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## Transcreation for Disaster Information: Simulation of Multicultural Support Using AI-Generated Personas

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# Transcreation for Disaster Information: Simulation of Multicultural Support Using AI-Generated Personas

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## Abstract

Today, the rapid and accurate dissemination of information is necessary. However, conventional disaster alerts often fail to effectively communicate with populations of various background. Simple translation is often insufficient, and universal design approaches cannot cater to fit diverse individual needs. Therefore, this research hypothesizes that “transcreated” messages reflecting the recipient’s cultural and personal background should be used. However, transcreation methods need to take into account various factors for the varieties of the recipients are numerous. We explore the solutions through a two-stage methodology. First, a foundational study was conducted using AI-generated personas to simulate the efficiencies of varieties of personalized transcreation of disaster alerts. Second, a real-time generative AI based system is developed to be tested by human subjects. The results from simulated persona suggest that AI-generated personas can be useful for simulating real human reactions. The human-subject surveys indicate that AI-generated transcreated disaster alert is more comprehensible and effective than conventional alerts. The comparison between AI-generated persona and human survey provide us of some insights about the simulation is robust to predict the real-world behaviour of human beings. This study demonstrates the effective use of generative AI to improve disaster communication. It also provides insights for developing next-generation disaster communication systems.

## 1 Introduction

### 1.1 Background

The increasing frequency of large-scale natural disasters globally presents a continuous and severe threat to society. In such crises, the swift and accurate transmission of information is critical. However, traditional methods of disaster information dissemination face significant hurdles in today’s globalized societies. For foreign residents and tourists, understanding warnings and taking appropriate evacuation actions is hindered not only

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by language barriers but also by a lack of “stock information”—the foundational knowledge specific to disasters and/or regions.

Current design of disaster communication support often consists of simple, direct translations, which fail to account for the recipient’s cultural context or knowledge level. This approach often follows the universal design (UD) philosophy. While UD principles aim for universally understandable information, their “one-size-fits-all” approach has inherent limitations in addressing the diverse needs of every individual during the extreme stress of a disaster. In addition, the recipients of the message have such wide varieties in their experiences, namely, “stock information,” which as a result, hinders their ability to understand the urgency of the message, potentially resulting in failure to evacuate.

## 1.2 The Potential of Transcreation and DX

“Transcreation” emerges as a promising approach to overcome these limitations. Unlike mere translation, transcreation is the process of deeply understanding the intent and cultural context of the original message and then recreating it to resonate most effectively with the target audience. This method can convey the true urgency of a disaster and the necessary actions to those lacking local stock information.

However, manually performing real-time transcreation for countless individuals with diverse backgrounds during a disaster is logistically impossible. To present a solution, this study proposes personalized transcreation enabled by Digital Transformation (DX) using Generative AI. By utilizing generative AI, it becomes possible to dynamically optimize disaster information based on individual user profiles, i.e., “stock information”—including language, culture, disaster experience, and personality—and deliver it instantaneously in the most impactful format.

## 1.3 Research Objectives and Approach

The primary objective of this research is to empirically validate the effectiveness of the transcreation methodology. To achieve this, a two-stage approach was employed:

- **Stage 1: Foundational Study via AI Persona Simulation**  
We generated diverse virtual AI personas and simulated the transcreation of disaster information for each. This stage aimed to gather foundational insights into the importance of stock information and identify key directions for personalization.
- **Stage 2: Real-time AI Transcreation Evaluation with Human Subjects**  
We developed a system to perform real-time transcreation based on an individual’s actual stock information, then conducted a survey to evaluate its effectiveness with human participants.

This paper consists of the following sections. Section 2 reviews prior research. Section 3 details the methodology in two stages. Section 4 provides an integrated analysis of the results. Section 5 offers deeper discussions. Finally, this article presents the conclusions, recommendations, and future challenges of the study.

## 2 Previous research and research questions

### 2.1 Existing Challenges in Disaster Information Dissemination and AI use

Recent research highlights the critical need for effective disaster communication, especially for diverse populations. Studies emphasize the importance of personalized, culturally tailored information dissemination (Zhao et al. 2024; Suzuki 2020). AI-powered solutions are increasingly explored for disaster management, offering rapid data analysis and decision-making support (Harika et al. 2024; Ogie, Rho, and Clarke 2018). Social media and mobile applications play a crucial role in providing real-time updates and multilingual support (Sakurai and Adu-Gyamfi 2020, Suzuki 2020). Personalized evacuation alerts using location and behavioural data have shown promise in increasing urgency perception (Yano, Otsu, and Izumi 2022). Integration of multi-channel alert systems and cloud-based tools can enhance coordination and improve individual preparedness (Klaft and Ziegler 2014; Inoguchi 2024). These advancements in disaster communication strategies, leveraging AI and digital technologies, aim to overcome language barriers, cultural differences, and information accessibility challenges, ultimately improving disaster resilience across diverse communities.

#### 2.1.1 The State of Multilingual Support: The Case of Tokyo

As a global metropolis, Tokyo has actively implemented multilingual disaster information services. These include a multilingual disaster preparedness app (TMG 2021) and the distribution of multilingual disaster preparedness handbooks (TMG 2024). These extensive efforts were prepared by learning from the Great East Japan Earthquake in 2011, when information provision to foreigners was insufficient, and emergency earthquake warnings were issued only in Japanese, using geographical names unfamiliar to non-locals (YOKE 2025). Examples such as this highlight that simply translating information is not enough; the “quality” of communication—how well the message is truly understood—is critical.

#### 2.1.2 Recipient Confusion due to Information Overload

Furthermore, during a disaster, a massive volume of information is released from government agencies, the media, and social media. This phenomenon results in “information overload.” This can impair cognitive function, hinder rational decision-making, and heighten anxiety. Social media, in particular, can accelerate the spread of misinformation and rumours, adding to the confusion. For foreigners with limited stock information relating Japanese disaster context, discerning credible and relevant information is even more difficult, exacerbating the problem.

#### 2.1.3 The Limitations of Universal Design

Universal Design (UD) aims to make products and information accessible to as many people as possible, utilizing tools like standardized pictograms and multilingual signage. However, UD strives for a “greatest common denominator” solution and struggles to address the complex needs of all individuals. Specific, nuanced support for diverse vulnerable groups—such as persons with disabilities, the elderly, children, or even those

temporarily facing access difficulties—is often insufficient with UD alone. A personalized approach is needed to complement the foundation laid by UD.

## 2.2 Research Leveraging Transcreation, AI, and DX

Recent studies have begun to apply the concept of transcreation to disaster communication and utilize advanced technologies like AI and DX to optimize information delivery.

- **Transcreation and AI Personas:** Research has highlighted the importance of information reconstruction through transcreation to effectively convey real-time “flow information” to those lacking “stock information.” One study demonstrated the potential of using Generative AI (in this case, ChatGPT) to create diverse AI personas and simulate the transcreation of disaster alerts tailored to each persona’s traits (language ability, length of stay in Japan, disaster experience, personality) (Katan 2016, Gaballo 2012). This pointed toward the possibility of a highly personalized approach that transcends the limits of uniform multilingual support.
- **AI for Information Analysis:** AI is also used to filter and deliver reliable information. Systems like “Spectee Pro” analyse social media in real-time to identify and verify disaster-related information, while other systems deliver personalized disaster notifications based on a user’s location (Spectee 2021).
- **DX in Disaster Response:** DX offers the opportunity to transform the entire disaster information pipeline—from collection and analysis to dissemination and feedback—making it faster and more effective. However, as noted in reviews of prior work, there is a need to establish clear metrics for evaluating the effectiveness of AI persona simulations and to address AI ethics, including privacy, bias, and transparency (Floridi et al. 2018). Otherwise, there would be accelerated risks of disseminations of FAKE posting after the disasters (Uesugi 2024).

## 2.3 Research Questions

This study builds upon previous work by combining “transcreation” with “generative AI” to empirically test the effectiveness of personalization. Its novelty lies in moving beyond simulation to real-time evaluation with human subjects. Our research questions are:

- **Research Question 1:** Compared to conventional, uniform alerts (original Japanese, Easy Japanese, direct translation), is personalized disaster information generated in real-time by AI perceived as more understandable and effective by individuals from diverse backgrounds?
- **Research Question 2:** Which specific aspects of an individual’s stock information (e.g., native language, Japanese proficiency, disaster experience, personality) influence their evaluation of transcreated disaster information?
- **Research Question 3:** How consistent are the insights from AI persona simulations with actual human evaluations, and what are the limitations of the simulation approach?

## 3 Illustrations of Survey Methodology

Our goal is to test the effectiveness of applying generative AI to enable transcreation at a scale of information processing that is impossible for humans to handle in real-time. The methodology was executed in two main stages: a large-scale AI persona simulation, followed by a real-time evaluation with human subjects.

### 3.1 Design

#### 3.1.1 Stock Information

A questionnaire was designed to capture the “stock information” of each participant. Questions were presented in both Japanese and English. The collected variables included:

- **Demographics:** Age and Gender.
- **Language & Visit Context:** Native Language, Japanese Language Proficiency (Fluent, Intermediate, Basic, None), Purpose of Visit (e.g., Tourism, Business, Study), and Period of Stay in Japan.
- **Situational & Personal Factors:** Knowledge of Current Location (Very Familiar to Not Familiar) and Personality (Bold, Timid, or Careful).
- **Disaster Experience & Knowledge:** Separate questions assessed the participant’s experience with and knowledge of fatal earthquakes and fatal tsunamis.

#### 3.1.2 Flow Information (Alert Messages)

Participants in both the simulation and the human survey were presented with four types of alert messages (“flow information”) regarding a tsunami warning:

- **Original Japanese Alert:** A fixed text based on the format recommended by Japanese government agencies.

“XXX City. Tsunami Warning (XXX City Coast). Issued from XXX City. Content of alert: Tsunami Warning issued for the coast of XXX City. Required action: Evacuate immediately to high ground and ensure your safety. Additional information: Estimated tsunami arrival time for the XXX City coast is X:XX PM. The expected tsunami height is X meters. The arrival time is an estimate, so evacuate promptly.” (original in Japanese)

- **Easy Japanese Alert:** A fixed text generated by providing the original alert to Gemini 2.5 with the prompt, “Please make this into an Easy Japanese message.”

“Run away from the tsunami! A tsunami is coming to the sea of XXX City. XXX City is saying this. A tsunami is coming to the sea of XXX City. Run away to a high place immediately! Please take action to protect your life. The time the tsunami is likely to arrive at the sea of XXX City is X:XX at night. The height of the tsunami is about X meters. The time the tsunami arrives might change. Please run away quickly.” (original in Japanese)

- **Translated Alert:** This message was dynamically generated by translating the Original Japanese Alert into the user’s specified native language using the Gemini 2.0-Flash API.
- **Improved (Transcreated) Alert:** This message was dynamically generated using the Gemini 2.0-Flash API and a specialized prompt designed to perform transcreation. The prompt instructs the AI to act as a transcreation expert, analyse the user’s specific stock information (including personality, age, location knowledge, disaster experience, and so on), and reconstruct the warning in their native language

(in JavaScript, e.g.,  ***$\$langForPrompt$*** ) to be as comprehensible and actionable as possible. The prompt explicitly instructs the AI to give special consideration to users with no prior experience of major earthquakes or tsunamis and to return only the improved alert text without any additional explanation.

### 3.1.3 Evaluation Metrics

For each of the four alert messages, participants provided ratings on a 5-point Likert scale for two key metrics:

- **Understanding:** “How well did you understand this message?” (from “Very well” to “Not at all”).
- **Effectiveness:** “Does this message make you want to evacuate?” (from “Very effective” to “Very ineffective”).

Finally, participants were asked to select which of the four messages they found to be the Most Effective Alert.

## 3.2 Stage 1: AI Persona Simulation Experiment

The simulation experiment — from persona generation to evaluation — was conducted entirely within an AI environment. The process is outlined below. Please note that both the translated and transcreated texts are presented in their original form to illustrate the simulation outputs.

### 3.2.1 Persona Generation

Gemini 1.5-Flash, operating in chat mode, was fed a prior research paper on the topic to learn the methodology of transcreation of persona (Morita, Uesugi, and Naruse 2025). Between May 5 and May 7, it generated a total of 105 distinct foreign national personas, with 35 each for the personality types “Bold,” “Timid,” and “Careful.”

### 3.2.2 Message Generation

For each of the 105 personas, the “Translated” and “Improved (Transcreated)” alerts were dynamically generated based on their unique stock information. This was executed using the Gemini 2.0-Flash API called via a Python script in a Colab environment.

### 3.2.3 Alert Evaluation

On May 29, each persona evaluated the four alert messages on the metrics of Understanding and Effectiveness. This step was also performed programmatically using the Gemini 2.0-Flash API in Colab.

### 3.2.4 Selection of Most Effective Alert

Also, each persona chose the single most effective alert from the four options based on its prior evaluations. This selection process utilized the Gemini 2.5-Pro-Preview model.

### 3.3 Examples of Persona and Transcreation Messages

As a result of the first step, we created 105 personas, i.e., 35 personas for each personality type (Bold, Timid, or Careful). The following represent some combinations of simulated persona and transcreated messages:

#### 3.3.1 Sample A: Cautious Persona (e.g., a German Professor):

- **Profile:** A university professor from Germany on his first, long-term visit to Japan (6 months). His personality is cautious. He knows basic Japanese greetings and attempted to gather information before his trip but became confused. His native language is German. **Simulated Reaction:** He cannot understand the Japanese alert and grows confused when his translation app fails to work properly. He frantically tries to find the information sources he researched beforehand, but it takes too much time. He tries to follow the actions of Japanese people around him but is hesitant, leading to a delay in his initial response due to a lack of information.
- **Transcreated Message:**

WICHTIG! TSUNAMI-WARNUNG für die Küste von XXX CITY!  
Von der Stadt XXX CITY ausgegeben.  
Was bedeutet das? Eine Tsunami-Warnung wurde für die Küste von XXX CITY herausgegeben.  
Was Sie tun müssen: SOFORT in höher gelegenes Gebiet flüchten! Bringen Sie sich in Sicherheit!  
Weitere Informationen:  
- Geschätzte Ankunftszeit der Tsunami-Welle: X:XX Uhr (Achtung: Dies ist nur eine Schätzung. Handeln Sie SOFORT!)- Geschätzte Höhe der Welle: X Meter (EXTREM GEFÄHRLICH!)
- Verlieren Sie keine Zeit!  
Bringen Sie sich SOFORT in Sicherheit!  
Das Leben ist kostbar!

#### 3.3.2 Sample B: Bold Persona (e.g., an American Backpacker):

- **Profile:** A backpacker from the United States travelling around Japan for several weeks. His personality is bold. He speaks no Japanese, prefers improvisation and chance encounters, does little advance preparation, and is willing to accept some risks. His native language is American English. **Simulated Reaction:** Although he cannot understand the Japanese text of the alert, he intuitively senses danger from the warning sounds and visuals. He decides he must “just move” and follows the crowd if they seem to be in a hurry. He will head for higher ground or inland, even without a clear destination. His bold, independent actions carry the risk of heading in the wrong direction.
- **Transcreated Message:**

TSUNAMI WARNING for XXX CITY Coast!  
GET TO HIGH GROUND IMMEDIATELY!  
- BIG WAVE COMING: Estimated to hit around X:XX PM.  
- WAVE HEIGHT: Could be as high as X METERS (that's HUGE!).  
- DON'T WAIT: This is just an estimate. EVACUATE NOW!  
- FIND HIGHER GROUND ASAP! Head inland, away from the coast. Follow the crowd if they are moving with urgency!  
YOUR LIFE IS IN DANGER. ACT NOW!

#### 3.3.3 Sample C: Timid Persona (e.g., a Spanish Web Designer):

- **Profile:** A web designer from Spain travelling alone for 10 days to visit Japan's hot springs. Her personality is timid. She speaks no Japanese, is shy, and finds it



difficult to ask for help even when in trouble, making it likely she will freeze in an emergency. Her native language is Spanish.

- **Simulated Reaction:** She is completely unable to understand the Japanese alert, which causes her severe anxiety and fear. She freezes up, startled by the warning sounds and vibrations. She panics even as others rush around her. Her shyness prevents her from seeking help, leaving her standing still, unsure of what to do and waiting for instructions.
- **Transcreated Message:**

¡ALERTA DE TSUNAMI EN LA COSTA DE XXX CITY! ¡PELIGRO INMINENTE!  
 ¡DEBES ACTUAR AHORA MISMO!  
 El Ayuntamiento de XXX CITY ha emitido una ALERTA DE TSUNAMI para toda la costa. ¡Esto significa que una ola gigante, un TSUNAMI, podría golpear la costa en cualquier momento!  
 ¿QUÉ DEBES HACER INMEDIATAMENTE?  
 1. ¡CORRE A UN LUGAR ALTO! Busca la colina o edificio más alto que puedas encontrar y ve allí lo más rápido posible. ¡NO ESPERES!  
 2. ¡NO VUELVAS ATRÁS! Una vez que estés en un lugar seguro, quédate allí hasta que las autoridades digan que es seguro regresar.  
 3. ¡AVISA A OTROS! Si ves a alguien que no se da cuenta del peligro, ¡intenta advertirle! Pero no te arriesgues, ¡tu seguridad es lo primero!  
 ¿POR QUÉ ES TAN IMPORTANTE ACTUAR RÁPIDO?  
 Se espera que el tsunami llegue a la costa de XXX CITY alrededor de las X:XX PM. ¡La ola podría alcanzar una altura de X METROS! ¡Eso es como un edificio de varios pisos!  
 ¡RECUERDA! La hora de llegada es solo una estimación. ¡El tsunami podría llegar antes! ¡No te arriesgues!  
 ¡NO TENGAS MIEDO, ACTÚA! Entendemos que esto puede ser aterrador, pero la mejor manera de protegerte es actuar rápido y seguir estas instrucciones. ¡Ve a un lugar alto AHORA MISMO!  
 ¡TU VIDA DEPENDE DE ELLO!

### 3.4 Stage 2: Real-time Evaluation with Human Subjects

An interactive system for human evaluation was built using Google Apps Script (GAS) and went live on May 2. It allowed human participants to input their own stock information (personality, language, disaster experience, and so on) and receive and/or evaluate the four alert types in real-time.

Data was collected over a 9-day period from May 23 to May 31 through a multi-channel approach:

- **Email Distribution:** An online survey link was sent via the Matsuyama International Center (MIC) mailing list, which has approximately 1,000 subscribers, yielding 6 responses.
- **In-person Intercepts:** On May 23, researchers approached inbound tourists near *Dogo Onsen* hot-spring Station, collecting 5 responses using a tablet.
- **Targeted Interviews:** On May 26, appointments were made with 3 workers from the Philippines, who completed the survey on a tablet and provided feedback on their user experience.

In addition, a German professor at Matsuyama University completed the survey on a laptop and was interviewed about the experience. His response is incorporated into the above-mentioned data collections. Furthermore, an additional 28 responses were collected from students at Matsuyama University via online distribution and QR codes.

## 4 Results and Discussions

### 4.1 Results of AI Persona Simulation

IBM SPSS Statistics Version 29.0.0.0(241) was used for the analysis. The complete statistics can be retrieved from Appendix A. For labelling purposes, the term “Improved” and “Transcreated” are used interchangeably. Also, variable names are shortened and abbreviated. For example, “Translated\_Understanding” means “Translated\_Alert\_Understanding.”

The analysis confirms there are statistically significant differences in the perceived effectiveness and understandability of the three primary alert types: Original, Translated, and Transcreated. The alert type of Easy Japanese contains only 2 responses and was ignored. The Translated and Transcreated alerts consistently outperform the original alert, particularly on measures of simulated personas’ understanding.

#### 4.1.1 Translated and Transcreated Alerts Are Superior for Persona Understanding

Modifying the original alert through translation or transcreation leads to a significant improvement in how well personas believe they understand it.

- **Translated Alert Understanding:** The most dramatic result is seen in the “Translated\_Understanding” measure. The ANOVA test shows a massive and highly significant difference between the groups ( $F(3, 101) = 20.127, p < .001$ ; see Appendix A). The post-hoc analysis reveals the source of this difference:
  - **Translated alert:** Simulated personas who were shown the Translated alert rated their understanding of it significantly higher than personas who were shown the original alert (Mean Difference = 1.492,  $p < .001$ ). They also rated their understanding significantly higher than those shown the Transcreated alert (Mean Difference = 1.715,  $p < .001$ ).
- **Improved (Transcreated) Alert Understanding:** This pattern holds across multiple metrics. For “Improved\_Understanding,” both the Translated and Transcreated groups rated their comprehension significantly higher than the original group, Appendix A;  $p < .001$  and  $p = .011$ , respectively.

To conclude, modifying the alert, especially through direct translation in this context, makes it significantly easier for personas to understand.

#### 4.1.2 The Reason for Alert Preference: Persona Knowledge is Key

The cross-tabulation analysis successfully identifies why personas prefer one alert type over another. The choice is not arbitrary but is significantly influenced by how much the persona already knows about the situation.

- **Location Knowledge:** There is a statistically significant relationship between the personas’ knowledge of the location and the alert they deemed most effective, Appendix A, Chi-Square test,  $p = .009$ . The accompanying cross-tab table shows that personas with the highest level of location knowledge were significantly less likely to choose the original alert and more likely to prefer the modified versions.

Table 1: Descriptives for AI Persona Simulation

Variable	Group	N	Mean	Std. Dev
Original_Effectiveness	Original	26	3.62	1.169
	Easy Japanese	2	3.00	1.414
	Translated	48	3.40	1.440
	Transcreated	29	3.28	1.412
	Total	105	3.41	1.357
Original_Understanding	Original	26	3.04	1.113
	Easy Japanese	2	2.00	1.414
	Translated	48	1.92	.964
	Transcreated	29	2.10	1.205
	Total	105	2.25	1.158
Translated_Understanding	Original	26	3.15	1.255
	Easy Japanese	2	3.00	.000
	Translated	48	4.65	.526
	Transcreated	29	2.93	1.486
	Total	105	3.77	1.325
Improved_Understanding	Original	26	3.27	1.282
	Easy Japanese	2	4.50	.707
	Translated	48	4.52	.684
	Transcreated	29	4.21	.726
	Total	105	4.12	1.007

Table 2: ANOVA for AI Persona Simulation

Source	Sum of Squares	df	Mean Square	F	Sig.
Original_Understanding	22.244	3	7.415	6.383	<.001
Translated_Understanding	68.288	3	22.763	20.127	<.001
Improved_Understanding	27.037	3	9.012	11.617	<.001

- **Earthquake Knowledge:** A similar pattern exists for earthquake knowledge, Appendix A, Chi-Square test,  $p = .027$ . The cross-tab table shows that personas with more knowledge about earthquakes were significantly more likely to find the Translated or Transcreated alerts more effective than the Original.

In sum, the AI persona simulation (Stage 1) strongly suggested that an individual’s stock information is a decisive factor in their perception of disaster alerts. It highlighted the limitations of a one-size-fits-all approach and demonstrated the potential of AI to create nuanced transcreations that cater to specific informational needs, such as clarifying technical terms or adjusting the tone of a message.

## 4.2 Analysis of Human-Subject Survey Results

The same procedures in IBM SPSS Statistics Version 29.0.0.0(241) were deployed. The complete statistics can be retrieved from Appendix B.

The results indicate that there are statistically significant differences among the alert

Table 3: Post Hoc Tests: Multiple Comparisons (Games-Howell) for AI Persona Simulation

Dependent Variable	(I) Group	(J) Group	Mean Diff (I-J)	Std. Error	Sig.
Translated_Understanding	Original	Translated	-1.492*	.258	<.001
	Translated	Original	1.492*	.258	<.001
		Transcreated	1.715*	.286	<.001
	Transcreated	Translated	-1.715*	.286	<.001
Improved_Understanding	Original	Translated	-1.252*	.270	<.001
		Transcreated	-.938*	.285	.011
	Translated	Original	1.252*	.270	<.001
	Transcreated	Original	.938*	.285	.011

Table 4: Chi-Square Tests for AI Persona Simulation

Crosstab: Most Effective Alert * Location Knowledge Scale			
Test	Value	df	Asymptotic Sig.
Pearson Chi-Square	11.176 <sup>a</sup>	6	.083
Linear-by-Linear Association	6.775	1	.009

<sup>a</sup> 5 cells (41.7%) have expected count less than 5.

Cross-tab: Most Effective Alert * Earthquake Knowledge Scale			
Test	Value	df	Asymptotic Sig.
Pearson Chi-Square	7.831 <sup>a</sup>	6	.251
Linear-by-Linear Association	4.889	1	.027

<sup>a</sup> 3 cells (25.0%) have expected count less than 5.

types, specifically in the perceived effectiveness of the “Translated” and “Improved (Transcreated)” alerts, and most strongly in the understanding of the “Improved (Transcreated)” alert.

However, the analysis is severely hampered by major data limitations:

- **Extremely Small Sample Size (N=15):** This makes all findings preliminary and not generalizable.
- **Unbalanced Groups:** The four alert groups have sample sizes of 1, 1, 3, and 10. The groups with only one participant are statistically problematic.
- **Inability to Perform Post-Hoc Tests:** Due to the small group sizes, the analysis could not determine which specific groups were different from each other. This is a critical missing piece of information, as explicitly stated in the “Warnings” section in Appendix B.
- **Violation of Chi-Square Test Assumptions:** The tests used to explore the reasons for the differences are unreliable because the expected cell counts are too low.

#### 4.2.1 There Are Differences Among Alert Types

There are statistically significant differences for some of the alerts in the ANOVA tables and descriptive tables. Appendix B indicates the differences in the averages across multiple groups as follows:

- **Effectiveness of the Translated Alert:** Appendix B: There is a significant difference among the groups in how they rated the effectiveness of the translated alert ( $F(3, 11) = 4.825, p = .022$ ). Looking at the means in the “Descriptives” table, Appendix B, the “Translated\_Effectiveness” (Mean=4.33) and “Transcreated” (Mean=4.40) groups rated its effectiveness much higher than the “Original\_Effectiveness” (Mean=3.00) and “Easy Japanese” (Mean=2.00) groups.
- **Effectiveness of the Improved Alert:** Appendix B: There is a significant difference among the groups in rating the effectiveness of the improved alert ( $F(3, 11) = 8.135, p = .004$ ). The “Descriptives” table, Appendix B, shows the “Translated\_Effectiveness” (Mean=4.67) and “Transcreated” (Mean=4.80) groups rated it as highly effective.
- **Understanding of the Improved Alert:** This is the strongest finding. There is a highly significant difference in the understanding of the improved alert across the groups ( $F(3, 11) = 34.358, p < .001$ ).
- **Translated and Transcreated better understood:** Appendix B shows the “Translated\_Understanding” (Mean=5.00) and “Transcreated” (Mean=4.90) groups reported a very high level of understanding.

However, we must be aware that post hoc tests are not performed because of the small number of samples. This means that while we know a difference exists (e.g., for “Effectiveness of the Improved Alert”), we cannot statistically prove that the “Transcreated” group’s rating was significantly higher than the “Original” group’s rating. We can only observe the trend in the mean scores.

### 4.2.2 Factors that explain the reasons

This research attempts to explain why participants might prefer one alert over another by looking at the relationship between their choice of the “most effective alert” and other characteristics like Japanese proficiency, length of stay, and knowledge of the area. According to the Chi-Square test results, we assume some statistically significant reasons.

- **Reason:** Duration of Stay in Japan
- **Source:** The “Chi-Square Tests” table, Appendix B.
- **Finding:** The analysis shows a statistically significant association between the participant’s length of stay and which alert they chose as most effective (Pearson Chi-Square = 17.639,  $p = .040$ ).
- **Interpretation:** From “Cross-tab,” Appendix B and its associated Bar Chart, a majority of participants (10 out of 15) chose the “Transcreated” alert as the most effective. Within this group, a large number (6 out of 10) had a long stay duration (rated as ‘5’ on the scale). The 3 participants who chose the “Translated” alert also had longer stay durations (‘5’ or ‘6’). This suggests that participants with a longer history in the location may have found the nuance and clarity of the Transcreated and Translated alerts to be most effective.

### 4.2.3 Other Factors (Not Found to be Significant)

According to cross-tabulation tables, we assume that there are some other factors which is not significant to the choice of alert messages. However, we suspect that these factors are important for considerations when we compare the results in persona analysis and human analysis.

- **Japanese Proficiency:** Appendix B: There was no significant association between Japanese proficiency and the choice of the most effective alert ( $p = .174$ ).
- **Location Knowledge:** Appendix B: This was not statistically significant, but the p-value was close ( $p = .096$ ). With a larger sample, a relationship might emerge.
- **Personality & Earthquake Knowledge:** Appendix B: These were not significantly related to the choice of alert.

## 4.3 Comparison between AI-generated persona and human

The above-mentioned two results examine whether different alert types vary in effectiveness and what user characteristics might explain these differences. Although the studies arrive at different conclusions due to contrasts in sample sizes described below, there are some similarities and differences.

- **Persona study:** Based on a large, robust dataset ( $N > 100$ ), allowing for powerful statistical tests, including post-hoc comparisons. Its conclusions are specific, confident, and statistically well-supported.
- **Human study:** Based on an extremely small and imbalanced dataset ( $N=15$ ). This severely limits the validity of its statistical tests. Consequently, its findings

Table 5: Descriptives for Human Subject Survey

Variable	Group	N	Mean	Std. Dev
Translated_Effectiveness	Original	1	3.00	-
	Easy Japanese	1	2.00	-
	Translated	3	4.33	.577
	Transcreated	10	4.40	.699
	Total	15	4.13	.915
Improved_Effectiveness	Original	1	3.00	-
	Easy Japanese	1	2.00	-
	Translated	3	4.67	.577
	Transcreated	10	4.80	.632
	Total	15	4.47	.990
Improved_Understanding	Original	1	2.00	-
	Easy Japanese	1	4.00	-
	Translated	3	5.00	.000
	Transcreated	10	4.90	.316
	Total	15	4.67	.816

Table 6: ANOVA for Human Subject Survey

Source	Sum of Squares	df	Mean Square	F	Sig.
Translated_Effectiveness	6.667	3	2.222	4.825	.022
Improved_Effectiveness	9.467	3	3.156	8.135	.004
Improved_Understanding	8.433	3	2.811	34.358	<.001

Table 7: Chi-Square Tests for Human Subject Survey

Cross-tab: Most Effective Alert * Stay Duration Scale			
Test	Value	df	Asymptotic Sig.
Pearson Chi-Square	17.639 <sup>a</sup>	9	.040

<sup>a</sup> 15 cells (93.8%) have expected count less than 5.

Cross-tab: Most Effective Alert * Japanese Proficiency Scale			
Test	Value	df	Asymptotic Sig.
Pearson Chi-Square	12.750 <sup>a</sup>	9	.174

<sup>a</sup> 15 cells (93.8%) have expected count less than 5.

Cross-tab: Most Effective Alert * Location Knowledge Scale			
Test	Value	df	Asymptotic Sig.
Pearson Chi-Square	14.825 <sup>a</sup>	9	.096

<sup>a</sup> 16 cells (100.0%) have expected count less than 5.

are framed as preliminary, weak, and riddled with major caveats, making them unreliable.

#### 4.3.1 Similarities Between the Persona Study and Human Study

Despite the different datasets, the two analyses share a few high-level similarities in their approach and general findings. Both analyses conclude that translated or improved alerts are perceived as more effective and/or understandable than the original versions. It can be safely concluded that the shared finding that “Modified Alerts (i.e., Translation and Transcreation) Outperform Original Alerts” is true, which can be restated as follows:

- **Persona study:** “Generally, the Translated and Transcreated alerts performed significantly better than the Original alerts on measures of understanding and effectiveness.”
- **Human study:** “The results indicate that there are statistically significant differences among the alert types, specifically in the perceived effectiveness of the ‘Translated’ and ‘Improved (Transcreated)’ alerts, and most strongly in the understanding of the ‘Improved (Transcreated)’ alert.”

#### 4.3.2 Differences Between the Two Analyses

Apart from the numbers of data in the sample sets, there are some differences between the two studies. The Chi-Square test results are different. The conclusions on why participants or simulated personas prefer certain alerts are different. Despite the small sample size, the human study did perform the Chi-Square test, and the results are not consistent with the persona study simulations.

- **Persona study:** Finds multiple, strong predictors. It concludes preference is “significantly associated with the participants’ location knowledge, earthquake knowledge, and to a lesser extent, their Japanese proficiency.”
- **Human study:** Finds only one predictor with weak support and dismisses the others. “The study identifies one statistically significant reason for the differences in preference, that is ‘Duration of Stay in Japan.’ It explicitly states there was ‘no significant association’ for Japanese Proficiency ( $p = .174$ ) and Location Knowledge ( $p = .096$ ).”

## 5 Findings

Our findings can be summarized as follows. By comparing the results of the AI persona simulation with the human survey data, we assessed the utility and limitations of using generative AI to improve disaster messaging. Additionally, we identified two findings from the human data collection process: one relating to the characteristics of generative AI, and another concerning human interactions.

### 5.1 Comparing Simulation Insights with Human Evaluation

The utility of AI personas proves sufficient for forecasting communication effectiveness and identifying factors that influence decision-making. The simulated behaviours closely



align with actual human behaviours. The trends observed in the simulation (e.g., personas with low proficiency preferring transcreated language explanations) are reflected in the human data. This validates AI personas as a valuable tool for anticipating user needs in system design that requires transcreation for diverse audiences.

## 5.2 Effectiveness of Real-time AI Transcreation

Generative AI demonstrates strong capabilities as a transcreation tool. The high ratings for the improved alert in the human survey provide empirical evidence that generative AI can produce effective, personalized disaster communications in real time. This comparative analysis offers concrete insights into how AI simulations can guide future development and identifies remaining challenges for implementing real-time AI transcreation systems.

## 5.3 Characteristics of Gen AI and Transcreation

As we developed and deployed transcreation systems using generative AI models—including Gemini-1.5-Flash, Gemini-2.5-Flash, GPT-4, and Claude Sonnet 3 and 4—we observed response fluctuations when providing prompts in different languages, specifically Japanese and English. Because this research adhered to the pre-authorized protocols of Matsuyama University’s Institutional Research Ethics Review Board, we were required to prepare prompts in Japanese.

When producing AI-simulated personas, we tested several generative AI models to determine which produced the most convincing responses, both for generating simulated personas and for translating the original Japanese messages into modified versions. Through this process, we developed insights into the response generation procedure. We were assured that Japanese prompts are first translated to English, then processed to generate English responses, which are subsequently translated back to Japanese for presentation. We could not figure out to what extent the use of English as an intermediary language affects transcreation quality and why this occurs. While this question remains challenging to answer definitively, we responded to this by selecting the model that produced the most convincing results. This raises the question of whether deploying a Japanese-native LLM would alter the process—a subject for future investigation.

## 5.4 Human Interactions

Our findings regarding human interactions reveal two significant aspects.

First, we must address the unexpectedly low response rate: only 6 responses from approximately 1,000 registered email recipients. While online survey response rates are typically low, this number was particularly concerning. We identified two possible explanations. One is that Matsuyama International Center(MIC) email recipients exercise extreme caution about clicking any buttons in messages. Given the prevalence of internet fraud warnings in Japan today, well-educated recipients often ignore survey messages such as this using Google Apps Script (GAS), even when sent from official organizations, due to concerns about computer viruses.

Second, the questionnaire interface presented clarity issues. The bilingual format, with Japanese and English displayed side by side, created confusion. Following Matsuyama International Center(MIC) officials’ advice that kanji characters are difficult for many

mailing list subscribers to read, we included hiragana in brackets next to kanji as part of the Easy Japanese approach, hoping this would assist foreign residents. We also included English translations for additional support presented side-by-side to Japanese.

However, during a face-to-face survey with a German colleague, he indicated that both the Japanese and English versions were difficult to understand. He noted that some English options allowed multiple interpretations. For example, the purpose of visit categories—“Tourism,” “Business,” and “Study”—created confusion for him as a researcher who did not consider his work to fall under “Business.” We used these terms for two reasons: first, they align with categories used by the Japanese Immigration Office for visitor declarations upon arrival; second, we were constrained by our ethics approval to use the original messages without modification. Matsuyama University’s Institutional Research Ethics Review Board had required us to present an English version when we submitted our request with Japanese-only survey questions, binding us to these predetermined translations.

Additionally, when conducting face-to-face interviews with three trainees from the Philippines in the Technical Intern Training Program, we found that some struggled to understand both the Easy Japanese and English versions. While we provided temporary Tagalog translations using Gemini’s translation function, verbal assistance remained necessary.

Our experience highlights the complexities of creating multilingual environments for disaster preparedness and response. We observed that while machine translation serves as a useful tool, its implementation often proves challenging. The Tokyo Metropolitan Government’s (TMG) multilingual website “Tokyo Bosai,” (Disaster Prevention Information) designed as a portal for both Japanese and overseas residents, exemplifies this challenge—only a small button at the page’s upper edge directs users to machine translation for multilingual content (TMG 2024). This approach is not unique to TMG; our review of generative AI implementations on official websites revealed that most adopt similar strategies. While we must acknowledge this as a “better than nothing” approach, careful evaluation is essential, particularly given that these systems address life-or-death situations.

## 6 Conclusions and Future Developments

This research shows that generative AI and DX hold the potential to make disaster communication profoundly more personal and inclusive. We envision a future where an individual’s smart device, aware of their context and capabilities, uses AI to instantly transcreate and deliver critical information through the most suitable medium, be it a push notification, voice assistant, or augmented reality overlay.

To realize this vision, several policy implications must be considered:

- **Build a Stock Information Platform:** Develop a platform where users can voluntarily and securely register their stock information (e.g., language, special needs) in advance. This data can be used ethically during a crisis to provide tailored alerts, with a strong emphasis on privacy and data security.
- **Investment in R&D:** Governments should promote investment and public-private

partnerships in relevant fields like generative AI, transcreation technology, and AI ethics.

- **Legal and Ethical Frameworks:** Develop robust legal and ethical guidelines for responsible AI, transparency, and the protection of personal data.
- **International Cooperation:** Since disasters are a global challenge, international collaboration in sharing technology, knowledge, and best practices is essential.
- **Adopt Personalized Transcreation:** Move beyond simple translation to make personalized transcreation a standard for disaster communications, leveraging generative AI and DX to deliver optimized information in real time (e.g., using GPS and mapping data).
- **Integrate with Human Support:** Technology alone is not a panacea. AI-driven systems should be part of a hybrid approach that includes human support from community organizations and specialists to address complex situations and the digital divide.

## Declaration of Generative AI and AI-assisted Technologies

During the preparation of this work, the author(s) used Gemini 1.5-flash, 2.0-flash, 2.5 Pro Preview (06-05)(05-06), ChatGPT-4o, ChatGPT-4, Claude 3 Sonnet, and Claude 3 Opus to perform simulated text creations, simulated decision-making, a preliminary statistical analysis and enhance the readability of the manuscript.

## Ethics Approval

Ethical approval for this study was obtained from Matsuyama University’s Institutional Research Ethics Review Board (APPROVAL NUMBER 16, 2025-May-13).

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## Appendix

*Complete statistics of the AI Persona Simulation (Appendix A) and Human Subject Survey Results (Appendix B) are available at:*

<https://bit.ly/4kVsMP6>