Conceptualizing the Design and Use of Augmented Reality Within a Common Operating Picture for Incident Command Systems

Annotated Bibliography

For **Indiana University Crisis Technologies Innovation Lab** and **Director of User Experience, Sonny Kirkley**

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Data Collected

Recorded Interview with Dale Rolfson - February 11th, 2022:

Dale Rolfson is the Chief Technology Officer for Indy Fire Department. He's been employed with the Indianapolis Fire Department for 34 years. The interview addressed his career working for the Indianapolis Fire Department and his responsibilities. Many of the questions targeted situational awareness and technology related to his day to day activities.

- **Watch on Kaltura**
- **Download Dale Rolfson Interview 1 - 02_11_2022.mp4**

Discussion with Sonny Kirkley - February 11th, 2022:

Follow-up discussion to review notes and insights obtained from the Dale Rolfson interview. Key points discussed were the project focus and the gathering of new information based on new findings.

- **Watch on Kaltura**
- **Download Dale Rolfson Interview 1 - Additional Discussion - 02_11_2022.mp4**

Recorded Interview with Dale Rolfson - February 25th, 2022:

Dale Rolfson is the Chief Technology Officer for Indy Fire Department. This interview included questions that focused on walking through incident command scenarios with Dale and attempted to capture the details of those experiences from thoughts, feelings, and motivations. This was done to assist in creating an affinity map, develop an empathy map, and ultimately, generate two unique personas that capture the necessary users. A bonus to this interview was witnessing the current software the IFD uses daily when responding to incidents.

- **Watch on Kaltura**
- **Download Dale Rolfson Interview 2 - 02_25_2022.mp4**

Recorded Interview and Tour with Dale Rolfson and Jacob Spence at Indianapolis Metro Police Department Command Center - March 2nd, 2022:

Dale Rolfson is the Chief Technology Officer for Indy Fire Department and Jacob Spence is an active Battalion Chief for the Indy Fire Department. This interview included a direct placement of researchers in the same room and seats that the users are in. Dale was also able to include Jacob Spence, an active incident commander, who provided valuable insights from his career, including recent events such as the NCAA tournament in 2021. Our researchers were able to capture critical information and take photos of the command center the incident commanders have been using when responding to larger scale emergencies and events.

- **View Images**
- **Download IMPD Tour and Interview - Dale Rolfson & Jacob Spence - 03_02_2022.m4a**

Recorded Interview with Kirk McKinzie - March 8th, 2022:

Kirk McKenzie is a retired firefighter and is currently the president of McKinzie Smart Technologies LLC. This interview was a group effort of four different teams and the time was

shared between all. Kirk explained the history, issues, and concerns of firefighters in different areas. He recounted his experience as an active firefighter and expectations for the future of first responders.

- **Watch on Kaltura**
- **Download Kirk McKinzie Interview 1 - 03_08_2022.mp4**

Wide Area Search Waypoint Data Directory Documentation - March 4th, 2022
A document containing information about visual icons and universal images that is used in emergency situations. The document also contains definitions about their use and when the images are implemented. The information contained within is also used internationally with other civilian service organizations. Dale passed this documentation to us as it dealt with common visualizations that should apply to all incident commanders.

- **Download USAR Data Dictionary.pdf**

Indianapolis Fire Department Standard Operating Procedure Documentation - March 4th, 2022
The document contains how certain first responders are required to account for their responsibilities depending on their role. These responsibilities include addressing immediate situations and the occupacity of other people's roles. Dale Rolfson provided this document and it allowed us to accurately picture responsibilities of our users in their roles.

- **Download IFD Accountability SOP.pdf**

Indianapolis Fire Department Tactical Worksheet - March 4th, 2022
Provided by Dale Rolfson, this worksheet details some of the things the incident commander in an emergency situation would cover and update. The document also represents the workflows incident commanders may encounter.

- **Download Tactical Worksheet - IFD - Version 4.31.xlsx**

Kirk McKinzie's Next Gen Curriculum Resource - March 8th, 2022
Kirk has graciously shared this with us and it contains a plethora of resources and links to continue investigating for research and inspiration.

- **Download McKinzie's Next Gen Curriculum 2021.pdf**

i-Axis Best Practices Guide - March 9th, 2022
An excellent resource detailing some best practices on navigational visuals for indoor mapping and tracking.

- **Download i-Axis Best Practices Guide to Indoor Mapping, Tracking, & Navigation.pdf**

References

"PSCR 2021: Augmented-Reality (AR) Usability Evaluation Framework for PSCR", *NIST*, https://tsapps.nist.gov/publication/get_pdf.cfm?pub_id=932560.
A framework for AR Usability Evaluation in the public safety communication research realm. The document contains examples of Usability Evaluation test scripts targeting specific metrics such as behavioral and performance. Further detail includes how the framework is implemented and the measurement of task performance.
- **Direct Web Link**
- **Download PSCR 2021 Digital Experience.pdf**

"PSIAP Augmented Reality (AR)." *NIST*, 21 Oct. 2021, https://www.nist.gov/ctl/pscr/funding-opportunities/past-funding-opportunities/psiap-augmented-reality.
Presents grants and funding opportunities for AR in public safety communications research, as well as descriptions of ongoing projects. The document mentions past participants who have received grants and the importance of research needed for AR technology.
- **Direct Web Link**
- **Download PSIAP Augmented Reality (AR) _ NIST - 02_23_2022.pdf**

"2020 Chariot Challenge: Advancing First Responder Communications." *NIST*, 8 Dec. 2021, https://www.nist.gov/ctl/pscr/open-innovation-prize-challenges/past-prize-challenges/2020-chariot-challenge.
Description of the CHARIoT Challenge in which participants built AR interfaces or IoT data emulators for first responder communications. The document mentions specific rewards provided based on success of a category. The challenge is to develop solutions using the latest technology in order to help first responders effectively obtain information.
- **Direct Web Link**
- **Download 2020 CHARIoT Challenge_ Advancing First Responder Communications _ NIST - 02_23_2022.pdf**

"Enhanced User Interface/User Experience Research Portfolio." *NIST,* 18 Sept. 2017, https://www.nist.gov/ctl/pscr/research-portfolios/user-interfaceuser-experience
Research portfolio for User Interface / User Experience work within the public safety Community. It contains links to different resources on user experience with AR and VR interfaces.
- **Direct Web Link**
- **Download User Interface_User Experience _ NIST - 02_23_2022.pdf**

Feldman, Harris, et al. "Public Safety User Interface R&D Roadmap." *National Institute of Standards and Technology,* **April 2017,** *https://nvlpubs.nist.gov/nistpubs/TechnicalNotes/NIST.TN.1961.pdf*

A roadmap for planning public safety communications research. The report contains detailed information regarding different interface technology that can enhance a user experience. Details and explanations on current technology and possible usage is discussed. It explores how specific interfaces can enhance, evolve and expand current public safety operations and the capabilities of users.

- **Direct Web Link**
- **Download Public Safety User Interface R&D Roadmap.pdf**

Motorola Solutions. "Consensus For Change Transforming Safety Through Technology." *n.d. Motorola Solutions.* *https://www.motorolasolutions.com/content/dam/msi/docs/dt/consensusforchange/Consensus_for_Change_Report_V13.pdf*

A document containing information on a study conducted by University of London detailing how the pandemic affected innovation and attitudes toward technology for public safety. Kirk McKinzie

- **Direct Web Link**
- **Download Motorola's Consensus for Change Report V13.pdf**

National Institute of Standards and Technology. "NIST Special Publication 1191: Research Roadmap for Smart Fire Fighting Summary Report." n.d. *https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1191.pdf*

A document detailing how new technologies have allowed for the collection of large amounts of information that can be used to enhance fire fighting and aid in public safety.

- **Direct Web Link**
- **Download NIST Research Roadmap for Smart Fire Fighting.pdf**