

### BACKGROUND

Handoffs have historically been an important focus for Naturalistic Decision Making research and application development. Patterson et al. (2004) set the stage with a naturalistic study across several domains – i.e., space, nuclear operations, railroads, ambulance dispatch –gathered evidence of use of 21 handoff strategies used on at least an 'as needed' basis.

While this early work offered a pathway toward this understanding by exploring handoff activities across diverse domains and contexts, the most enlightening advances from the NDM community since have primarily been achieved in healthcare. Rattray et al. (2018) discovered inadequacies in preparing residents to conduct effective handoffs, characterizing them somewhat *generically* as "a complex combination of socio-technical information where residents balance relational factors against content and risk."

Thus, even after two decades of work, we remain in the exploratory stage of understanding the *specific nature* of handoffs. It has also proven difficult to gain consensus on how best to measure handoff success (Patterson et al., 2010).



The concept map-based model attempts to integrate the context and content of knowledge transfer in during handoffs. It posits handoffs as comprising three elements: Situations, Knowledge, and Parties. Situations are characterized by aspects of the work, the handoffs, and the interactions that comprise the handoff. Work is characterized by content and complexity, and handoffs are characterized by their activities and focus. Parties address who/what is involved in the handoff. Knowledge considers types of knowledge that may be transferred, and the saliency/relevance/ import of any particular knowledge. By bringing these components into the same space, the model demonstrates the complexity of handoffs.

A secondary benefit of the model is to explicitly show hypothesis, which are highlighted in orange. Embedding the hypotheses in the model allows consideration of the implications of the model components.

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# **Exploring Relationships between Context & Content of Knowledge Transfer during Handoffs**

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## INTENTION

The model presents our understanding the general nature of handoffs from an NDM perspective. The model is an attempt to *organize and integrate* – from an NDM-informed perspective – the contextual elements inherent in handoff situations, aspects of the parties involved, and a typology of knowledge types that may be transferred. Our primary intention in developing the model is to enable assumptions about handoffs to be considered in the light of a more comprehensive view. That said, we do not suggest that the model is comprehensive nor complete. We have conducted an initial evaluation using available incidents that was useful for adding new elements.

Our secondary intention is to posit hypotheses about risks to handoff success and proposed handoff interventions. The hypotheses are highlighted in orange. Hypotheses are stated against a single outcome – Risk of Failure. Each hypothesis is suggested by a null statement – e.g.,:

#### **Risk of failure is most likely when [conditions]**

The descriptions included 9 incidents from the chemical and energy industries, 1 from railroads, 1 from aviation, 1 in construction management, 2 from military operations, 1 from shipping, 1 from mining and 13 from healthcare. The sources of the descriptions are listed in the References section. Given the sources, which were mostly post-incident analyses, some scenarios had more details than others. Five evaluators reviewed the incidents to analyze which concepts from the framework were present, and to extract new concepts and relations that were not included.

We found evidence supporting most of the aspects of the framework, and also added new concepts – e.g., the (non)involvement of tertieary parties in the handoff interaction. Notably, none of the incidents explicity addressed knowledge transfer to the level of detail described in the model.

## **EVALUATION**

To validate our initial model, we gathered 29 publicly available descriptions of handoff incidents from different domains that resulted in errors and/or accidents. The goal of the evaluation was to validate the framework components, generate additional hypothesis, and discover new components.

We hope the model will enable researchers to explore broader questions about knowledge transfer. While NDM has traditionally focused on methods to enable knowledge capture and transfer (content), or on instances of handoff activity (context), few studies have explored the relationship between the two. We invite comments, critiques, and extensions, particularly those informed by naturalistic explorations.

#### FUTURE

The purpose of developing the model was to integrate findings and considerations about handoffs in a way that enables the full picture to be assessed. Many studies of knowledge transfer during handoffs address only a few aspects of this complex element of cognitive performance.

We believe the model, in particular the hypotheses, could be useful for exploring organizational, training, and system development goals. Designers of interventions targeting these aspects of performance support should consider how their proposals might reduce the risk of failure across multiple aspects.

Cole, C., & Woodward, C. (2019). Accidents Will Happen. Dronewars.Net. https://dronewars.net/wp-content/uploads/2019/06/DW-Accidents-WEB.pdf

Dawson, D. M., & Brooks, B. J. (1999, June). The Esso Longford Gas Plant Accident. Gov.Au. https://www.parliament.vic.gov.au/papers/govpub/VPARL1998-

Dupont La Porte Toxic Chemical Leak. (n.d.). Csb.Gov. Retrieved June 13, 2022, from https://www.csb.gov/file.aspx?DocumentId=6124 Friesen, M. A., White, S. V., & Byers, J. F. (2008). Handoffs: Implications for Nurses. In Patient Safety and Quality: An Evidence-Based Handbook for Nurses. Agency

Gwal, K. (2021). The consequences of miscommunication regarding a possible artifact. https://psnet.ahrq.gov/web-mm/consequences-miscommunication-regarding-

Kue, R., Brown, P., Ness, C., & Scheulen, J. (2011). Adverse clinical events during intrahospital transport by a specialized team: a preliminary report. American Journal of Critical Care: An Official Publication, American Association of Critical-Care Nurses, 20(2), 153–161; quiz 162. https://doi.org/10.4037/ajcc2011478 Lardner, R. (1996, June). Effective Shift Handover - A Literature Review. Gov.Uk. https://www.hse.gov.uk/research/otopdf/1996/oto96003.pdf

Macleod, F., & Richardson, S. (2018, July 6). Piper Alpha: The disaster in detail. Thechemicalengineer.Com. https://www.thechemicalengineer.com/features/piper-Manias, E., Geddes, F., Watson, B., Jones, D., & Della, P. (2015). Communication failures during clinical handovers lead to a poor patient outcome: Lessons from a case

NATIONAL TRANSPORTATION SAFETY BOARD. (1991, September 11). Erau.Edu. https://libraryonline.erau.edu/online-full-text/ntsb/aircraft-accident-

Patterson, E. S. "Handoff Strategies in Settings with High Consequences for Failure: Lessons for Health Care Operations." International Journal for Quality in Health Patterson, Emily S., and Robert L. Wears. "Patient Handoffs: Standardized and Reliable Measurement Tools Remain Elusive." The Joint Commission Journal on

Rattray, Nicholas A., et al. "Content Counts, but Context Makes the Difference in Developing Expertise: A Qualitative Study of How Residents Learn End of Shift

White, J. R. (2014, August 1). Lockout/tagout accident investigation -- occupational health & safety. Occupational Health & Safety. https://ohsonline.com/Articles/2014/08/01/LOTO-Accident-Investigation.aspx

Wikipedia contributors. (2022, June 5). Texas City Refinery explosion. Wikipedia, The Free Encyclopedia. https://en.wikipedia.org/w/index.php?title=Texas\_City\_Refinery\_explosion&oldid=1091671002

*Figure 1: Moon & Hayden Handoff Framework*