

Model Curation Implementation & Innovation

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By

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Models are *increasingly valuable*,
used throughout system lifespan

Need for *composability of models*
beyond original use

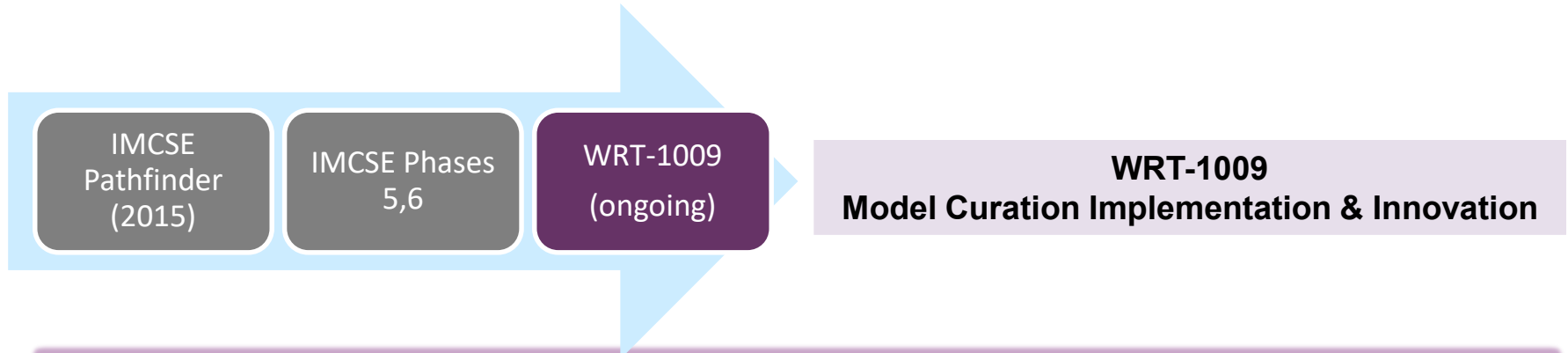
Significant IP challenges but model
sharing is imperative

Enterprise's modeling competency
not strategically managed

Models *seldom managed as*
enterprise collection

As model collections grow, *model*
discovery becomes difficult





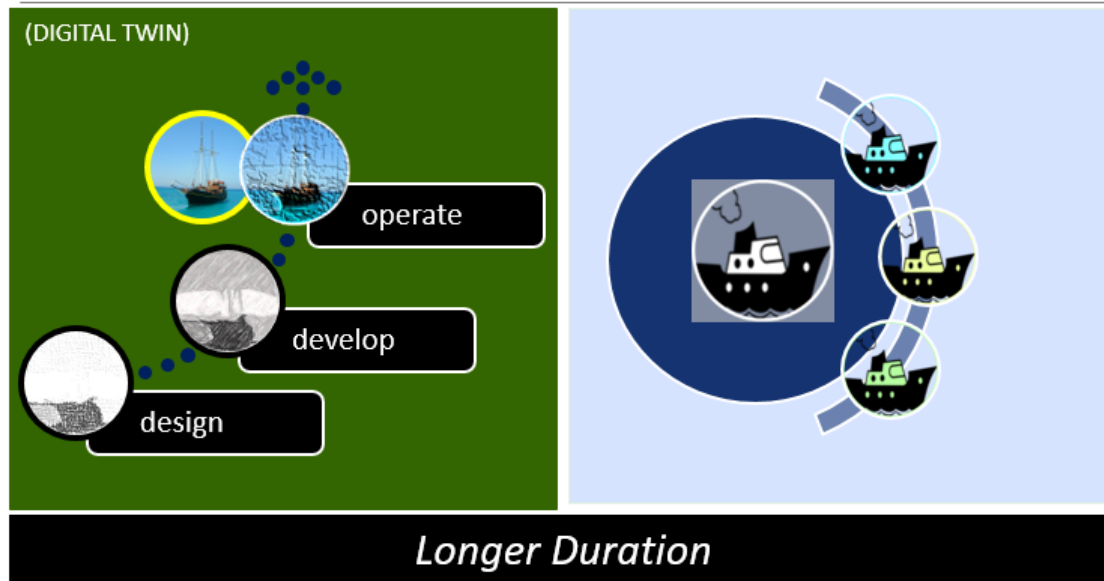
Prior Phase Findings:

1. SERC's initial investigation of model curation has indicated systems community will benefit from formal curation practices
2. Lack of access to models, mistrust of models, and perception of model legitimacy are barriers to reuse and longevity, potentially mitigated via model curation
3. Potential to adapt practices from other fields once the model curation-specific needs are understood
4. Enablers for implementation have potential to further enhance model curation practice: lexicon, pedigree standards, curation templates, etc.

*Model curation is the **lifecycle management, control, preservation and active enhancement** of models and associated information to **ensure value for current and future use**, as well as **repurposing** beyond initial purpose and context*

THROUGH LIFESPAN

MODEL REUSE



Enterprise model curator role aligned with the goals of DoD Digital Engineering Strategy



DoD organizations must “formally develop, integrate and curate models”



model curator

- enterprise model accessions
- valuation of model and digital artifacts
- strategic loan/acq of models
- oversight of model collection activities
- set model collection policy/practices
- strategies for model-centric future
- leadership for model demonstrators

Prior Phase Findings

Semi-structured interviews indicate enterprise leaders recognize need for enterprise-level leadership

Seven alternative organizational forms for model curation leadership identified, with conditions under which form would be most appropriate

research objectives

1. **Investigate** curation implementation practices
2. **Identify** precursors, enablers and barriers to model curation
3. **Discover** innovation opportunities using new technologies

collaborate

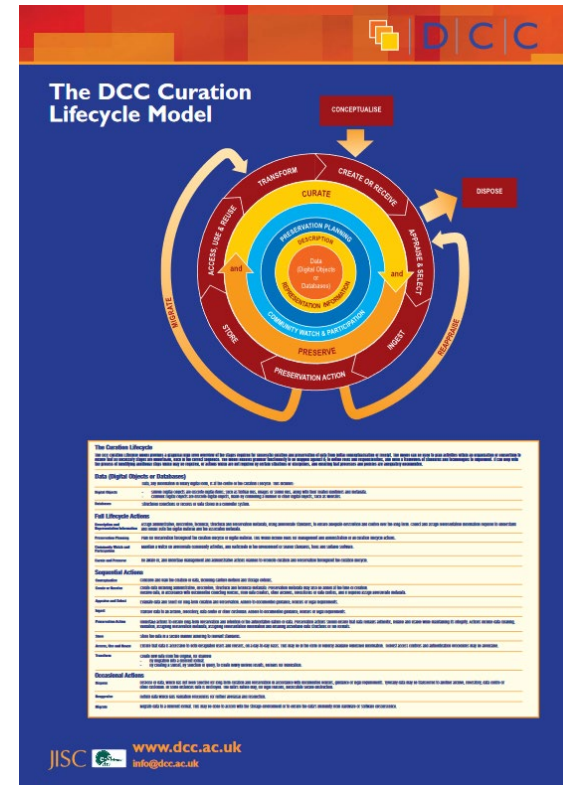
- Engage with research stakeholders to evolve implementation practices
- Connect with other researchers within and outside of SERC
- Conduct workshop to set research agenda



What is the lifecycle model and what are fundamental practices for model curation?

What useful lifecycle models exist in other fields of curation?

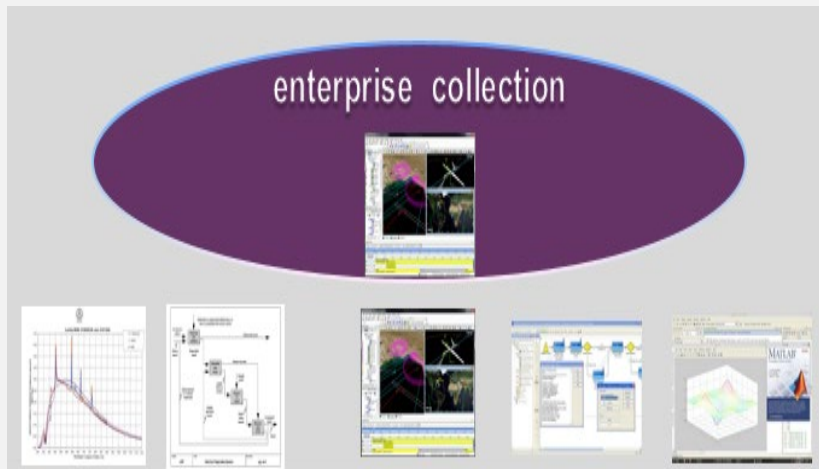
What relevant practices can be adopted/adapted for model curation?



Research approach: literature review, empirical knowledge gathering, technical exchanges

Model Accessioning

Formal process of officially accepting models (sets of models) into enterprise level model collection



Model Acquisition and Loan

Governance and oversight of acquiring and loaning models to external stakeholders

- Handle intellectual property concerns and agreements
- Valuation of models



What are the precursors, barriers and enablers for effective model curation?

Many questions to be explored through interacting with stakeholders and investigating related past work

examples

- How are models presently managed and controlled?
- How are models “certified”/evaluated for future use?
- What are the barriers to model curation throughout system lifespan?
- What issues impede model sharing between organizations?
- What practices and templates can better enable model curation?

Research approach: empirical knowledge gathering, technical exchanges, collaboration

model pedigree contains all of the information about a model, its origins and use over time

PURPOSE

...enable the decision maker to determine the model's status with respect to past achievements, theoretical and methodological state of the art, and the expert advice that went into its development

Gass & Joel (1980)



Pedigree has information not always included in engineering model documentation and metadata: model origin, originators and developers, development process used, assumptions and limitations, related expert knowledge, investment in model, etc.

- Credibility is determined not by the model, but by the model consumer's perception
 - Model curation requires continued investment... payoff is when enterprise uses, re-uses and re-purposes models
 - If model consumers do not find perceive models to be trustworthiness they will not be used
 - Perception of credibility is influenced by the infrastructure and user experience in accessing/discovering models

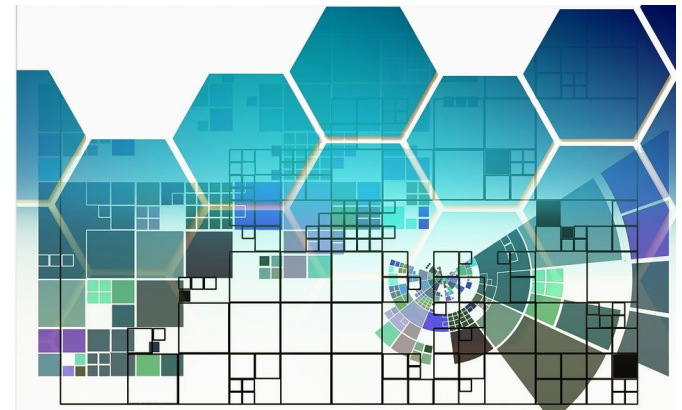


What innovations are emerging from other fields that may benefit model curation?

Leveraging new sciences/technologies: data science, visual analytics, machine learning, NLP, UX design, augmented intelligence, lightweight formal methods...

examples

- **machine-learning assisted triage method to replace manual curation** of biomedical knowledge, presently done by humans querying and reading articles (Lee et al., 2018)
- **visualizations created from data**, used in telling story of a library collection (Wissel & DeLuca, 2018)
- **use of interactive visualization** to provide curators with a means to analyze large-scale digital collections (Xu et al. 2014)



Research approach: research investigation, empirical knowledge, technical exchanges

Can newer technologies help...

- *Search for appropriate models within a large collection?*
- *Enable effective re-purposing of models for new context?*
- *Compose models to demonstrate a new capability?*
- *Customize model information to suit preferences of model consumer?*

Digital Demonstrators

Strategic support for selecting and composing models for a special purpose

Example: demonstration of new system capability in support of a competitive bid or market opportunity



- Prior SERC reports
- DEIXWG Knowledge Base
- Collaboration on model curation practices with several organizations
- Several talks and webinars



IW2019 MBSE Lightning Rounds - How Model Curation Influences Model Duration

Selected Publications

- Rhodes, D.H. (submitted, 2020). *Investigating Model Credibility in the Model Curation Context*. CSER 2020
- Rhodes, D.H. (2019) *Model Curation: Requisite Leadership and Practice in Digital Engineering Enterprises*. CSER
- Rhodes, D.H. (2018). *Using Human-Model Interaction Heuristics to Enable Model-Centric Enterprise Transformation*. IEEE SysCon
- Reymondet, L., Rhodes, D.H., Ross, A.M. (2016). *Considerations for Model Curation in Model-Centric Systems Engineering*, IEEE SysCon

Expected Outcomes

- Foundational knowledge and constructs
- Business case and justification for model curation
- Collaborative research agenda for model curation research
- Established community of interest and connections to other fields
- Shared vision of needs, challenges, and opportunities for innovation

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