

# Data Quality Monitoring Plan

Presented to Office Directors - May 21, 2019

Prepared by the Office of Data Quality and Visualization



Virginia Department of  
Behavioral Health &  
Developmental Services

# Goal and Objectives

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The goal of this data quality effort is to provide reliable, actionable knowledge.

*The following objectives will support the accomplishment of this goal.*

## **Establish Data Quality Guidelines (*Maturity Model*)**

Establish objective, measurable guidelines for data quality, enabling data consumers to better manage and direct accuracy of business information reporting.

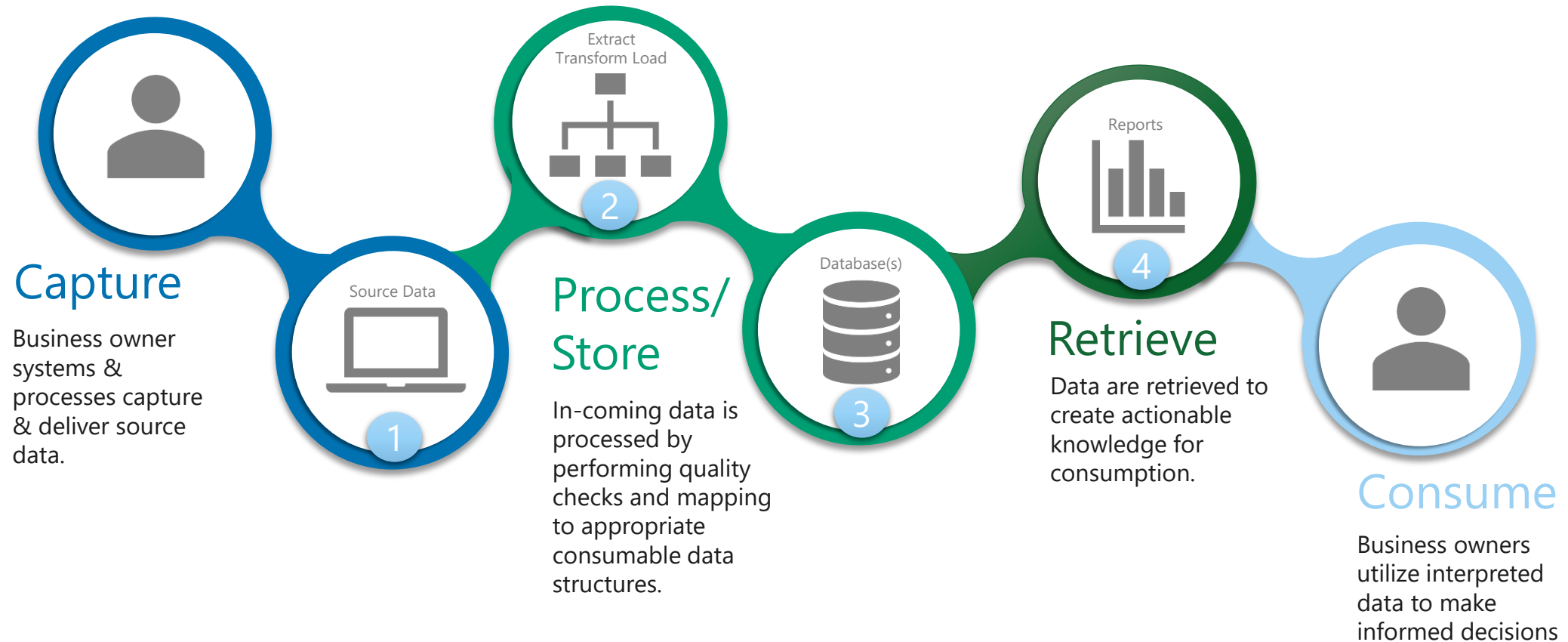
## **Empower Business Owners and Analysts**

Empower business owners (and all related parties) who source, store, and consumer data with specific recommendations and justification for improved data quality from beginning to end.

## **Ensure Continued Data Quality Improvement**

Adopt a monitoring cadence for verifying data quality best practices, using the maturity model, throughout its lifecycle to ensure consistent and continual improvement.

# Data Quality Control Points



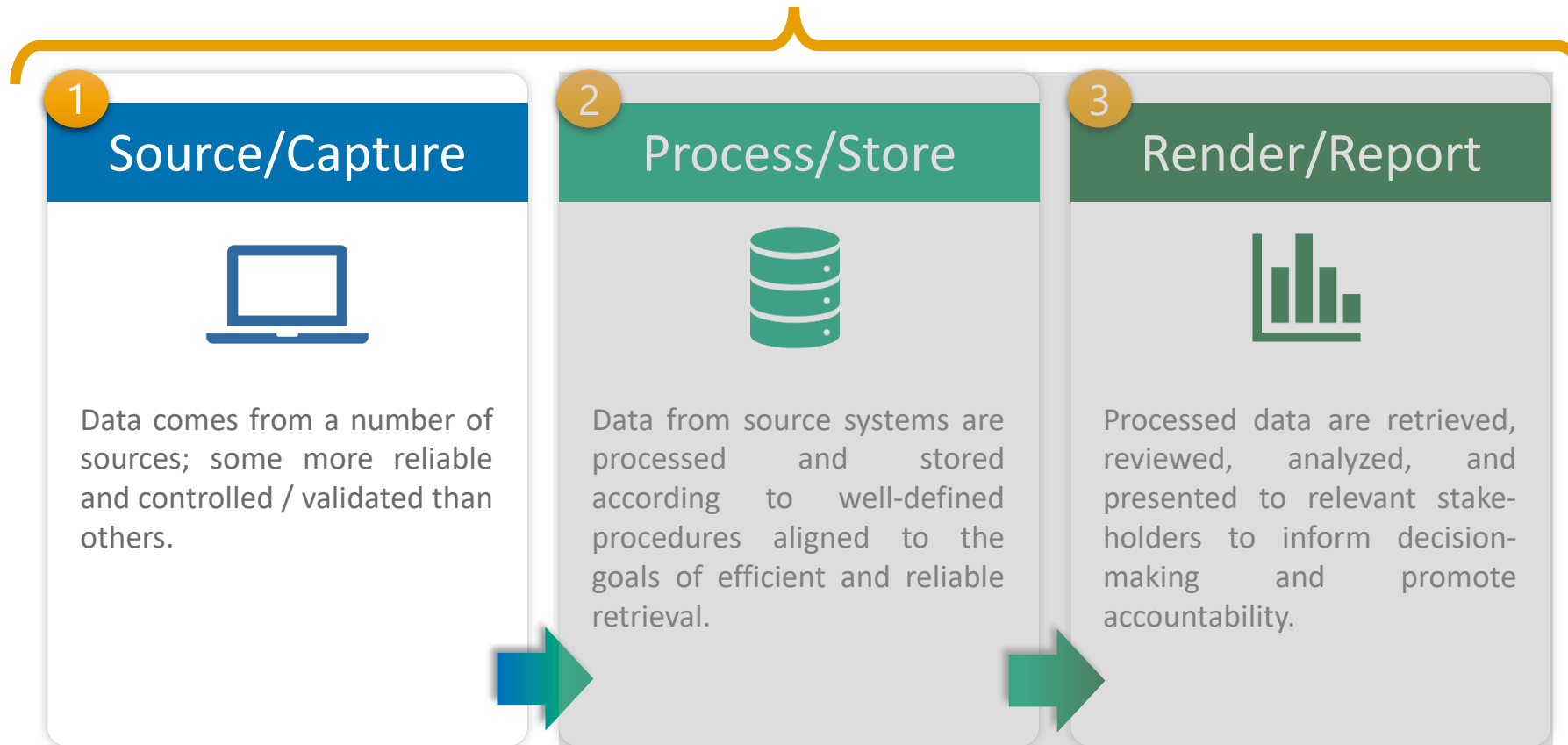
# Steps of Quality Monitoring

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1. Determining what to monitor
2. Determining priorities in monitoring
3. Selecting an assessment approach
4. Formulating criteria and standards
5. Obtaining the necessary information
6. Choosing when and how to monitor
7. Constructing a monitoring system
8. Bringing about behavior change

# Phases of Data Processing



# Initial Source System Reviews



- Individual Support Plan (ISP)
- Independent Housing
- Regional Support Teams (RST)
- Post-Move Monitoring (PMM)
- Community Consumer Submission (CCS3)
- Office of Licensing Information System (OLIS)
- Individual and Family Support Program (IFSP)
- Protection Advocacy Incident Reporting System (PAIRS)
- Children in Nursing Facilities
- Computerized Human Rights Information System (CHRIS) Human Rights
- Computerized Human Rights Information System (CHRIS) Serious Incident
- Waiver Management System (WaMS)

# Steps of Quality Monitoring

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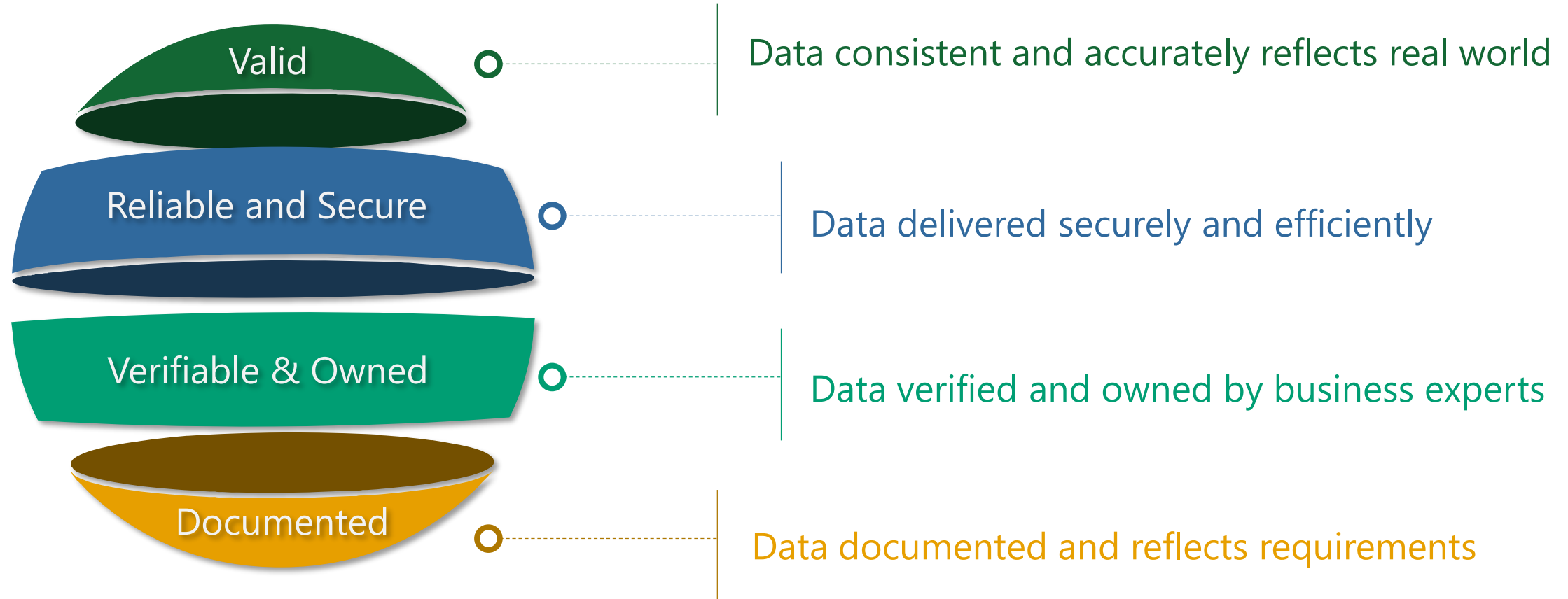


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# Data Quality Maturity Attributes



## Core Attributes





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# Initial Assessment



- Contents of the data source
- Who enters the data
- Purpose of analyzing the data
- Unique Identifiers and joining
- Existing documentation
- Existing data validation
- Data quality concern
- Data quality concern - Suggested solution
- Status of the solution

Office of Licensing Data System (OLIS)				Accuracy	Timeliness	Usability
Contents of data source	Purpose of analyzing the data	Who enters the data	Existing data validation			
<ul style="list-style-type: none"> <li>▪ Licenses issued by provider, service, service location, program, and program details</li> <li>▪ Applications for licenses including those not approved</li> <li>▪ DBHDS staff info</li> <li>▪ Details of inspections and investigations including follow up actions.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Reports on number of licenses for service type by location</li> <li>▪ Monitor licensing specialist inspections, citations, investigations, and corrective actions</li> </ul>	<ul style="list-style-type: none"> <li>• Licensing specialists</li> </ul>	<ul style="list-style-type: none"> <li>▪ Very little existing; new system will have more</li> </ul>			
What we would like to do		Unique identifiers and joining	Existing documentation			
<ul style="list-style-type: none"> <li>▪ Analyze inspections, citations, and investigations by provider, service, region</li> <li>▪ Analyze licensing response to serious incidents and deaths using aggregate data</li> </ul>		<ul style="list-style-type: none"> <li>▪ New system will use NPI number and name; cannot be linked across systems</li> <li>▪ Program and service codes are unique</li> </ul>	<ul style="list-style-type: none"> <li>▪ No data dictionary</li> <li>▪ Some definitions can be found in licensing regulations</li> </ul>			
Data quality concern	Solution	Status	Status notes			
License conditions (LicenseConditionValue) are not applied in a consistent way	Data validation that checks whether an initial license is new, etc.	Unclear	Data validation on this field may be possible with new vendor			
Service code descriptions are written manually, so there are too many unique values due to typos	Data validation on descriptions so that they are identical for each program and service code	Unclear	Data validation on this field may be possible with new vendor			
No integration with incident reporting system (CHRIS)	Incident reporting directly in same application	In progress	New vendor has capability for CHRIS integration			
Very little data validation on names, addresses, etc.	Automatic data validation of new and historical data	In progress	New vendor will run data validation on OLIS data beginning in about January 2020			
Inspection time field does not allow for text entry, and units are unclear	Provide guidance on what the number should represent (minutes or hours)	Unclear	New field description may be possible with new interface when we transition to new vendor			
Closed locations still populate in the inspection screens that the specialists use to enter data	Currently, specialists manually alter the name of a closed location to say CLOSED or to have a * in front of the name	In progress	New licensure system will not display closed locations			
Not all regulations are populated	Fix application so that all <u>regs</u> populate	In progress	Developers are working on a fix			
Specialists can only enter one action and one purpose	Consider allowing "check all that apply" or another way to check CAP + something else	Unclear	Not sure which option would be preferred by OL			
"Human rights investigation" is not an option under purpose	Add to list of purposes	Unclear	No plans to change at this time			
OHR investigations are entered as "inspections" by licensing specialists	Build in way for OHR investigations to be entered	Unclear	No plans to change at this time			

# Steps of Quality Monitoring

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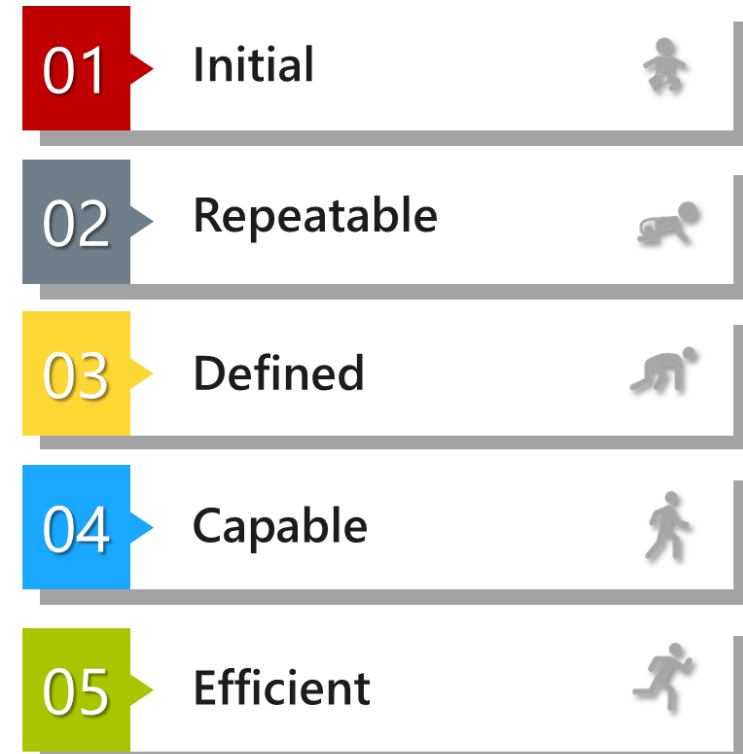
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# Data Quality Maturity Model



## Purpose

- Provide perspective on best practices and what should be expected of their data
- Help business owners justify actions & resources needed to improve data quality as they progress up the maturity model
- Provide direction as to how they can progress up the maturity model.



Based on the Capabilities Maturity Model from IEEE Software framework standards. See Appendix for details.

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# Maturity Review Process



## Scalable, Objective Review

Assessing data sourcing systems, data processing/storage systems, and data retrieval/rendering systems - by comparing core attributes to best practices at varying levels - will result in recommendations for improvement, and maturity level placement

Confidential

System Name: Data Source System XYZ  
Business Owner: Joe Smith, Director of WXYZ

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Recommendations

Data Quality Maturity Review Recommendations  
Review Date: 3/21/2019

Additional comments

Recommendations to progress to next level

Category Sub-category Description Weight Characteristics Identified

Validity

Data validation processes

To progress to next level (4), do the following:  
- All applicable fields should limit data to valid choices, or at least warn user and block from processing if invalid choice selected/entered.  
- If supported, lookup and validation data should be periodically imported from approved reference sources (e.g., data warehouse) and prepopulated or compared to for validation purposes.  
- Note: often software changes may be required to achieve the goal.

(Free-form supporting comments, notes, etc. may be entered here by analyst conducting maturity review)

Confidential

Data Quality Maturity Review Definitions  
Review Date: 3/21/2019

System Name: Data Source System XYZ  
Business Owner: Joe Smith, Director of WXYZ

Category Sub-category Description Weight Characteristics Identified

Validity

Data validation processes

Data delivery/integration process

Reliability & Security

Source provider change management

Variables & Control

Business Owner

Business Processes

Documented

References availability

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# Maturity Matrix Layout



**Data Quality Maturity Review Definitions**

System Name: Data Source System XYZ  
 Review Date: 3/21/2019  
 Business Owner: Joe Smith, Director of MXX

Category	Sub-category	Description	wgt	Characteristics-Level 1
Validity	Data validation processes	Data validation rules: point-of-entry checks Data rules for comparison and/or lookup references, ranges, etc.	100%	Data collected and stored electronically. -> Challenges: -may be collected via free-form text entry with no pre-checks for validity. E.g., Text characters entered into numeric and currency fields without resulting in warnings, errors, or any feedback to person entering data. -data entered are not restricted to a valid set of choices: e.g., no dropdown list box or radio buttons -data...
	Data delivery integrity process	Required data structure (e.g., JSON/CSV/XML), parity checks, self-describing metadata, etc.		
	Data origination source type	Vendor COTS*, automated data collection, validated at point of entry, manual entry, etc.		
	Data uniqueness	UniqueIDs/Primary Keys, well defined relationships		
Reliability & Security	Automated, secured delivery		100%	

Select accordingly  
 If Characteric describes source system  
 true >> ✓ (1),  
 kind of true >> ! (0.5),  
 not true >> X (0).

**Data Quality Maturity Review Recommendation Options**

Category	Sub-category	Recommendation-1
Validity	Data validation processes	-if possible, implement basic validation rules, e.g.: -number/currency fields should be restricted to numeric values only; text and other special characters should be rejected or produce an error message, and -date fields should only accept validate dates, or invalid dates produce error message, preventing user from committing/saving invalid date.
	Data delivery integrity process	Required file(s) are delivered (e.g., uploading or copying file(s) to a central location). A notification of success should be provided via an email or other method.
	Data origination	Vendor controls are used to ensure data is collected via...

For each Sub-category's Characteristic identified, there is a canned Recommendation for how-to move up to next Level

- Document relevant to:
- Business Owner
  - SME
  - Developer
  - Bus/Data Analyst
  - End User



# Maturity Matrix Output



Data Quality Maturity Review Recommendations				System Name: Data Source System XYZ		
Review Date: 3/21/2019				Business Owner: Joe Smith, Director of WXY		
Cate	Sub-category	Description	W	Characteristics identified	Recommendations to progress to next level	Additional comments
<b>Validity</b>						
		Data validation rules; point-of-entry checks	100%			
	Data validation processes	Data rules for comparison and/or lookup references, ranges, etc.	25%	<p><b>LEVEL-1:</b> Data collected and stored electronically. -&gt; Challenges: -may be collected via free-form text entry with no pre-checks for validity. E.g., Text characters entered into numeric and currency fields without resulting in warnings, errors, or any feedback to person entering data. -data entered are not restricted to a valid set of choices; e.g., drop-down list box or radio buttons. -data not compared to any references or business rules to ensure it is valid; e.g., min/max values, date ranges, percentage boundaries.</p> <p><b>LEVEL-2:</b> -number/currency fields are validated for numeric only, and -dates are validated.</p> <p><b>LEVEL-3:</b> Same as level 2, plus -most multiple choice data elements are constrained to drop-down list boxes, radio buttons, etc. -some range constraints exist for validating some data; e.g., start dates come before end dates, percentages</p>	<p>To progress to next level (4), do the following: -all applicable fields should limit data to valid choices, or at least warn user and block from proceeding if invalid choice selected/entered. -if supported, lookup and validation data should be periodically imported from approved reference sources (e.g., data warehouse) and pre-populated or compared to for validation purposes. Note: often software changes may be required to achieve the above.</p>	{Free-form supporting comments, notes, etc. may be entered here by analyst conducting maturity review}
	Data delivery integrity process	Predefined data structure [e.g. JSON/CSV/XML], parity checks,	15%	<p><b>LEVEL-1:</b> Data can be delivered to central collection point.</p>	<p>To progress to next level (5), do the following: -for vendor systems that support API interfaces:</p>	

Final output shows all Characteristics to the highest level identified in review process; *in this example reached level-3*

Shows Recommendations for moving up to the next level; *in this example, to reach level-4*

And allows analyst to provide additional helpful comments, suggestions, prioritization, ...

Document relevant to:

Business Owner	<input checked="" type="checkbox"/>
SME	<input checked="" type="checkbox"/>
Developer	<input type="checkbox"/>
Bus/Data Analyst	<input checked="" type="checkbox"/>
End User	<input type="checkbox"/>



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# Process Flow



## Train

DQV provides training to business owners & SMEs—what & why.



## Review

DQV uses maturity model to assess each data source system.



## Recommend

Based on review, recommendations are provided for improvement.



## Improve

DQV helps to implement recommendations, e.g., documentation.



## Monitor

DQV re-assesses annually or when changes occur to source system.

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# Change through Transparency



- Promote the value of documentation
- Develop an "At-A-Glance" Overview with the Business Owner
  - Results in a catalog of all of the data systems
- Provide support in making improvements to improve their maturity score

**At-A-Glance Overview**  
Data Source: CHRIS Serious Incident Side (Serious Incident Reporting)

**OVERVIEW:**

**PROCESS:**  
Data used to monitor and investigate instances and trends of Level II and III Serious Incidents, including serious injuries and deaths.

**INPUT:**  
Licensed service providers, Licensing specialists

**OUTPUT:**  
Data to DBHDS Data Warehouse for use in various reports.

**BO:** Jae Benz, Dev Nair  
**SME:** Jae Benz, Angelica Howard  
**ITE:** Grace Sheu, Hung Luu  
**USER:** Offices of Licensing and Human Rights, Licensing specialists, Licensed service providers

**PURPOSE/USE:**

- Identify patterns and trends in injuries and deaths
- Respond to patterns and trends with corrective actions, prevention efforts, and quality improvement strategies
- Determine which providers are not reporting incidents and injuries as required by regulations

**FREQUENCY:**  
[?? Frequency data is delivered to DW]

**KEY DATA ELEMENTS:**

- Date, time, location, and circumstances of incidents and deaths
- Type of injury or incident
- Details about the nature of injuries
- Type of death and suspected event
- Description of medical treatment and finding (free text)
- Known facts about death (free text)
- Did incident involve seclusion, restraint, abuse
- External notifications
- Consequences and risks of harm
- Provider corrective actions
- Individual age, race, gender, and waiver type

**FILTERS/CRITERIA:**

- No unique individual ID
- System generated provider ID that is unique but not able to link to other data sources
- Licensed services have program and service codes

**CALCULATIONS:**  
Existing data validation:

- Checkboxes, drop down menus
- Licensed service location links with OLIS

**MISC NOTES:**  
Who enters the data:

- Licensed service providers
- Licensing specialists

  
Existing documentation:

- No data dictionary
- Some definitions in Code of Virginia / licensing regulations

File Name: chris\_seriousincident\_at-a-glance overview.docx  
Created By: VITA Program; 20-Mar-19

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Created By: VITA Program; 20-Mar-19

Page 1 of 2  
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# Appendix

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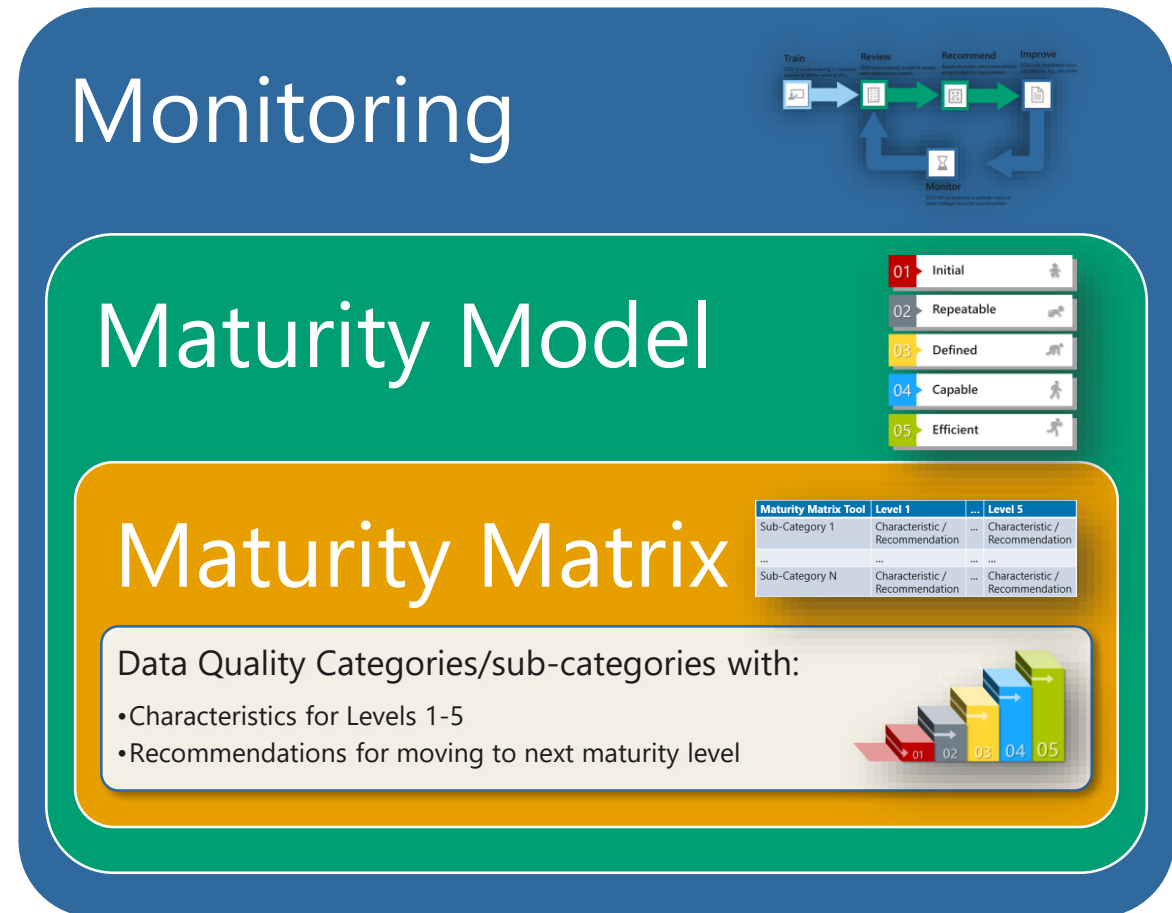
# Key Components of Monitoring Process



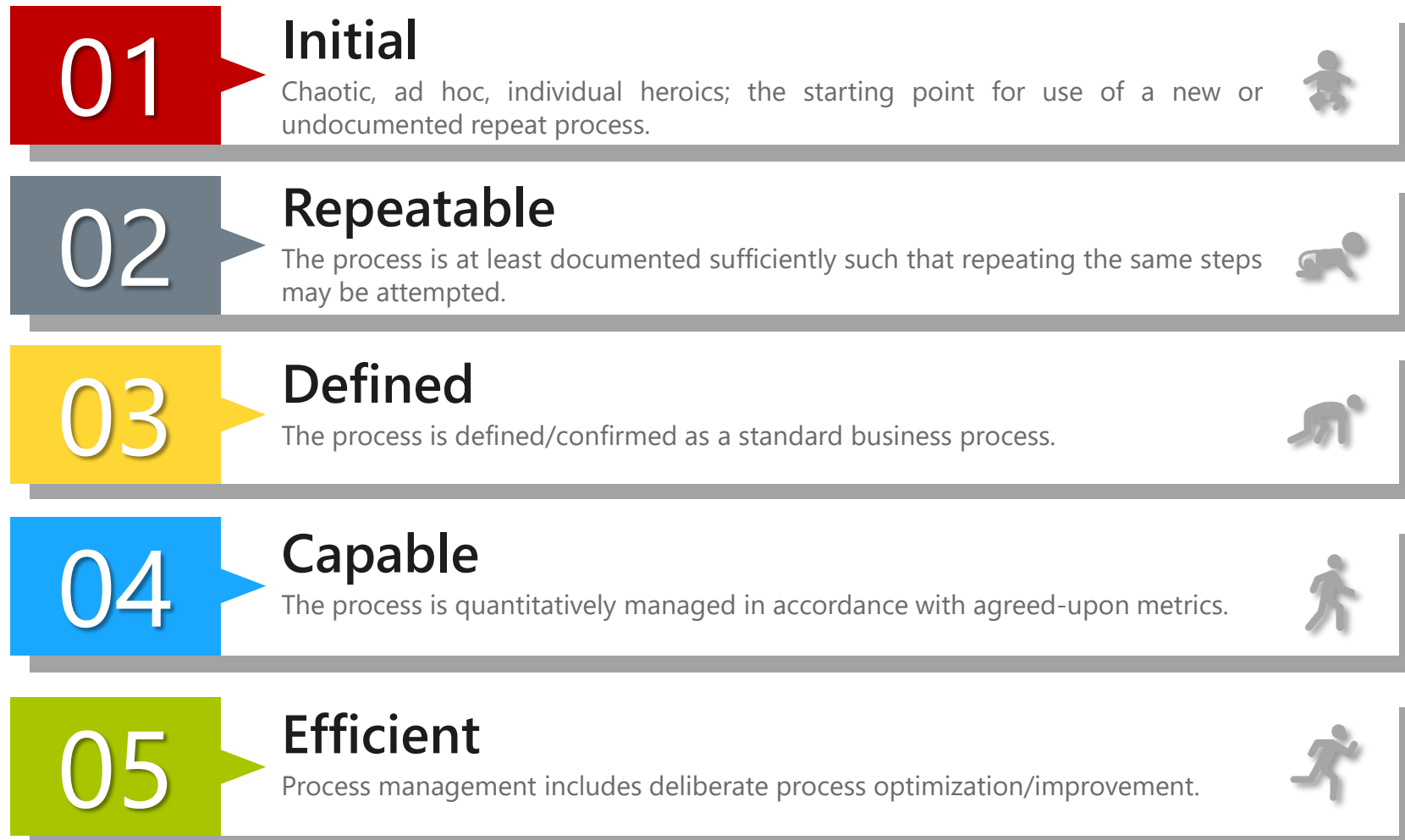
Data Quality Monitoring Process for assessing a data system's maturity and recommending improvements--*based on data quality best practices.*

This process is built on a capabilities Maturity Model (*levels 1-5*) to help provide prospective.

Which is incorporated into the Maturity Matrix measurement tool--*used to capture the characteristics of a system, at each maturity level, and make recommendations for improving data quality.*



# Five Levels of Maturity



# Data Quality Maturity Attributes



## Attributes

## Requirements

### Valid

### Data validation rules; point-of-entry checks

Data validation processes (*comparison and/or lookup references, rules, etc.*);  
Data delivery integrity process (*parity checks, self-describing metadata, etc.*);  
Data origination source type (*COTS, automated data collection, validated at point of entry, manual entry, etc.*); Data uniqueness (*UIDs/PKs, well defined relationships*)

### Reliable and Secure

### Automated, secured delivery

Data delivery reliability & security (*automated/scheduled, encrypted files, encrypted delivery protocol, org managed encrypt keys*); Source provider change management practices (*change notification process, staging/UAT, SLAs, etc.*)

### Verifiable and Owned

### Business owned & approved

Business owner (*director level or above*) identified/trained/responsible; Business reviewed & approved (*by one or more SMEs*); may also be verified by outside/independent auditor, etc.

### Documented

### Overview & detailed documentation

References availability – current & complete (*system overview docs, business definitions, data dictionary, and related reports cross-reference*)