Architect’s earthquake readiness

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Abstract. Earthquakes are natural disasters that often result in both physical and psychological damage, so prevention efforts are needed to deal with them. Prevention efforts will be realized when everyone has awareness and preparedness for the disaster itself. For architects, preparedness to face an earthquake is important because it can be felt in the implementation of their work that is utilized by the community. This study wants to see Architect’s Earthquake Readiness as a measurement of how responsive architects are in preparing for disasters in their work. The research method is Neuroresearch method with survey techniques. The results show that the main dimension that forms Architect’s Earthquake Readiness is current prevention that is supported by a commitment to change, namely a commitment to turn their work into a work that accommodates preparations in the face of earthquake disasters.

Keywords: Architect, Earthquake Readiness, Architect’s Earthquake Readiness.

1. Introduction
The educational mission of architects is to design learning experiences that invite students to build knowledge in their work. Learning architects must accommodate a variety of configurations namely instructor creativity related to art and science, instructional methodologies provided, and the expansion of interconnectivity as a framework. When a student designs an architect, learning will naturally lead to the right goals and have a pattern of order and coherence [1]. The architect during his education must be able to develop a variety of solution strategies for the given problem. So, they can have the freedom to develop flexible strategies in their work, but they also can still do validation so that the complexity in their architectural work is consistent with the existing problem [2].
One of the things that distinguishes architecture education is the existence of an apprenticeship element that tries to help students to learn directly from professionals. On the other hand, Architect education is also characterized by the large number of students who spend most of their time in design studios. Design studio is a place for students to learn to visualize and learn various graphic problems and develop the ability of designers in themselves [3]. In various studies it has been explained how various technological devices are used to enhance and equip students with various skills so that they can become reliable architects [4], [5].

For Indonesia context, Architects make outstanding contributions in development. However, there are several geographical conditions in Indonesia that must be considered. Indonesia is a ring of fire country that has great potential to continue experiencing earthquake disasters. Various studies are currently carried out to see the potential for earthquakes that occur in Indonesia and the Philippines [6]. In recent years, many earthquakes experienced by various regions in Indonesia. One of the major disasters that occurred was the earthquakes in 2004 and 2009 that struck the island of Sumatra, which claimed enormous lives. A study found that one of the important things that caused many casualties is how people behave when facing a disaster. This study found that people's behaviour in dealing with disasters is influenced by cultural, social, economic, and political contexts [7], [8], [9].

In a disaster-prone geographical condition, Indonesia needs professional architects who consider risk mitigation and have preparedness in dealing with earthquake disasters. This study wanted to see whether the architecture graduates had that readiness.

2. Literature Review
In dealing with disasters, especially earthquake disasters, readiness is an important factor for every community, especially for architects in their work called Architects Earthquake Readiness [10]. Various studies on disasters have been carried out. Behaviour in dealing with disasters is very important. An architect is considered to have Earthquake Readiness when he is able to produce works so that the architect's work shows readiness in dealing with earthquake disasters so as to prevent and reduce the fatal risks that will arise [11].

The fact that happens, many people are often not ready to face disasters. A study explained that important aspects in dealing with earthquakes are aspects of survival and damage mitigation measures [12]. Planning, coordination and communication become an important factor in disaster response and in the recovery process after a disaster [13].

3. Research Method
The research method is mixed-method Neuroresearch with survey techniques [14]. The population in this study were all architect graduates in Jakarta. The sampling technique uses cluster random sampling with a total sample of 539 respondents. Data collection techniques using a questionnaire with a Likert scale of 1 to 5. Instrument calibration is done with content validity through expert judgment to academics. The research paradigm is as follows:
4. Result and discussion
Analysis of the data that has been distributed to respondents is then processed to provide an overview of the results of the analysis that has been done. The first research result is answering the tendency of respondent's response, that is architect, to their readiness in facing earthquake (DisReadiness_Y). Statistical analysis using the confidence interval ($\mu$) approach with a significance level of $\alpha < 0.05$ with the results shown in Table 1 below.

**Table 1. Results of Trend Tests for Population Conditions**

| Descriptives | Statistic | Std. Error |
|--------------|-----------|------------|
| DisReadiness_Y Mean | 36.1429 | 22.605 |
| 95% Confidence Interval | 35.6988 | 36.0969 |
| Estimated Mean | 36.0490 | 36.0000 |
| Variance | 27.543 | 6.24012 |
| Minimum | 29.00 | 50.00 |
| Maximum | 39.00 | 7.00 |
| Skewness | 0.17 | 0.155 |
| Kurtosis | 0.165 | 0.210 |

In the process of drawing conclusions, researchers set 5 categories of trends in the response of architects in Jakarta to their readiness in implementing buildings that prevent earthquake hazards (DisReadiness_Y). These categories are: (1) Architects have absolutely no preparedness to face...
disasters, (2) Architects occasionally have preparedness to face disasters, (3) Architects are less ready to face disasters, (4) Architects have preparedness to face disasters, and (5) Architects feel have the very preparedness to face a disaster. Based on Table 1, the Lower Bound is 35.6988 and the Upper Bound is 36.5869. Therefore, it can be concluded that architects in Jakarta, their designs tend to be less ready to implement contextual designs for prevention disaster significantly at $\alpha < 0.05$.

The second research result is finding dimensions and indicators that need to be improved so that architects feel very ready in facing disasters (DisReadiness_Y). The analysis is then performed with Binary Segmentation which is also called Classification and Regression Trees. In this analysis, researchers set a Prunning Depth of 2, a Prunning Parent of 2, and a Prunning Child of 1 and a significance level of $\alpha < 0.05$. The analysis found as in Figure 2 below.

![Figure 2. Binary Segmentation Results](image)

5. Conclusion

Earthquakes occur without warning, so making various preparations to deal with them is very important [15], [16]. Large earthquakes that occur in various countries and even Indonesia need to be a lesson for everyone to understand the importance of preparing for an earthquake [17], [18]. The results found that the most crucial dimension of Architects Earthquake Readiness so that architects feel very ready to make housing works in Jakarta that contextually implements earthquake prevention is Current Prevention (Dim_Prev). Current Prevention (Dim_Prev) will be maximal, if the architects have Commitment Change.

Current Awareness (Ind_CA) is the most decisive indicator so that architects feel very ready to create works that contextually implement earthquake prevention (DisReadiness_Y). Current Awareness (Ind_CA) will be maximal, if it has Hope for Change (Ind_HC) and builds a good Community Climate (Ind_CC). Earthquake readiness will produce practices and behaviors that refer to how responsibilities, budgets and even human resource management to anticipate disasters are carried out together and synergize with each other [19]. This can be started from the education of the architects. The curriculum for architectural education needs to contain both risk mitigation and earthquake prevention mitigation so that architect graduates have an Earthquake Readiness that can be implemented in their work and the benefits will be felt by the wider community. One study even found a significant relationship between residence, earthquake experience and preparation in dealing with it. Those who have experienced dealing with earthquakes have realized the need to prepare for disaster.
Therefore experience is an important factor for architects to sharpen their readiness in facing earthquake disasters

References

[1] Robin Fogarty. (1999). Architects of the Intellect.

[2] Maaike Waalkens, Vincent Alevien, and Niels Taatgen. (2013). Does supporting multiple student strategies lead to greater learning and motivation? Investigating a source of complexity in the architecture of intelligent tutoring systems,” Computers & Education. 60(1); 159–171.

[3] O. Alagbe, P. Aderonmu, A. Opoko, and A. Oluwatayo. (2014). Relevance of Manual Drafting in Design Studio Education in Nigeria: Covenant University Architecture Students Perspective. Proceedings of EDULEARN14 Conference. July; 1588–1594.

[4] Leo Porter, Saturnino Garcia, Hung-Wei Tseng and Daniel Zingaro. (2013). Evaluating Student Understanding of Core Concepts in Computer Architecture Categories and Subject Descriptors. 18th Annual Conference on Innovation and Technology in Computer Science Education - ITiCSE.

[5] Manhães, Laci Mary Barbosa, da Cruz, Sérgio Manuel Serra, and Zimbrão, Geraldo. (2014). WAVE: an architecture for predicting dropout in undergraduate courses using EDM. Proceedings of the 29th annual ACM symposium on applied computing. 243–247.

[6] Thomas J. Fitch and Peter Molnar. (1970). Focal mechanisms along inclined earthquake zones, in the Indonesia-Philippine region. Journal of Geophysical Research. 75(8); 1431–1444.

[7] Jean Christophe Gaillard, Elsa Clavé, Océane Vibert, Deni Azhari, Jean Charles Denain, Yusuf Efendi, Delphine Grancher, Catherine C. Lianzon, Desy Rosnita Sari, and Ryo Setiawan. (2008). Ethnic groups’ response to the 26 December 2004 earthquake and tsunami in Aceh, Indonesia. Natural Hazards. 47(1); 17–38.

[8] Zahrul Umar, Biswajeet Pradhan, Anuar Ahmad, Mustafa Neamah Jebur, Mahyat Shafapour Tehrany. (2014). Earthquake induced landslide susceptibility mapping using an integrated ensemble frequency ratio and logistic regression models in West Sumatera Province, Indonesia. Catena. 118(September); 124–2014.

[9] Jose C. Borroero. (2005). Field survey of northern Sumatra and Banda Aceh, Indonesia after the Tsunami and earthquake of 26 December 2004. Seismological Research Letter. 76(3); 312–320.

[10] Matthew J. Spittal, Frank H. Walkey, John McClure, Richard J. Siegert, and Kimberley E. Ballantyne. (2006). The earthquake readiness scale: The development of a valid and reliable measure. Natural Hazards. 39(1); 15–29.

[11] Dennis S. Mileti and Joanne D. Darlington. (2012). The Role of Searching in Shaping Reactions to Earthquake Risk Information. Social Problem. 44(1); 89–103.

[12] Matthew J. Spittal, John McClure, Richard J. Siegert, and Frank H. Walkey. (2008). Predictors of two types of earthquake preparation: Survival activities and mitigation activities,” Environment and Behavior. 40(6); 798–817.

[13] Michele M. Wood, Megumi Kano, Dennis S. Mileti, and Linda. B. Bourque. (2009). Reconceptualizing household disaster readiness: The ‘Get Ready’ Pyramid. Journal of Emergency Management. 7(4); 25.

[14] Chris S. Hulleman, Sheree M. Schrager, Shawn M. Bodmann, and Judith M. Harackiewicz. (2010). A meta-analytic review of achievement goal measures: Different labels for the same constructs or different constructs with similar labels? Psychological Bulletin. 136(3); 422–449.

[15] Douglas Paton, Ella Anderson, Julia Becker, and Jessica Petersen. (2015). Developing a comprehensive model of hazard preparedness: lessons from the Christchurch earthquake International Journal of Disaster Risk Reduction. 14; 37–45.

[16] Dennis S. Mileti, Colleen Fitzpatrick, and Barbara C. Farhar. (1992). Fostering public
preparations for natural hazards: Lessons from the Parkfield earthquake prediction. Environment: Science and Policy for Sustainable Development. 34(3); 16–39.

[17] David E. Alexander. (2011). Mortality and morbidity risk in the L’Aquila, Italy earthquake of 6 April 2009 and lessons to be learned. *Human casualties in earthquakes, Springer*, 185–197.

[18] Douglas Paton and Li-ju Jang. (2016). Earthquake readiness and recovery: an Asia-Pacific perspective. *Earthquakes and Their Impact on Society, Springer*, 647–663.

[19] Dennis S. Mileti, Daniel M. Cress, and Joanne D. Darlington. (2002). Earthquake culture and corporate action. *Sociological Forum*. 17(1); 161–180.

[20] Meltem Oral, Aynil Yenel, Elif Oral, Nazan Aydin, and Tarik Tuncay. (2015). Earthquake experience and preparedness in Turkey. *Disaster Prevention and Management*. 24(1); 21–37.

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