

# Survey Study on Factors in Civil Defense Participation

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**Abstract:** Civil Defense activities are state lead campaigns aimed to improve preparedness against natural or man-made disasters within communities. Traditionally, written guidelines targeting the general public are created with easy to understand language and graphical instructions. Regardless, as noted by a survey made during this research, many people do not actually read and follow those instructions; or even know about their existence. In this survey study, we explore the factors that affect the effectiveness of Civil Defense preparedness guidelines. For this, we applied a questionnaire to the general public in two events related to disaster prevention activities in the city of Ikoma, Nara Prefecture of Japan; obtaining 95 data points from the local population and foreigners residing in the area. We have found that most of the population does not read or follow disaster preparedness guidelines. A statistical significant difference in the respondents over 50 years old, shows that they are perceiving such guidelines' advice more difficult to follow than respondents in their 30's. Derived from the results, we propose a new approach to improve guidelines' effectiveness and reach, leveraging commonplace smartphones.

## 1. Introduction

Civil Defense programs are government initiatives whose purpose is to increase the readiness of the citizens in a certain community against natural or man-made disasters. Around all of Japan, Civil Defense programs actively try to reach and inform the local and visiting population on preparedness for typhoons, fires or earthquakes [1], [2], [3], [4]. Traditionally, printed and mass media is used to communicate preparedness knowledge and enable people to divert from danger during these unavoidable events. These documents are then presented in a diverse collection of formats like pamphlets, books, or ads found in public spaces, television or the Internet. For earthquake preparedness, recommendations can be found compiled in preparedness guidelines. In which, with the intention to reduce injury and property damage, the population is informed regarding actions that can be taken before, during and after an earthquake has occurred.

In particular, preparedness guidelines focus on the actions the general public can take upon their environment. They are meant to reduce injuries and damage to their belongings or properties. A clear correlation has been proven before, between the media and activities produced on these programs and the increase on the levels of preparedness in the population [5], [6]. Regardless, it has been observed that even

if such knowledge can be substantially transmitted through such means, the effective level of preparedness in the citizen houses is not necessary substantially increased [7]. Xiao *et al.* revealed such levels of preparedness relevant [8]; observing that business engaging in preparedness activities against hurricanes, is able to substantially reduce damage on their properties and assets. Preparedness activities found in these documents can take diverse forms, such as: fixing furniture to a wall; preparation of emergency rations; moving valuables to a higher ground level; clearance of emergency exit ways or acquisition of useful knowledge for safety procedures during and after the disaster.

Knowledge refers to a piece of information or understanding about a certain topic that has been acquired by one of many means. Knowledge transfer in organizational theory refers to the practical discussion regarding the problems arising when knowledge is shared between different entities. In this context, von Hippel [9] introduces the term “sticky information,” to refer to technical knowledge that is hard to transfer to a different organizational unit.

These concepts are widely used to understand organizational problems in getting competitive or business advantage. Notwithstanding, we identify disaster preparedness communication as an analogue of these organizational processes. In this comparison, an organization (the government) requires a transfer of technical knowledge — procedures, techniques, reference information — to a different unit (citizens) who is expected to reproduce effectively the same attitudes and actions.

In this study, understanding that disaster preparedness

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guidelines are the carrier of a knowledge transfer process and that it will be affected by knowledge stickiness, we set ourselves to understand the impact of their shortcomings and their relevance when the public tries to implement their advice. Towards this goal, we have defined the following questions:

- Q1. Do people read disaster preparedness guidelines?
- Q2. How hard to follow do people find them?
- Q3. How open people are to alternative media for these guidelines?

In this survey study, we will first describe how the questionnaire was designed, the environment in which it was applied and the nature of the population that answered. Then we will discuss the results and our interpretations. Finally, we present a proposal of a new approach to assess the barriers disaster preparedness guidelines are facing using ubiquitous Information and Communication Technologies (ICT) available to the same population these government programs aim to reach.

## 2. Method

We prepared a short questionnaire of 8 questions, composed of 7 multiple answer questions and 1 open question.

We first present participants with the intention of the questionnaire: to learn about the weak and strong points of government disaster preparedness guidelines. Then three questions would follow probing participants' demographics. The second section would explain briefly what a disaster preparedness guideline is and introduce a couple of examples of recommendations that can be found written in them. In this section three yes/no questions would explore whether participants were aware of their existence, have read their contents or have followed their recommendations. A question inquiring the perceived difficulty of the instructions would follow after. In this question, participants were able to express their perceived difficulty in a 5 leveled Likert scale, from "Very Easy" to "Very Difficult." Finally, we presented an open question where participants could freely suggest alternative media to present disaster preparedness guidelines; and that in their opinion, could improve the reach of them.

We collected data from the public from two Disaster Prevention Events in Ikoma City, Nara Prefecture of Japan (Nov. 6th & 14th, 2021). In the first event, the public was taught practical skills for disaster scenarios. Every participant at the end of the event was given a questionnaire as part of the event materials. The public in this event was composed of adults from the general public and foreign graduate students from the University where the event was being held. The second event was an exposition of Disaster Prevention countermeasures, technology and goods. This event was held in an open plaza near the main station of a city, where common citizens were approached and asked for their participation in the survey as shown in Fig.1. University customized stationary was given to people after they



Fig. 1: Survey study at the event, Nov. 14th, 2021

Nara Institute of Science and Technology, Ubiquitous Computing Systems Laboratory

1

### Disaster Preparedness Guidelines Usage

We in Ubiquitous Computing Systems Laboratory want to know about how common is for people to make use of the Disaster Preparedness Guidelines that Governments usually distribute to their citizens. Please help us to form a clear perspective of the advantages and disadvantages of current Preparedness campaigns distributed to the citizens.

1. Age range:  
☐ 10-15   ☐ 15-20   ☐ 20-30   ☐ 30-40   ☐ 50-60   ☐ Over 60
2. Gender:  
☐ Female   ☐ Male   ☐ Other   ☐ Do not want to disclose
3. In your house, you live:  
☐ Alone   ☐ With Family   ☐ Room mates

**Disaster Preparedness Guidelines**

Disaster Preparedness Guidelines are easy-to-read documents that collect general advice about how to prepare for a Natural or man-made Disasters. These documents explain for example: how to check for gas leaks after the Earthquake or where to seek refuge during a Typhoon.

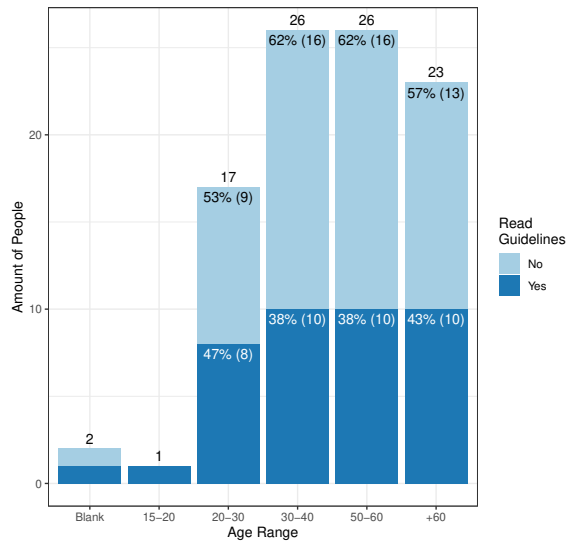
4. Have you seen a Disaster Preparedness Guideline before?  
☐ Yes   ☐ No
5. Have you read before a Disaster Preparedness Guideline?  
☐ Yes   ☐ No
6. Have you tried to follow their advice?  
☐ Yes   ☐ No
7. How hard it was to follow their recommendations?  
(mark one of the 5 boxes)  
 Very Easy   ☐ — ☐ — ☐ — ☐ — ☐   Very hard
8. Mention different media that do you think would invite more people to follow these kind of Guidelines   (e.g. videos, video games, apps)

Fig. 2: Questionnaire (English)

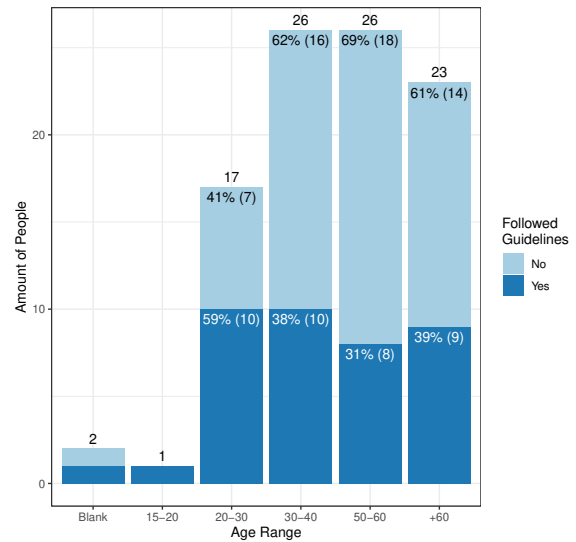
participated in the University's booth activities. In both events the questionnaire was available in both Japanese and English as shown in Fig.2 and there was no monetary compensation for the participants.

The open question inquiring about suggestions for alternative media for disaster preparedness guidelines frequently required a brief explanation from the questioner. After the brief explanation and a couple of examples, people usually would gladly describe their ideas to the questioner and write them down.

We acknowledge a mistake in the age range definition not making the ranges exclusive, producing an overlap in the age ranges (e.g., 10-15, 15-20, 20-30). We consider it negligible since the impact of the overlap on the conclusions derived from the data was small. No participant commented on this overlap either. Thus, we infer that overlapping age data points were zero or minimal.

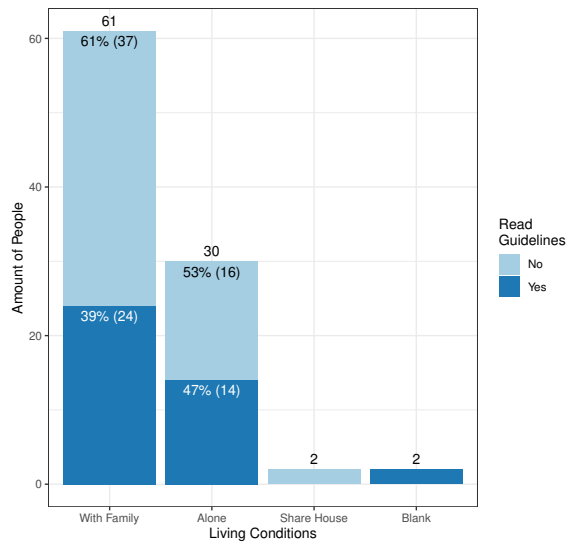


(a) People that have read guidelines

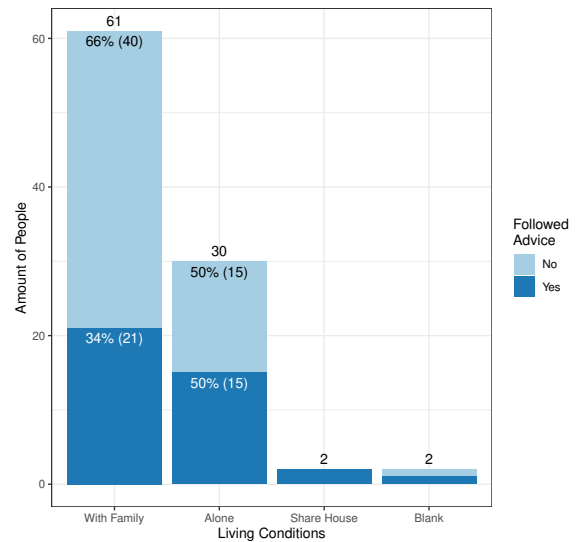


(b) People that have followed guidelines

Fig. 3: People that have Read and Followed Guidelines discriminated by Age Ranges



(a) People that have read guidelines



(b) People that have followed guidelines

Fig. 4: People that have Read and Followed Guidelines discriminated by Living Conditions

### 3. Analysis & Results

The collected data points consist of 95 answered questionnaires. Nationality was not inquired in the survey, nonetheless 23 questionnaires in English were answered. It is important to mention that foreign students proficient in Japanese might have answered the questionnaire in Japanese. Also, it is relevant to mention that there was no participation from people in the range of 10 to 15 years old; and there was only one data point from a person in the range of 15 to 20 years old. No people in the range from 40 to 50 years old gave suggestions for alternative media in the open question. One person who knew and has read disaster prevention guidelines did not answer whether he had followed their advice, thus this case was considered as a “No.”

#### 3.1 Q1. Effectiveness of Civil Defense Activities

For Q1, “Do people read disaster prevention guidelines?” more than half of the participants (58%) have never read these kinds of guidelines. This trend seems consistent across the age range of the collected data as seen from Fig.3(a). In general, people usually do not read preparedness guidelines. From the perspective of whether people follow them or not, a similar trend is seen in Fig.3(b).

When we divide by the living conditions of the participants, we can observe in Fig.4 that people living with other family members are similarly prone not to read them nor follow them. Nevertheless, those living alone do not usually read or follow them either.

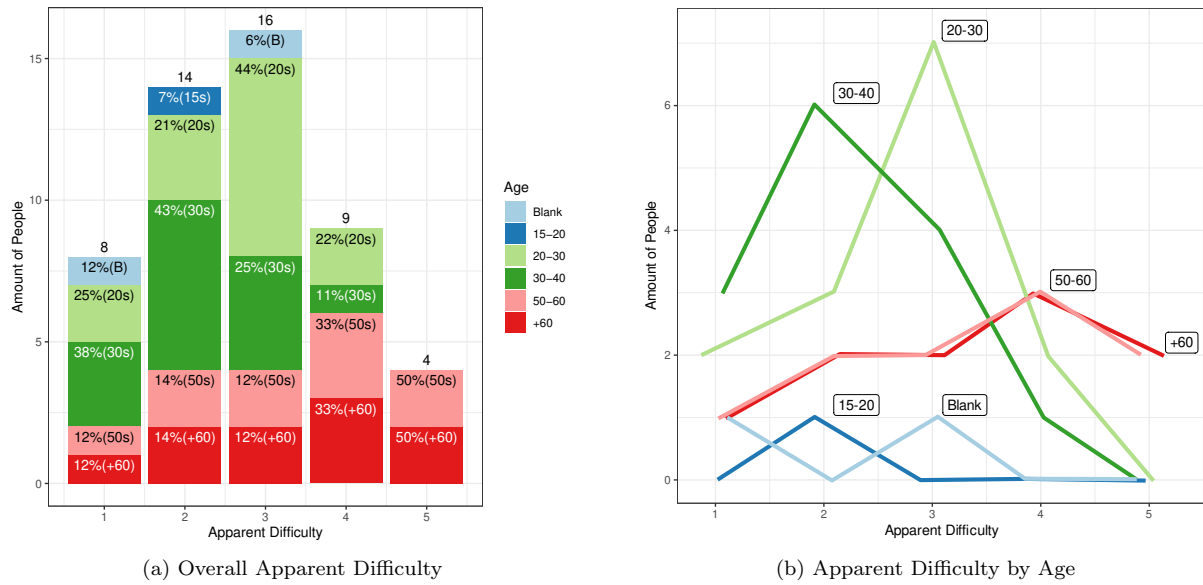


Fig. 5: Difficulty perceived by Common Citizenry

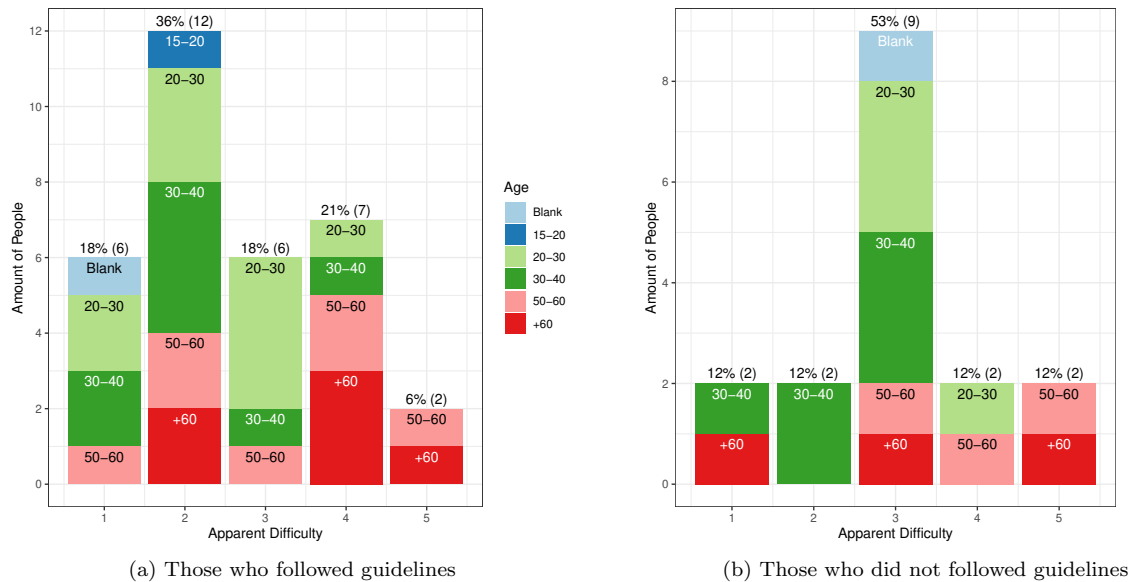


Fig. 6: Difficulty perceived, partitioned between those who did or did not follow guidelines

### 3.2 Q2. Perceived Difficulty of Disaster Prevention Guidelines

For Q2, “How hard to follow do people find them?” from Fig.5(a) we can conclude that in general, disaster preparedness guidelines are perceived having a medium to medium low difficulty.

In Fig.5(b), a difference in difficulty perceived can be appreciated from the groups of 20 to 30, 30 to 40 and those respondents over 50 years old. Considering the low number of samples of 40 to 50 and over 60 years old (N: 10 each), and their overlapping responses, to execute a statistical analysis, we combined their data points into one group: “over 50 years old”. The single data point of the range 15 to 20, was not included in the analysis.

Due to the nature of the collected data and its low number of samples, we used a non-parametric Kruskal-Wallis rank-

Table 1: P-values of Mann-Whitney U test between each age range perceived difficulty distribution

	p-value
20's & 30's	0.199
20's & +50's	0.175
30's & +50's	<b>0.046*</b>

sum test and observed a significant difference between the means of the aforementioned age ranges (H: 7.02, DF: 2,  $\chi^2_{0.05}$ : 5.991, p: 0.03).

As a result, a pairwise Mann-Whitney U test with a Benjamini & Hochberg p-value adjustment, reveals a significant difference between the samples of people in their 30's and those above 50 years old as seen in Table 1. Concluding that seniors seem to have more trouble following them than the younger population.

When we divide this data between the people that did or

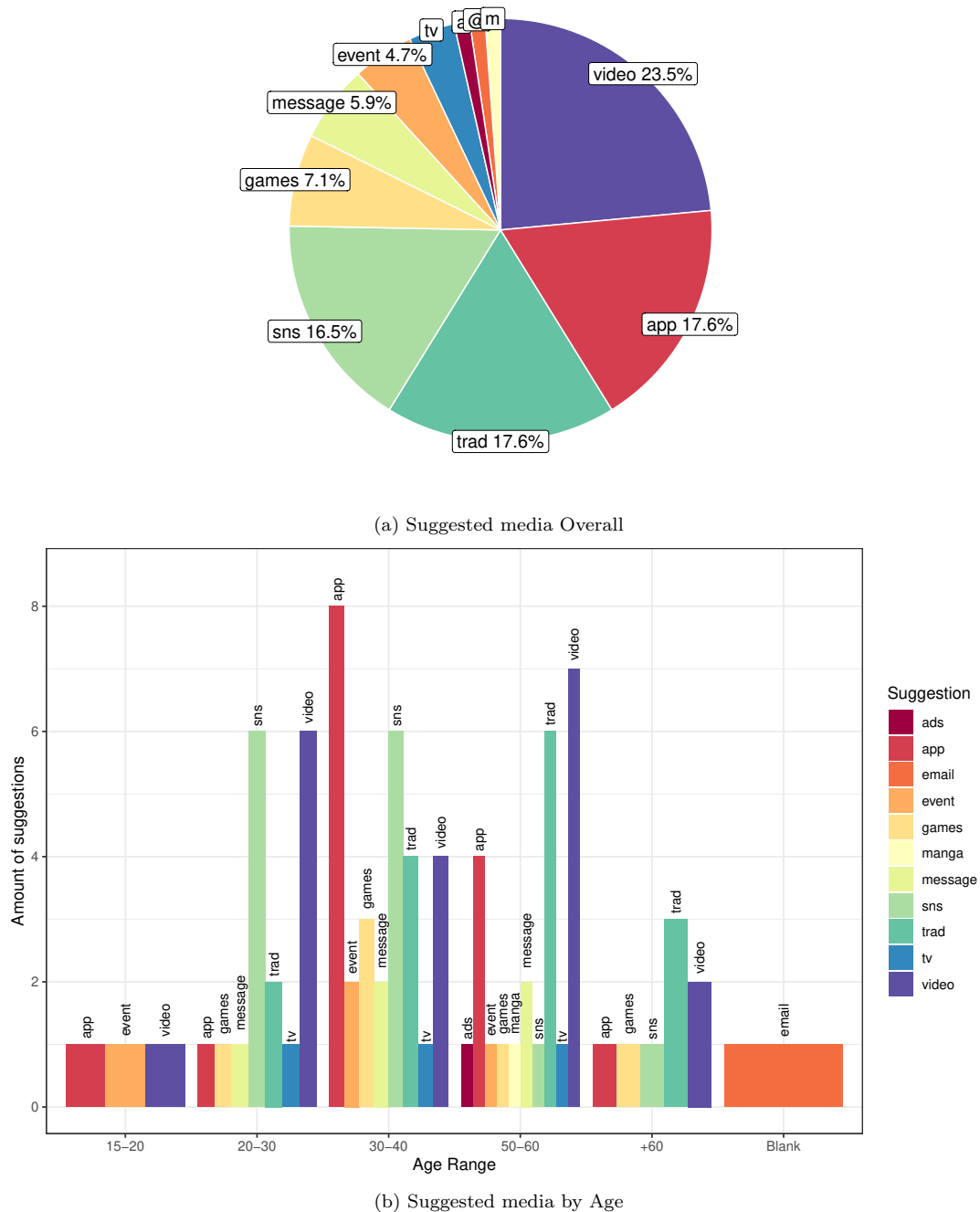


Fig. 7: Media suggested by the public, with potential to involve more people in disaster preparedness activities

did not follow disaster prevention guidelines, we can see a clear distinction. Even having data points becoming more sparse, we can observe in Fig.6(a) that people following the guidelines tend to perceive such guidelines as medium to low difficult. From Fig.6(b), where people not following guidelines are represented, we can observe a clear predisposition to classify them as having a medium difficulty. From the reduced variance on this group we may infer a certain unwillingness to offer a nuanced critique over disaster prevention guidelines difficulty.

### 3.3 Q3. Openness to Alternative Media

We regarded Q3, “How open people are to alternative media for these guidelines?” as a question to be answered in a more indirect manner. To probe the openness of the participants to alternative media, we asked them for suggestions. Through the final open question we explored the opinion of people and their willingness to talk about alternative media. If requested, it was clarified to them, to write down examples of media that could be more effective in reaching people and make them participate in preparedness activities.

The suggestions from the aforementioned open question were normalized. We created a category for each distinct

suggestion: ads, application, email, events, games, comics, messages, social media, traditional media (school education, written pamphlets), television and videos. Then we tagged every answer with as many categorization tags that can describe the essence of the suggestion. Every instance of each tag was considered a data point.

Popular suggestions as seen in Fig.7(a) were videos, applications, social networks and traditional media. When divided by age as seen in Fig.7(b), seniors seem more comfortable with informative videos and traditional media, but modern ICT's were also suggested by people in the 50's range and above 60. On the other hand, the proportion of ICT's against more traditional media was greater in people below 50, with a clear preference for media present in smartphones. Informative videos were uniformly suggested in all age ranges.

## 4. Discussion and Future Work

### 4.1 Discussion

Through the information produced by this study, we have found the general population does not seem very aware of disaster preparedness guidelines, or have actually read them. This trend is observed through all surveyed ages and all living conditions, whether they cohabit with other people or live alone. It can be assumed that a considerable amount of the population have not applied disaster preparedness recommendations on their houses, and there is a room of improvement in these civil defense programs.

We have found that regardless of the effort into disaster preparedness guidelines to make them accessible to the general public, they are afflicted with a rather low penetration in the population. The public regards them as being medium low difficult, with seniors finding them harder to follow than younger people. Particularly, people that do not have followed them in the past, perceive them as being more difficult than those who have followed them. We can assume that regardless of not perceiving them with high difficulty, the experienced difficulty is not negligible.

It is worth to mention, as M.L. Edward explored [10], that there are many factors (e.g., family income, children present in the family core) that affect the rate of people participating in preparedness activities. M.L. Edward further observes that people with family might participate more in preparedness activities. This might contrast with our findings; however, he mentions this gradient is observed when small children are found in the family core. Our findings showing no significant difference in preparedness activities participation between people living alone or with family might be related to the absence of small children in such co-living families. Nevertheless, we consider of importance to assess the effectiveness of one of the most common and easiest to distribute media: written guidelines.

Some limitations of this study is the small sample size that do not allow us to generalize the significant difference in the perceived difficulty of disaster preparedness guidelines when comparing population of different generations. Also,

this study only sampled the population of one city of Japan that might reflect only the effectiveness of local Civic Defense activities.

### 4.2 Future Work and Proposal

In light of this information, we conclude that addressing knowledge transfer roadblocks described in organizational theory could improve the effectiveness of disaster preparedness civil activities. Extensive studies have been done about the barriers that hinder knowledge transfer; and how modern media or Information and Communication Technologies (ICT) improve the effectiveness of such transfer of knowledge in organizations [11], [12], [13].

ICT is being used in the classroom to improve learning; even in sometimes considered low engaging subjects such as History [14], [15]. Augmented Reality and Virtual Reality (VR) have actually begun to find their application in factories in the manufacturing and maintenance sector. Obermair *et al.* have found that AR applications guiding users in procedures can achieve lower occurrence of procedure mistakes and target misidentifications [13].

Understanding the latter and having each year smartphones more capable of performing advanced data processing such as AR and running Machine Learning models, we will propose a computational system that will follow this survey study work.

We will build an AR based Guideline application leveraging smartphones as a distribution medium, since they are widely available and their operation is familiar to the general public. On this system, responsible entities will upload units of recommendations for certain Targets of Interest (ToI). Such units will represent a task to be performed on an entity by the user. The aforementioned entity is designated as Target of Interest, since its nature can range from a physical object (a refrigerator to be secured with breaks) to a piece of information to be procured (identify gas valves). Then machine learning object recognition technology will be leveraged for identifying each ToI. AR commercial frameworks will be used to map them in the real environment and a user interface with gamification elements will be built to effortlessly guide the user to the desired action.

## 5. Conclusion

In order to shed light on the effectiveness of disaster preparedness guidelines used in Civic Defense activities, and the public perceived factors that influence their advice adoption; we conducted a survey of the general public of the city of Ikoma in Nara Prefecture, Japan. From the data collected we can conclude that the majority of the public does not seem to read or follow the advice found in disaster preparedness guidelines. This trend is revealed on all surveyed age ranges independent of their living conditions. We apply a further analysis of the difficulty perceived by different age groups, in following the recommendation of said guidelines. We have observed a statistical significant difference between the difficult perceived by respondents over 50 years old and

those in their 30's. Respondents regard video, application, social media and traditional mediums as effective platforms that could increase the public participation in preparedness activities. Considering these observations, we propose an AR based guideline application that could leverage the public familiarity with smartphones and their image processing power to provide easier to follow disaster preparedness advice.

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