



# Assessment of Barriers to Educational Technology Acceptance

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October 27, 2024

# The Project



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# The Project

- Part of an overall training modernization process
- This report examines work by Defense Research and Development Canada (DRDC) to develop a model of factors that inhibit the use of learning technology

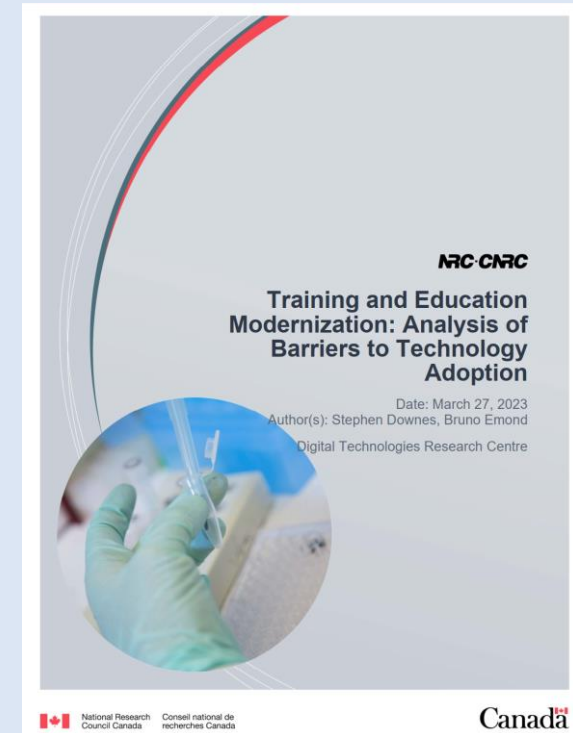


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# Full Publications

## Defense Research and Development Canada (DRDC)

- Training and Education Modernization: Analysis of Barriers to Technology Adoption . Mar 27, 2023. [https://cradpdf.drdc-rddc.gc.ca/PDFS/unc466/p817939\\_A1b.pdf](https://cradpdf.drdc-rddc.gc.ca/PDFS/unc466/p817939_A1b.pdf)



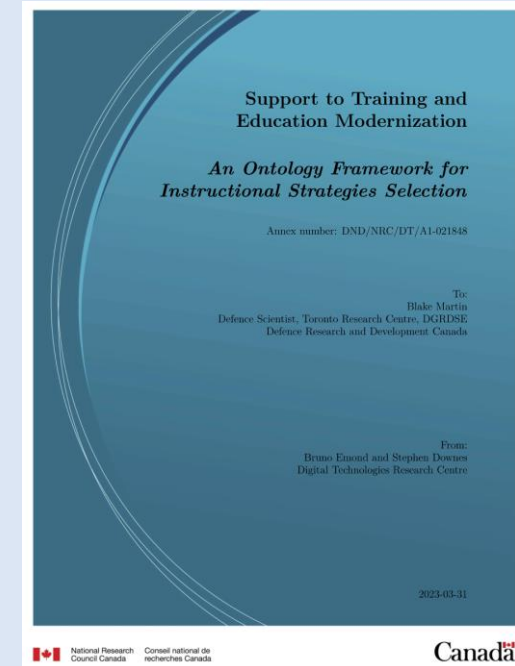
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# Full Publications

## Defense Research and Development Canada (DRDC)

- An Ontology Framework for Instructional Strategies Selection Report Report. Mar 31, 2023. [https://cradpdf.drdc-rddc.gc.ca/PDFS/unc456/p817583\\_A1b.pdf](https://cradpdf.drdc-rddc.gc.ca/PDFS/unc456/p817583_A1b.pdf)



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# My Motivations

- To share a structured description of the factors involved in a study of this sort – to inform people who may not have this background
- To ask about the use of ‘x perception of y’ studies
- To consider the limits of a cognitive (aka folk psychological) study of human motivations, actions and decision-making



# Acceptance Models



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# Acceptance Models

- Adoption theory describes the choices individuals make and is understood in terms of behaviour change.
- Diffusion theory considers the spread of a technology over time across an organization





# Innovation Diffusion Theory (Rogers, 1962)

Five stages of diffusion :

- awareness of the innovation,
- persuasion of its benefits,
- decision to adopt the innovation,
- implementation of the decision, and
- confirmation of the innovation process.



# Theory of Planned Behavior (Ajzen, 1985)

Changes in intention can be caused by:

- changes in the salience of belief,
- new information,
- changes in confidence or commitment,
- individual differences (skills, willpower, emotions)
- external factors (time, opportunity, others).



# Technology Acceptance Model (Davis, 1989)

Considers attitudes, rather than behavioural intentions, as the main predictors of behaviour:

- usefulness
- ease of use

Decomposed Theory of Planned Behavior (DTPB) combines TPB and TAM to depict specific beliefs as decomposed into belief constructs (Taylor & Todd, 1995).



# Concerns-Based Adoption Model (Straub, 2009)

Includes three diagnostic, judgement-free components:

- the Stages of Concern (SoC) survey;
- Levels of Use (LoU) interviews; and
- Innovation Configuration Maps (ICM)

“Technology adoption is a complex, inherently social, developmental process.”



# Unified Theory of Acceptance and Use of Technology (Venkatesh, et al., 2003)

- three direct determinants of intention to use (performance expectancy, effort expectancy, and social influence)
- two direct determinants of usage behavior (intention and facilitating conditions).



# UTAUT2 (Venkatesh, et al., 2012)

- four constructs (performance expectancy, effort expectancy, social influence and facilitating conditions) from the UTAUT model
- three new constructs (hedonic motivation, price value and habit) as antecedents of behavioral intention and use behavior



# Barriers to Technology Adoption (Reid, 2014)

- Unavailable technology is an obvious barrier.
- Less obvious are the reliability and complexity of available instructional technologies.
- Faculty with poor self-efficacy may be reluctant to try them.
- Faculty turning away from it will influence others to do the same



# Discussion

- Technology acceptance is individual but influenced by beliefs, desires, fears, perceptions, social factors
- Technology adoption is organizational and influenced by acceptance along with other factors
- Difficulty of obtaining a *structured* description

## The DRDC Model

- Technology
- Process
- Administration
- Environment
- Faculty





# Risk Management



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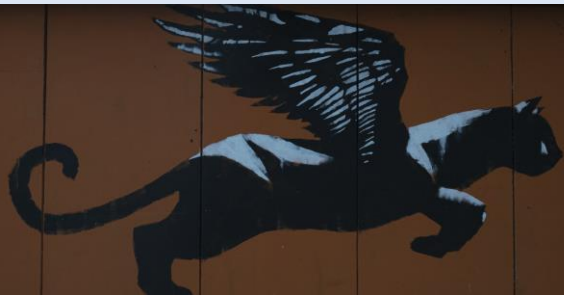
# Risk Assessment Models

- measure exposure to negative consequences as a result of a policy or plan
- may be qualitative, quantitative, or a combination of
- usually subjective, measuring ‘perceived’ or ‘expected’ risk



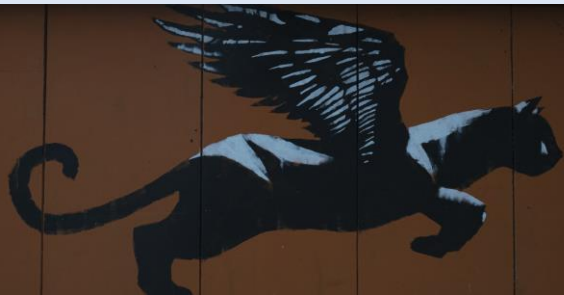
# Fine-Kinney method (1971, 1976)

- calculates a risk score based on the product of scores for probability, exposure, and consequences.
- Each is weighted equally; later modifications vary the weighting.



# Analytical Hierarchy Process Model (Harker, 1989)

- method for weighting and combining multiple goals or outcomes and multiple criteria in order to obtain weighted outcomes
- classification scheme organizing risk factors according to categories, for example, 'acts of god', 'financial', 'design', etc., with subfactors being identified under each



# Risk Matrix

- “Consistent predefined likelihood and consequence” (DOD, 2017, 23).

		Impact →				
		Negligible	Minor	Moderate	Significant	Severe
Likelihood ↑	Very Likely	Low Med	Medium	Med Hi	High	High
	Likely	Low	Low Med	Medium	Med Hi	High
	Possible	Low	Low Med	Medium	Med Hi	Med Hi
	Unlikely	Low	Low Med	Low Med	Medium	Med Hi
	Very Unlikely	Low	Low	Low Med	Medium	Medium

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# Discussion

- Risk is self-referential – ie., a discussion of perceptions of risk will result in a revision of perceptions of risk
- Risk perceptions vary depending on point of view
- Risk as an individual construct is quite different from risk as an organizational construct



# Validation

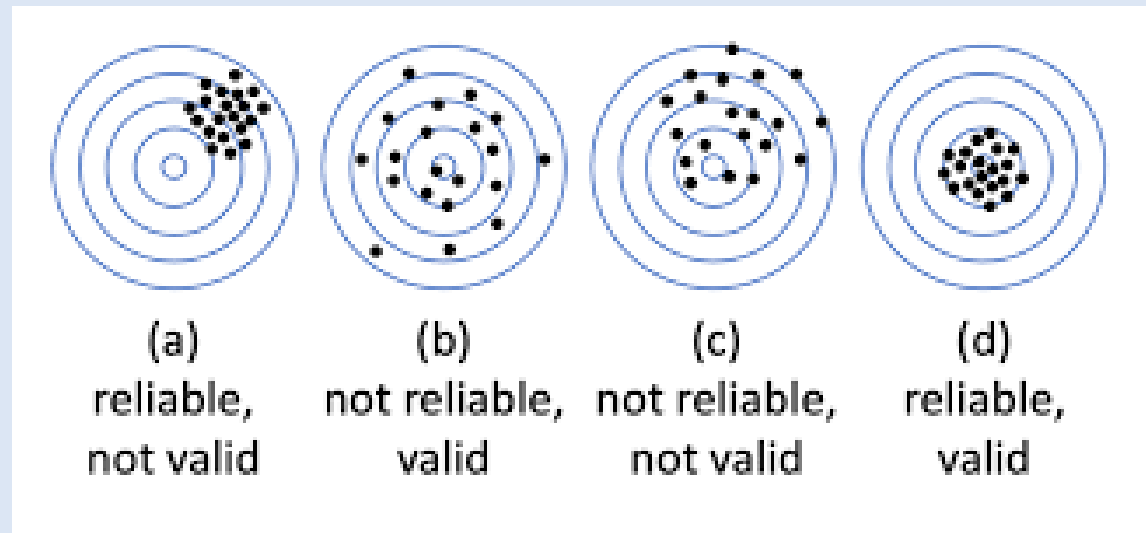


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# Validity and Reliability (AERA, 2014)

- reliability refers to the consistency of a measure,
- validity refers to the accuracy of a measure.





# Content Validity

Content validity involves assessing whether the questions in the survey cover the entire range of issues or concepts being studied.

- the degree of correlation of test scores with external criteria (Cureton (1951) in Sireci, 1998, 88)
- includes elements of content representativeness and content relevance (Messick, 1975) or process (Tenopyr, 1977).



# Construct Validity

The structure or construction of the concept intended to be measured

E.g. In a Likert survey, where respondents the option that best describes their attitudes, beliefs, and experiences, the Rasch model measures such factors as the unidimensionality and local independence of those options (Yamashita, 2022, 4).



# Criterion Validity

“The extent to which an operationalization of a construct, such as a test, relates to, or predicts, a theoretical representation of the construct - the criterion“

- evidence concerning its reliability, the extent to which it represents the intended construct (AERA, 2014)
- ‘Logic Model’



# Test-Retest Reliability

Administering the survey twice to the same group of people and comparing the results to ensure that they are consistent

- it may be sufficient to administer the same survey twice to the same type of people.
- distinguishing random short-term score differences from true improvements or deteriorations over time” (Polit, 2014).



# Internal Consistency

Extent to which the questions in the survey are measuring the same construct.

For example, if some questions are asking about the objective existence of an entity, and other questions are asking about a respondent's perceptions of an entity, the questions are not measuring the same construct.



# Discussion

Three major components of study validity:

- Data – issues of fidelity, provenance, completeness, cleaning, etc
- Instrument – surveys vs measurement; what we study; limitations on what can be measured or comprehended
- Theory – defines what counts as data, the relation between a subject perspective and objective reality



# The Assessment

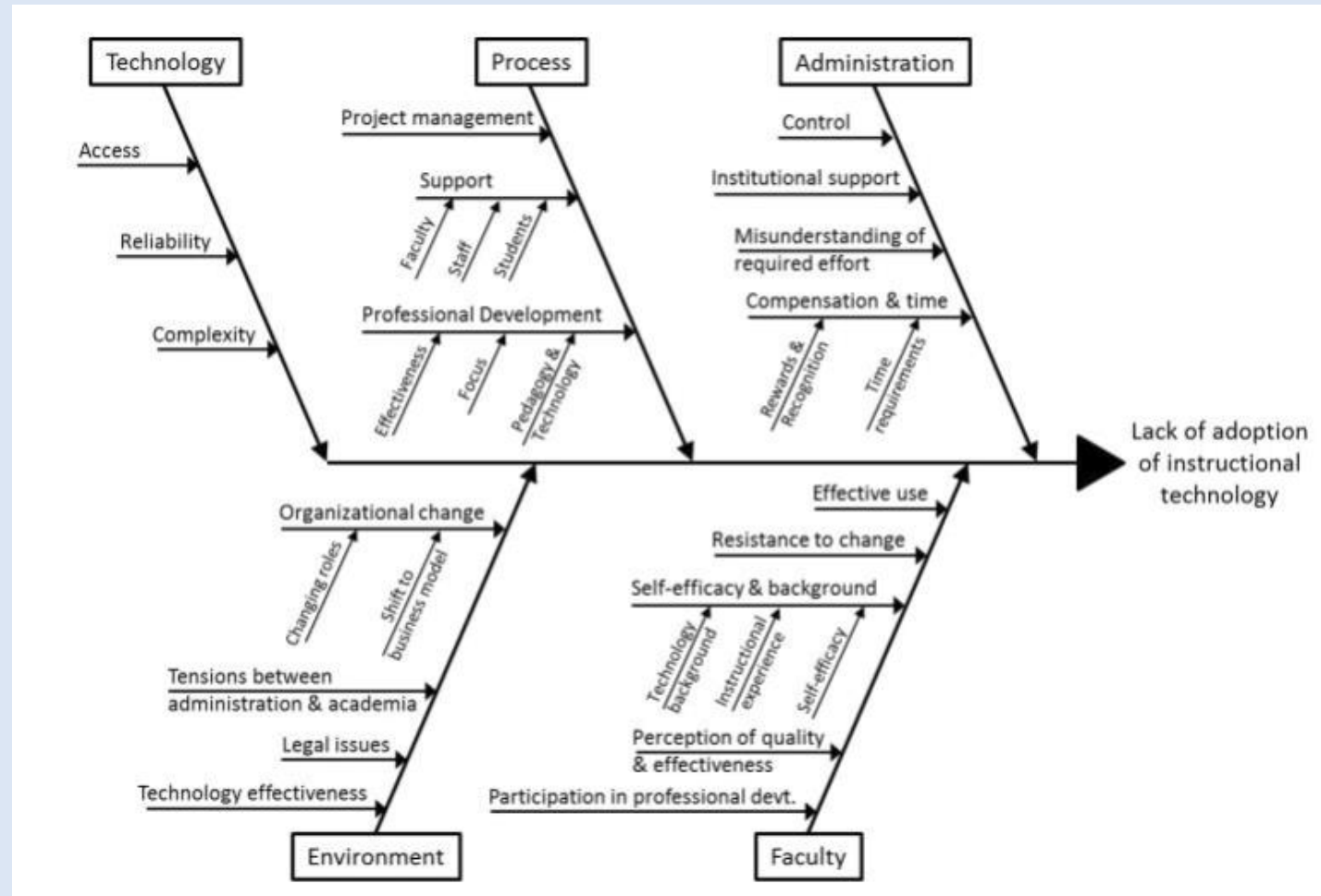


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# The DRDC Model

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# Results and Key Takeaways

Code	Barrier	Mode of Impact Rating	Mode of Presence Rating
T1	Technology – Access		Sometimes
T3	Technology – Complexity	Serious	Usually*
P1	Process – Process Management	Moderate*	Usually
P2	Process – Support to Trainers	Serious	
P5	Process – Learner Needs	Moderate*	
E2	Environment – Value of Instructor’s role		Sometimes*
E4	Environment – Legal Concerns		Sometimes*
TS4	Training Stakeholders – Positive perception	Moderate*	

Note: \* = most common rating after “No Observation.”



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# Looking at Barriers as...

## Pathways

- less focused on acceptance models than it is an examination of an institution and specifically, what affordances are needed for an institution design or adapt new models and technologies

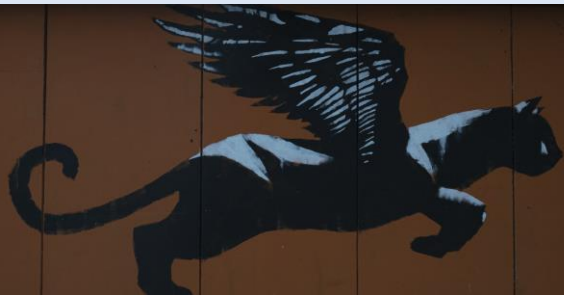
## Risk

- Questions addressing each of the categories and subcategories were designed following a risk assessment matrix model



# Conceptual Issues

- Are respondents talking about other people, or are they talking about themselves?
- Individual perceptions are influenced not only by their own experience but also as experienced either by behaviour that is modelled by others
- The emphasis on role may suggest to the respondent an intention to adopt an organizationally-based stance, a ‘view from nowhere’.



# Thank You

- Stephen Downes
- <https://www.downes.ca>



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