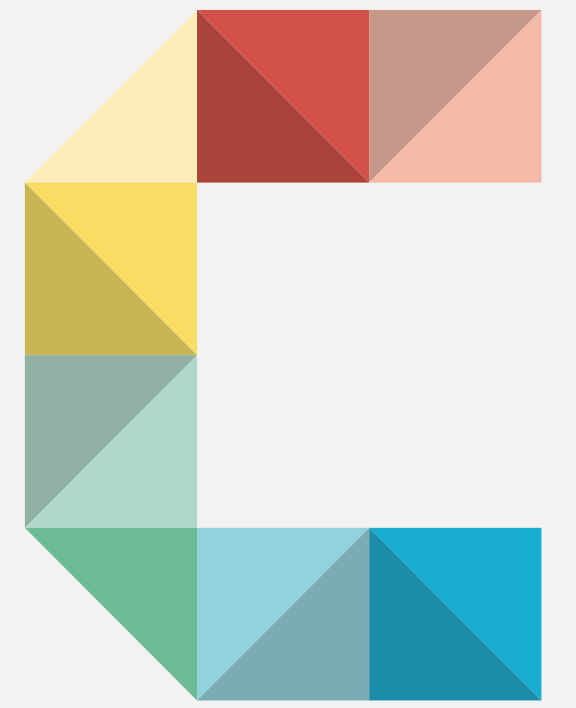


Communicating Disaster Risk Information – Cartographic Dashboards and Mixed Reality



by John McCall

With disasters as an ever-increasing threat to humanity, the field of disaster risk management is growing and using new technologies to address both natural and anthropogenic hazards. Two of these modern technologies are cartographic dashboards and mixed reality, which includes augmented and virtual reality. Each of these technologies has proven to support spatio-temporal knowledge transfer and communication of disaster risk information.[1][2] Further understanding the benefits of technology will allow us to leverage them and apply them to new products in the future. This thesis asks how can we combine these technologies for use in the field of disaster management?

CONTEXT

This master's thesis aims to evaluate a proof-of-concept of a cartographic dashboard with an augmented reality (AR) element to help improve the communication of disaster risk information.

RESEARCH OBJECTIVES

- 1) Discover needs of disaster risk management professionals for cartographic technologies.
 - 1a) Identify how an AR cartographic element can support disaster management
 - 2) Identify how to integrate AR technologies into a cartographic dashboard.
 - 3) Understand if a dashboard with an AR element can improve the communication of information to a user about disaster risk and how
 - 3a) Analyze how dashboard layout impacts user

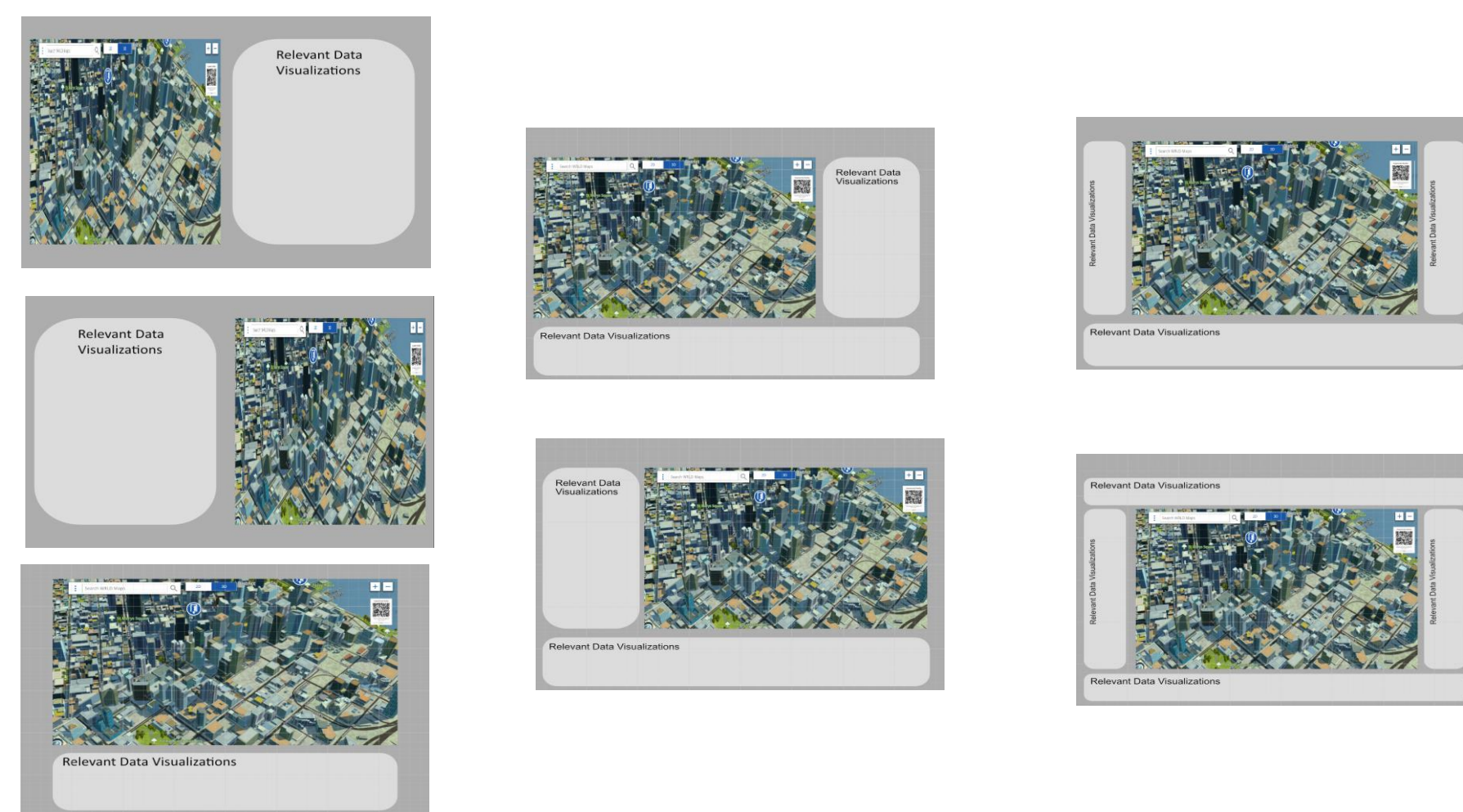


Figure 1: The left column contains two-pane dashboards, the middle column contains three-pane dashboards, and the right column contains four- and five-pane dashboards

METHODOLOGY

The methodology can be divided into three phases:

1. Theoretical background and user research: A literature review and user-requirement survey were conducted.
2. Proof-of-concept: A prototype was developed to prove the concept could work in disaster management.
3. Prototype evaluation and analysis: Expert interviews were conducted and finally a discussion and analysis in order to understand how to apply this concept to disaster management.

A proof-of-concept methodology was chosen in order to understand how a cartographic dashboard AR product could be used in disaster management in the future, which could then be translated into the production capacity needed for a specific group's needs. [3]

PROOF-OF-CONCEPT

Several dashboard layouts [Figure 1] were tested to understand what number of data visualization panes were acceptable. Then, a QR code was placed directly on the map element, which allows a user to scan the code with their device of choice and view an augmented reality city-section [Figure 2]. This type of AR is known as markerless AR.

RESULTS & CONCLUSION

Ultimately, it was understood that a cartographic AR dashboard can improve the communication of disaster risk information to disaster risk professionals. From the experts, we learned that any ability to provide additional information about a disaster scene is useful if implemented correctly. As AR provides new ways to view a scene, it gives professionals more ways to plan and address disasters. Examples would be improved information about transportation access to the building, setting up ingress/egress and triage zones, as well as the possibility for indoor AR navigation and evacuation. As for dashboard design, professionals preferred four or fewer panes, indicating that overly complex dashboards end up being confusing. The next step of this technology is to work with a group and create a cartographic AR dashboard for their specific real-life needs.



Figure 2: The augmented reality city-section the viewer sees when scanning the QR code

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KEYWORDS

Disaster risk management, Mixed reality, Augmented reality, Dashboards, Cartographic dashboards, proof-of-concept

AUGMENTED REALITY QR CODE



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