through which data you can assess the resilience of your community?
	Q05	How do you find the idea of modelling community resilience along different dimensions?
	Q06	Select resilience dimensions that you think are important towards your community to assess resilience
	Q07	Which of these types of indicators are necessary for assessing community resilience?
	Q08	If static indicators are required, select which information that you think is required to assess community resilience.
	Q09	If dynamic indicators are required, select which data sources that you think are helpful to access community resilience.
	Q10	If dynamic indicators are required, how long do you believe a system to provide decision support for community resilience can wait for getting the required information?
G2	Q11	Do you think it is beneficial to have data from more than one source for community resilience?
	Q12	Select which type of data sources that you think is helpful for community resilience.
	Q13	Select which type of data sources is helpful for community resilience in your current professional role and work?
	Q14	Select which type of data sources that you think is available in your community?
	Q15	Select which data sources that you know have availability through Application Programming Interfaces (APIs) in your community?
	Q16	Would you be interested in learning from others' experiences to assess resilience?
G3	Q17	Have you used or known any community resilience repository?
	Q18	If you experienced any resilience repository, please specify the name of the resilience repository.
	Q19	If you experienced any resilience repository, how do you find this tool useful for your community?
	Q20	If you experienced any resilience repository, is something missing from it?
	Q21	Which of the following are effective and useful interfaces for a resilience repository?
	Q22	In resilience repository would it be beneficial to see semantic relationships between different data sources?
	Q23	Who are potential end-users of a resilience repository?
	Q24	In which phase of the disaster management cycle you think that the resilience repository would most likely be used?
	Q25	Select potential challenges that you think that the resilience repository should take into account.

We conducted the survey by distributing it with the disaster response personnel from different backgrounds. We used snowball sampling to distribute the questionnaire through Google Forms[1]. We received a total of 35 responses. The survey was open from November 11, 2020 to December 11, 2020. A possible bias of this approach could be the limitation on the number of answers available. Although we had a text field for respondents to add extra thoughts in the questionnaire, we only obtained the preference for the predefined answers.

Detailed Findings

In this section, we discuss the responses and the observations of our survey that are valuable for modelling and designing the community resilience data repository.

[1]https://www.google.com/forms/about/

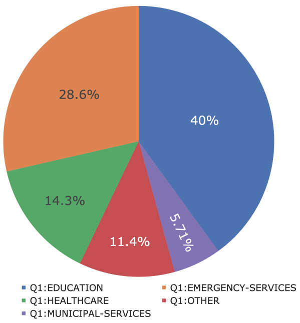

Figure 2. Distribution of organisations of respondents.

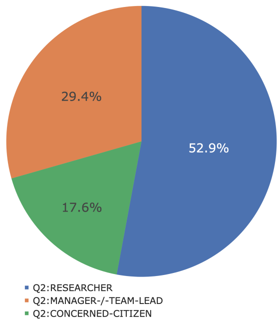

Figure 3. Distribution of roles of respondents.

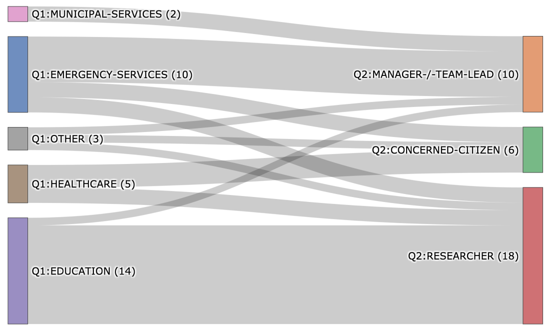

Figure 4. Distribution of roles for each type of organisation.

Experience and roles: Figure 2 shows the respondents' organisations at the time of the survey. The majority of respondents are working in academic institutes. It is vital to note from Figure 4 that a large number of respondents who work in educational institutes are researchers. Therefore, they become one of the expert users of the resilience repository. The second-largest contribution to the survey is from respondents working in emergency services. The number of respondents working in healthcare follows those who work in emergency services. Both industries are important when obtaining a practical perspective on challenges and usage of a community's resilience repository. Figure 3 shows the distribution of roles of respondents. The majority are involved in research activities, while some hold the role of manager/team leader.

Assessing the community resilience: nearly 43% of respondents have the necessary knowledge to assess community resilience, and 34% respondents know about data that helps assess community resilience. Accordingly, there is a lack of knowledge of respondents in assessing the community. More importantly, there is a lack of data/information needed to assess the community's resilience. Moreover, we see a positive correlation of 0.71 between these two variables. Therefore, we believe that the lack of data and the lack of knowledge on those data could have affected the lack of knowledge on assessing community resilience.

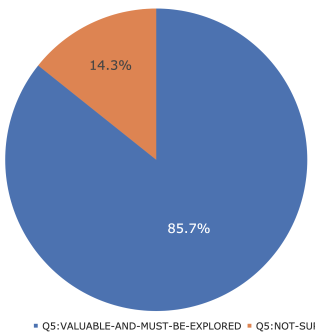

Figure 5. Opinion on the idea of modelling community resilience.

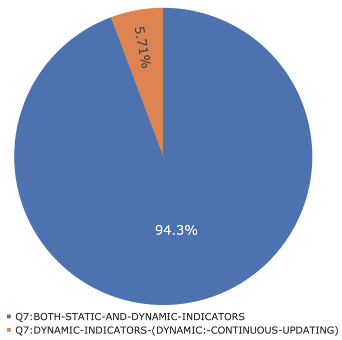

Figure 6. Distribution of static and dynamic indicators.

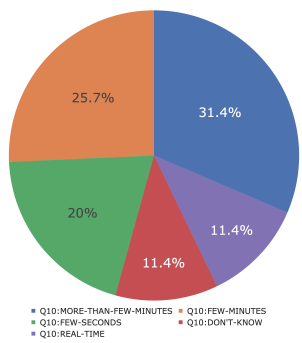

Figure 7. Distribution of the wait times of dynamic indicators.

Modelling community resilience: Figure 5 illustrates the distribution of the respondents opinion on modelling community resilience. The majority has pointed out that modelling community resilience is valuable and should be explored (85%). Figure 8 demonstrates different dimensions that are important to assessing resilience. We conclude that the dimensions listed are important for assessing resilience as economical, social, physical, and institutional dimensions. Apart from these four prominent dimensions, one respondent suggested using psychology. However, we will leave the psychology dimension for our future work since it is not commonly used in other literature, as shown in the previous section.

Types of indicators: as shown in Figure 6, both dynamic and static indicators are found useful for assessing community resilience. Static indicators update information non-frequently, and the updated information replaces previous truth. Dynamic information adds more information to previous information infrequent intervals. For example, risk perception at time t will be replaced by another at a later time. However, dynamic indicators like sensors keep adding to previous information. Figure 9 shows the types of static and dynamic indicators: risk perception, vulnerability, exposed value, community capacity, hazard, social media, and sensor. The majority

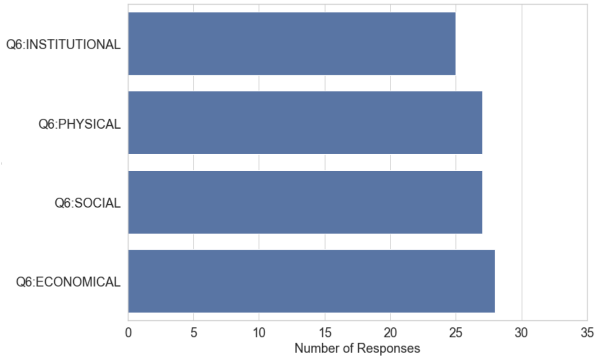

Figure 8. Number of responses indicating the importance of each resilience dimension.

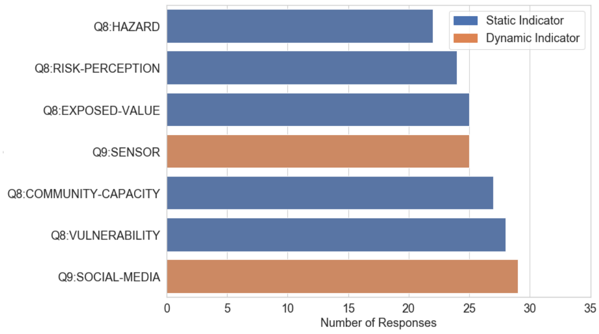

Figure 9. Number of responses indicating the importance of each type of information.

of respondents provided that all of these indicators are required (> 50%). Therefore, all of those indicators are considered when modelling problem and designing the solution in future sections. In addition to the dynamic indicators provided above, the respondents commented that mobility information is also valuable. However, we can consider that as a type of sensor data. Moreover, Figure 7 illustrates the wait time for dynamic indicators. Generally, It shows that for resilience, people can wait for information longer time.

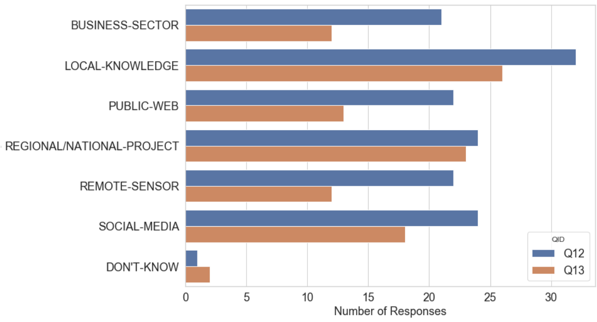

Figure 10. Number of responses for each data sources that might be useful.

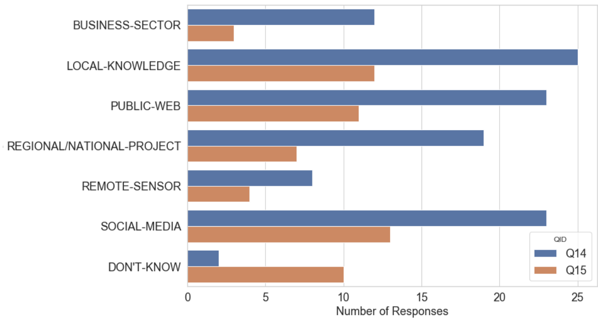

Figure 11. Number of responses indicating availability of different data sources.

Data sources: 97% of participants responded that it is important to have information from more than one source. Figure 10 shows the distribution of votes for each data source: business sector, local knowledge, public web, regional/national project, remote sensor, and social media. While many believe that different data sources are useful in community resilience, not all are useful in the currently involved domains. The number of respondents who think local knowledge is useful exceeds all others. This might be because local knowledge provides unique information based on location. Regional/national projects and social media data have a similar interest to the respondents. In response to Q16, 94% of responses stated that they are interested in learning from others' experiences to assess resilience. Therefore, knowledge sharing is also a viable knowledge source for assessing resilience.

Data availability: the majority (> 70%) of participants believed that local knowledge is the most acquirable information source. Many (> 50%) said that public web, social media, and regional/national project data is available. The remote sensor data and business data has the least votes. This might be because those data have constraints such as privacy of sensor data and business data's organisational policies that prevent them from being exposed to the public. This could be a challenge when developing a resilience repository.

Existing resilience repositories: only 2 respondents out of 35 said they had experienced a resilience repository. One respondent mentioned "*RØDE-KORS*" as an existing resilience repository. None of the participants in our survey replied to question 19 and 20. This might be because there is a lack of knowledge on resilience repository systems.

Resilience repository interfaces: Figure 12 shows the kinds of interfaces that are effective and useful in applying resilience repository. Most respondents identified that search engines are useful. Simulations are preferred less than search engines but are still preferred by more than 50% of respondents. Only 45% of the responses identified that recommendation interfaces are useful. Few respondents stated that they don't know about any form of interface that can be useful. The respondents may have selected the most commonly observed interfaces without thinking about

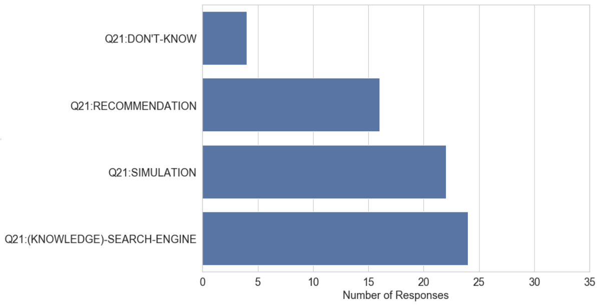

Figure 12. Different types of interfaces of a community resilience repository.

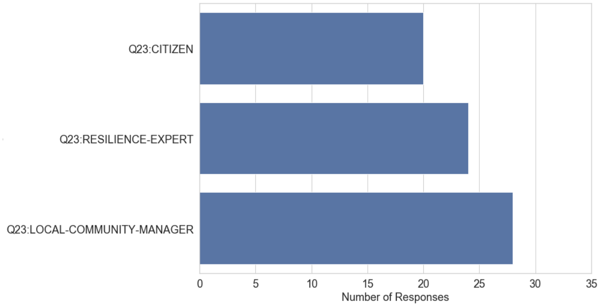

Figure 13. Potential end-users of a community resilience repository.

the potential benefits of advanced interfaces like a recommendation. Additionally, 97% of respondents stated that it is beneficial to see semantic relationships between different data sources.

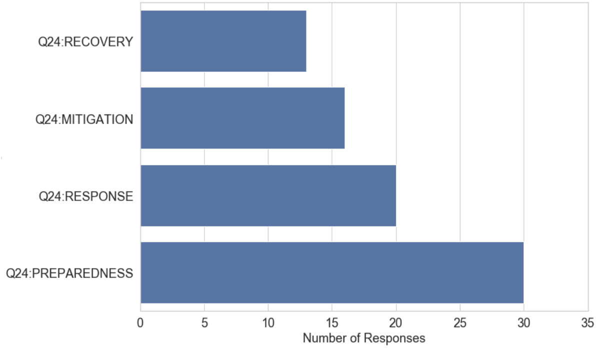

Figure 14. Phases of disaster management cycle that a community resilience repository can be used.

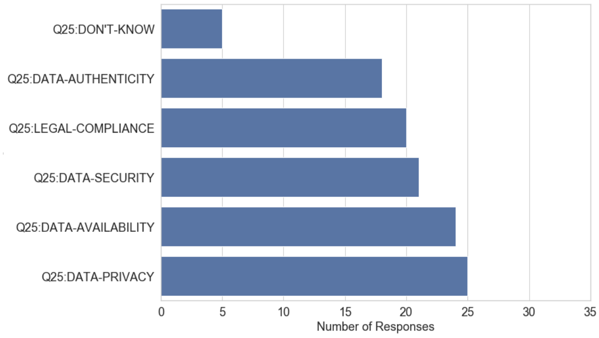

Figure 15. Potential challenges that a community resilience repository should take into account.

End-users of resilience repository: Figure 13 shows the distribution of votes for different types of end-users. More than 50% agreed that local community experts, resilience experts, and citizens would benefit from a resilience repository. Most of the respondents believe that local community managers will benefit from this system the most.

Phases of resilience repository: Figure 14 shows the distribution of votes for different phases of disaster management that a resilience repository can be used. The majority agreed that a resilience repository would be used in the preparedness phase. This could be why the respondents select longer wait times for the information since there is no emergent risk in the preparedness phase. The response, mitigation, and recovery phases follow preparedness accordingly to the respondents' replies.

Challenges of resilience repository: Figure 15 shows the distribution of responses for the potential challenges that the resilience repository should take into account. Most respondents thought data privacy to be a challenging factor. Therefore, we should carefully address privacy in the design of the resilience repository. Although data authenticity is the challenge that the least percentage of respondents agreed, it is still greater than 50% of all responses. Therefore, we identify that all of the previously mentioned challenges are relevant factors to consider when designing the repository.

Next, we leverage the insights from the survey to propose the design of a resilience repository.

Overview of the Repository

Figure 16 represents the overview of the architecture of the community resilience data repository. Six potential data sources to collect both static and dynamic indicators based on their availability in users' communities are described as follows. An indicator is static in case it represents information that is stable or gradually change in a long duration, including risk perception, vulnerability, exposed value, capacity, and hazard, which follow the definitions on disaster risk reduction[2]. Contrariwise, a dynamic indicator depicts *i*) dynamic risk perception through sentiment analysis using social media data and *ii*) dynamic exposed value by fusing available sensor data. We keep

[2]https://www.undrr.org/terminology

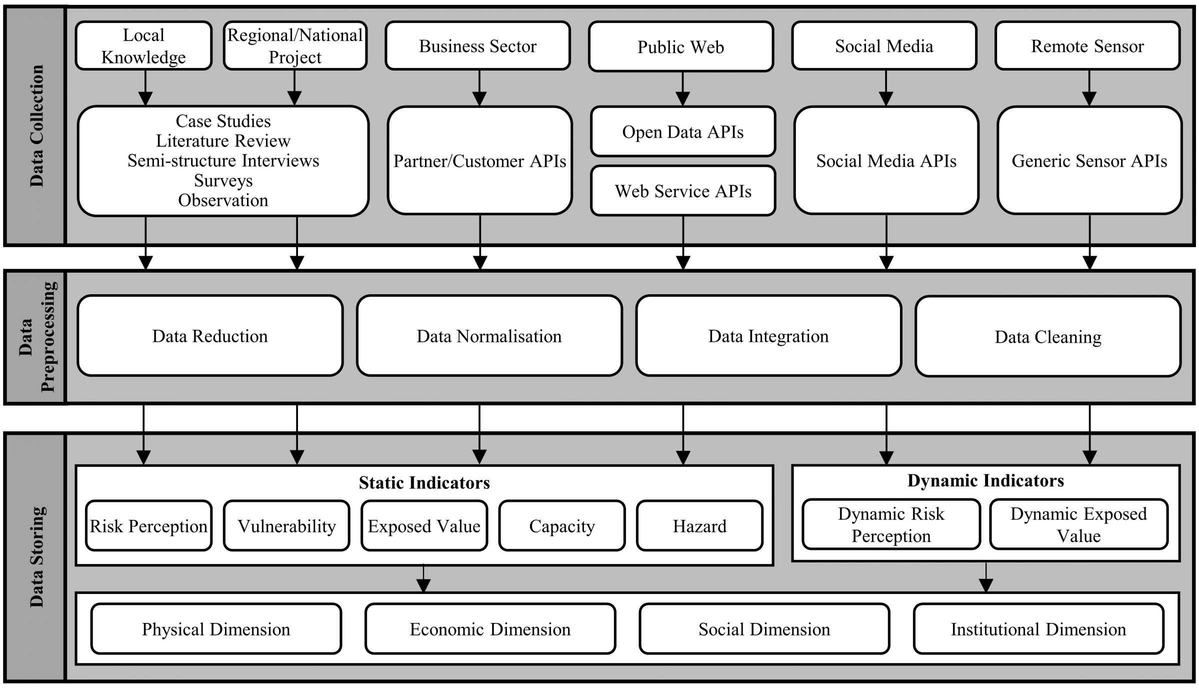

Figure 16. Overview of the community resilience repository.

in mind that the remote sensor data and business data may be less available than the others due to these data sources' privacy and policy.

- **Local knowledge:** it is crucial to derive valuable experience from local community managers, experts, and citizens at the community level. Our repository can be enriched with practical hazardous information from local knowledge through case studies, literature review, interviews, surveys, and observation.
- **Regional/National project:** the experience from previous regional/national projects can bring us various knowledge and insights. There are many open knowledge bases available from relevant projects.
- **Business sector:** business sectors can provide applications that are the set of tools, programs, and software developed to streamline business-related tasks. We can collect necessary information through applications for project management, content management, and human resource organisation.
- **Public web:** every day, we are generating an enormous amount of content and publishing them to websites. There is much useful information related to resilience indicators, such as government, weather, traffic, health care services, economics, and regulatory, available in this data source.
- **Social media:** this dynamic data source can help us in gaining a better understanding of our citizens' perceptions and needs. It is beneficial to collect all public information from popular social media (e.g., Facebook, Twitter, Instagram, and YouTube).
- **Remote sensor:** sensor data can provide reliable, detailed, accurate information with less human error. The present generation of fixed and mobile sensors can enable the ability to anticipate risks precisely and in real-time.

To fill up our repository, we can use either qualitative methodologies or application programming interfaces (APIs) for data collection. Each type of data collection is responsive to a specific data source; for example, we can use social media harvesting and social media interaction APIs to crawl data from social media. Due to the extensive data collection from multiple sources, our repository may contain a lot of noise and inconsistent. Therefore, we need to sequentially pre-process our data, including data cleansing, data integration, data normalisation, and data reduction, by applying data fusion and augmented intelligence techniques. This is a must-have step to reduce the heterogeneity, irrelevance, and inconsistent content in the repository. Many tensor factorisation-based, translation-based, blocking-based, and probabilistic-based methods are available and efficient in fusing data from multiple sources; however, we do not go into details about data pre-processing in this paper.

Data privacy and security are critical since we aim to gather resilience data from various sources; some of them can be personal and sensitive. This data can be the target of bad intentions or unlawful intents. To guarantee the integration of privacy and security by design in the earlier stage of the repository development, it is essential to define a standard security system development life cycle, which will help developers and researchers capture what should be contemplated or best practices in each phase of the repository elaboration. Besides, repository managers must seek appropriate methodologies to protect personal information while retaining its significant and potential benefits.

To develop the repository in the "Development" phase, we will use and derive benefit from open methodologies, models, and technologies. The Agile development methodology is suitable because it increases the collaboration between developers, end-users, and stakeholders through progressive interactions of comment, validation, and verification. Also, this method places end-users at the forefront by consecutively sending releases and receiving feedback.

Eventually, on top of the repository is a set of interactive user interfaces (UIs) to provide end-users with the possibility to populate and derive essential information from our resilience repository. To design the UIs, we should follow the road map given by (Mandel 1997), which are: (1) placing users in control, (2) reducing user's memory load, and (3) making interface consistency. These three golden rules can boost users' effectiveness and efficiency in using and interacting with our repository.

UTILISING THE COMMUNITY RESILIENCE DATA REPOSITORY

In this section, we present different scenario on how we utilise the resilience repository for practical applications. Local community managers, resilient experts, and citizens can refer to these use cases for designing, implementing, and supporting more robust and more resilient emergency plans and analytics. Besides, researchers and practitioners can also use this section, as open issues, for sharping and guiding their future research directions.

Search Engine

A search engine is one of the simplest forms of utilising the resilience repository. This interface's main goal is to provide a list of resources associated with a query provided by an individual. Thereafter, the individual can decide what to do with the resources provided by the system. Given a query as input to the system, the system will provide all knowledge resources associated with that query. The system can use a mapping function to generate a set of resources. Subsequently, query results should be sorted and presented to the user for easy access.

A query can be a simple text query like in queries generally used in web search engines. Additionally, it could contain metadata queries. Metadata query will look through the specific metadata associated with the resource and try to filter the data. For example, you might only require the resources that originated throughout a certain period of time. We can utilise the metadata fields associated with each resource for such queries. We can create the mapping function by indexing the resources in a search engine. Elasticsearch[3] and Solar[4] are some of the enterprise search platform options that are commonly used for these purposes. Sorting of the resources requires more sophisticated mechanisms as we have particular data. For example, the latest and validated information may be more important than old and invalid information.

Machine Learning-Based Simulation

Resilience experts can create simulations based on stored dimensions and indicators. Simulations with high-performance will be captured as snapshots to create actions and macro-actions at the community level. To conduct a simulation, a set of vulnerability, risk perception, and exposed value indicators, along with their values and weights, are necessary as inputs for defined functions and algorithms to a group and assess resilience dimensions. The selection of indicators and the precision of the weights and values is challenging; it may impact simulations' accuracy. Therefore, we can apply different machine learning models to help end-users improve and enhance the performance of simulations with minimum efforts and work input. Particularly, computational models can be constructed to learn and optimise variables based on previous simulations automatically instead of requiring users to check and manipulate these variables by themselves.

Besides, based on the set of indicators provided by users, we can apply feature selection methods to discover hidden relationships between dimensions and indicators from previous simulations, allowing us to predict a new simulation to validate whether it is good enough to recommend to users. A machine learning model will achieve better performance in case we derive an adequate number of previous simulations.

[3]https://www.elastic.co/elasticsearch
[4]https://lucene.apache.org/solr/

Recommendation System

The recommendation system is another use case, which leverages the repository as the input to offer emergency suggestions to end-users. One potential application is to organise communities and resilience indicators in a multi-dimensional matrix $A \in \mathbb{N}^{m \times n}$ where m is the number of communities, n is the number of resilience indicators, and each index a_{ij} of the matrix reflects the value of a resilience indicator j concerning community i. The methodology to assess the resilience indexes a_{ij} should consider both static and dynamic indicators from different disasters and past events. We can then apply collaborative filtering methods, which do not overspecialise in communities' s profiles, to suggest indicators that have never been considered essential to communities for driving better and more comprehensive decision-making.

CONCLUSION

This paper aims at designing a data repository to be generally used by communities and relevant stakeholders. The repository can support local community managers (e.g., public administrations and first responders), experts (e.g., city planners and advisors), researchers, and citizens in enhancing community resilience towards different types of risks and providing better decisions. Eventually, we demonstrate the utility of the repository through various scenarios. We believe that our work can increase the perception of resilience in communities and give our communities the capacity to develop in not only standard but also challenging conditions. Generally, this research paper is in the "Design" phase, and its results provide essential fundamentals for the "Development and Demonstration" phases.

There are several limitations in this paper. The first shortcoming is related to the diverse types of participants in the communities (e.g, a deficiency of multiple geographies) for the survey. Another limitation is that we did not provide specific solutions to overcome the resilience repository challenges (e.g., data privacy, data authenticity, and data security). These remaining matters will be considered and direct our future research. In addition to that, we planned to extend the types of resilience dimensions and indicators and potential data sources for well adapting with other communities and different stakeholders. After implementing the repository, we will propose an appropriate methodology to deploy it on a cloud-computing platform and infrastructure to guarantee high accessibility, excellent mobility, and better performance. Along with the repository, potential functions that support emergency management will also be implemented, including a semantic search engine, indicator recommendation, and resilience information visualisation.

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