



## Maturity Models in Biomedical Informatics: Current Status and Internationalization Workshop

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Justin Starren – Northwestern University

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## Outline

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- Overview. What are maturity models? – Dr. Embi
- Developing a Maturity Model, the CTME example – Dr. Starren
- Using maturity models at your institution. – Dr. Platt
- Where are we going, what can you do? – Dr. Wilcox
- Discussion



## Peter Embi – Vanderbilt University Medical Center

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## Dr. Justin Starren – Northwestern University

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- Developing a new Maturity Model
- Clinical Trials Management Ecosystem (CTME) example



## Define Need

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- Clinical trial management (CTM) is a large, complex and expensive operation.
- CTM requires many different systems, not just a Clinical Trial Management System (CTMS)
- Current maturity instruments in the Clinical and Translational Sciences Award (CTSA) consortium only ask about CTMS.



## Step 1:

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## Define Axes

- Study management
- Regulatory and Audit management
- Financial management
- Investigational product management
- Subject Identification & recruitment
- Subject management
- Data
- Reporting analytics & dashboard
- System integration and interfaces
- Staff training & personnel management
- Organizational maturity and culture



## Step 2: Define Levels

- Developed REDCap survey to solicit candidate statements for each maturity level for each axis.
  - Did Levels 1 and 5 first, then 2,3,4
- Statements clustered under **Standardization, Complexity/Integration, and Monitoring**
- Collaborative discussion and refinement of each statement.
  - 3-7 statements per level.
  - Over 200 individual statements



## Step 3: Test and Refine

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- Core group attempts to utilize instrument.



## Timeline

Activity	Duration	Complete
Axes Defined	2 mo	Mar. 22
Level 1 & 5 Defined	4 mo	July 22
Intermediate Levels Defined	7 mo	Feb. 22
Review Draft Model	1 mo	Mar. 22
Redcap Survey Tool	2 mo	May 23
Initial CTSA Hub Survey	est	Oct. 23
Paper	est	Nov. 23



## Jodyn Platt – University of Michigan

- Using maturity models at your institution.



## Using maturity models at your institution

- Interviews (n=34, 1h, 3 institutions)
  - Focus on molecular tumor board
  - What is the current state of maturity of precision health (oncology) at your institution?
  - Facilitators and barriers to advancing maturity
- Workshop (n=18)
  - Focus on precision health



## Overview of Key Findings

### Current state:

- Knowledge and expertise gaps
- Need for institutional support
- Lacking LHS infrastructure
- Limited tools



### Future Maturity Pathways:

- Better tools and tech
- Expanded NGS testing
- Greater education
- Improved access
- Data privacy & security solutions



### Implications for Maturity Models:

- Limited learning from practice
- Growing role of industry
- Proprietary v collective LHS



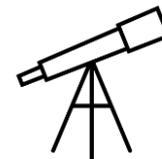
Critical environment: policy barriers, reimbursement challenges, limited access





## Strategies to Advance Maturity and use of MMs

- **Value proposition**
  - Stakeholder definition and engagement
  - Willingness to adapt
- Investing in “**how**”
  - **Emerging technologies** that augment clinical practice
  - **Education** and **capacity building** for stakeholders (patients and physicians)
- Responding to **critical environment** issues





## Critical environment

- **Policy** enabling patient data sharing supports improvement, but cumbersome
  - HIPAA (clinical versus research)
  - Institutional policy
- Sequencing technology outpacing reimbursement designations
  - **Payors** tend to allow individual gene code stacking instead of creating standardized codes for large panel tumor profiling tests. It is unclear whether MTB decisions regularly play a role in the authorization for coverage process.
- Concerns about **cost and accessibility** for individuals and organizations





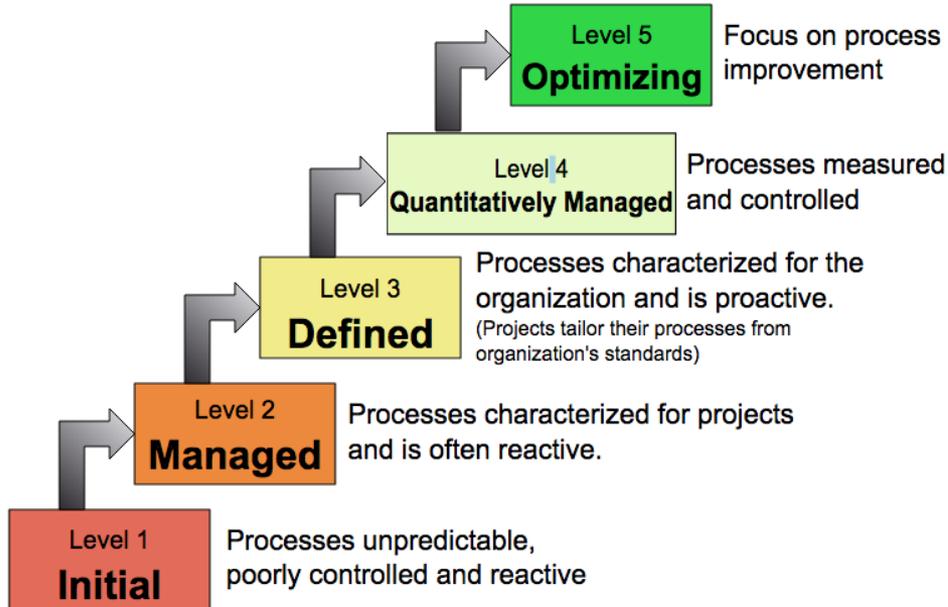
## Adam Wilcox – Washington University in St. Louis

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- Where are we going, what can you do?



## Capability Maturity Model Integration





## HIMSS Analytics Maturity Model

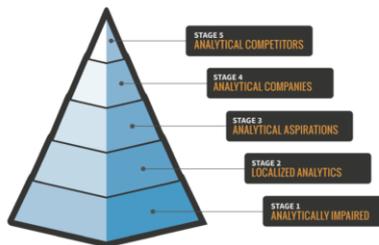
Stage 1: **Analytically Impaired**: Organizations at this level are “not data driven.” They rely on gut feel and plan to keep doing so. They aren’t asking analytics-driven questions and/or lack the data to answer them.

Stage 2: **Localized Analytics**: Organizations at this level are primarily “using reporting.” They are doing analytics or reporting in silos.

Stage 3: **Analytical Aspirations**: Organizations at this level “see the value of analytics.” They are still struggling to mobilize the organization and become more analytical.

Stage 4: **Analytical Companies**: Organizations at this level are “good at analytics.” They are highly data oriented, have analytical tools and make wide use of analytics. They are still working on commitment to use analytics strategically.

Stage 5: **Analytical Competitors**: Organizations at this level have reached “analytical nirvana.” They use analytics broadly and deeply across the enterprise as a competitive differentiator.



The State of Analytics Maturity for Healthcare Providers. International Institute for Analytics and HIMSS Analytics, 2014.

<b>D</b>	DATA	BREADTH, INTEGRATION, QUALITY
<b>E</b>	ENTERPRISE	APPROACH TO MANAGING ANALYTICS
<b>L</b>	LEADERSHIP	PASSION AND COMMITMENT
<b>T</b>	TARGETS	FIRST DEEP THEN BROAD
<b>A</b>	ANALYSTS	PROFESSIONALS AND AMATEURS



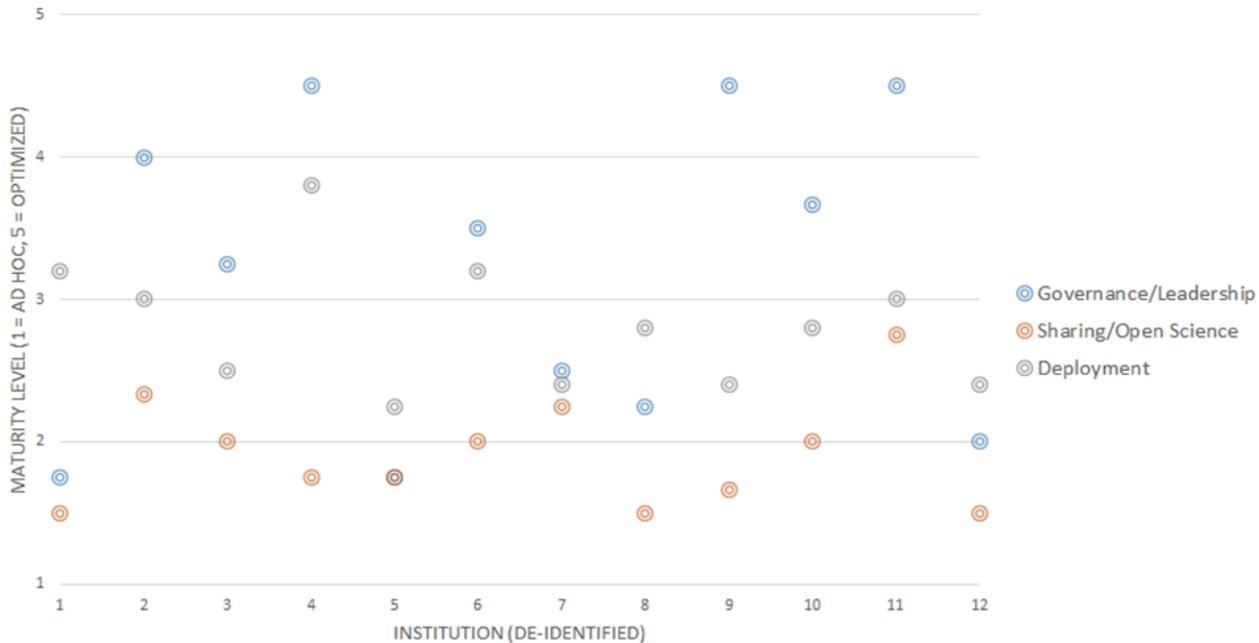
## HEALTHCARE ANALYTICS ADOPTION MODEL

Data binding grows in complexity with each level

Level 8	Personalized Medicine & Prescriptive Analytics	Tailoring patient care based on population outcomes and genetic data. Fee-for-quality rewards health maintenance.
Level 7	Clinical Risk Intervention & Predictive Analytics	Organizational processes for intervention are supported with predictive risk models. Fee-for-quality includes fixed per capita payment.
Level 6	Population Health Management & Suggestive Analytics	Tailoring patient care based upon population metrics. Fee-for-quality includes bundled per case payment.
Level 5	Waste & Care Variability Reduction	Reducing variability in care processes. Focusing on internal optimization and waste reduction.
Level 4	Automated External Reporting	Efficient, consistent production of reports and adaptability to changing requirements.
Level 3	Automated Internal Reporting	Efficient, consistent production of reports and widespread availability in the organization.
Level 2	Standardized Vocabulary & Patient Registries	Relating and organizing the core data content.
Level 1	Enterprise Data Warehouse	Collecting and integrating the core data content.
Level 0	Fragmented Point Solutions	Inefficient, inconsistent versions of the truth. Cumbersome internal and external reporting.



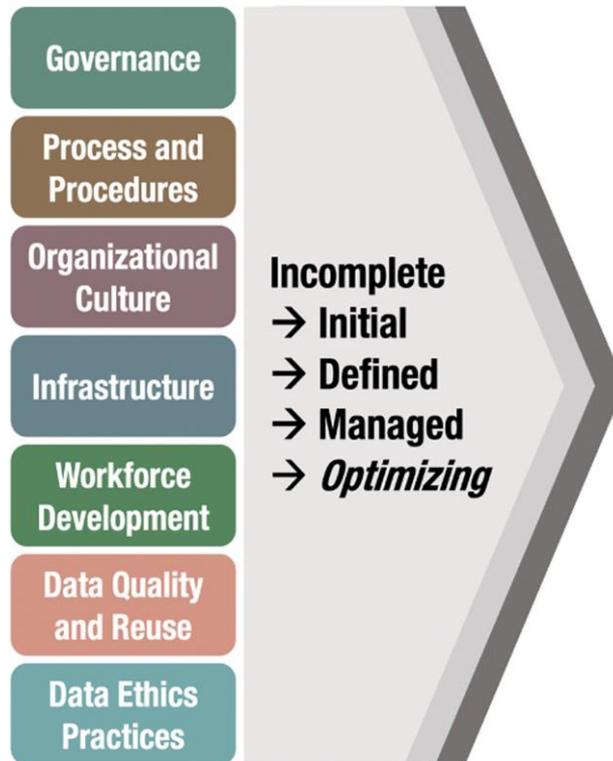
## Research Informatics and Open Science Maturity model Average maturity level by domain





## Research Data Sharing Capacity Maturity Model

Champieux R et al. Ten simple rules for organizations to support research data sharing. PLOS Computational Biology, 2023.





## Development Process

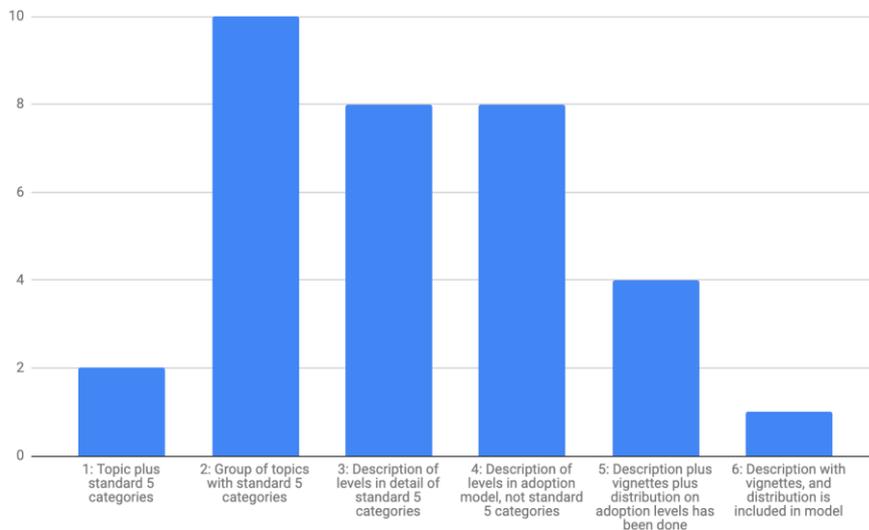
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- Individual Expert
  - DELTA, Health Analytics Adoption Model
- Surveys/Interviews
  - RIO SM
- Expert Consensus
  - Research Data Sharing Capacity



## Levels of Meta-Maturity

1. Single topic, standard 5 levels
2. Multiple topics, standard 5 levels
3. Detailed description of 5 levels
4. Adoption model, not standard 5 levels
5. Vignettes as descriptors; data distributions
6. Distribution as part of model





## Links & Discussion

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- [Connect.amia.org/maturity](https://connect.amia.org/maturity) (AMIA members only)
- [Justin.starren@northwestern.edu](mailto:Justin.starren@northwestern.edu) (for CTME REDCap data dictionary)