AI MATURITY MODEL

X | XAVIER HEALTH

AI WORKFLOW
Consider the AI Workflow as it may inform the details in the maturity matrix.

LEVEL 0 (MACRO LEVEL)

Implement AI Solutions

LEVEL 1 (PROCESS LEVEL)

AI Evolution (same requirements, modified/new algorithm)

A11. Data Needs & Requirements	A12. Acquire Data	A13. Prepare Data	A14. Stage/Publish Data	A15. Select/Define Algorithm(s)	A16. Train Model	A17. Test Model	A18. Quality Model	A19. Validate Results
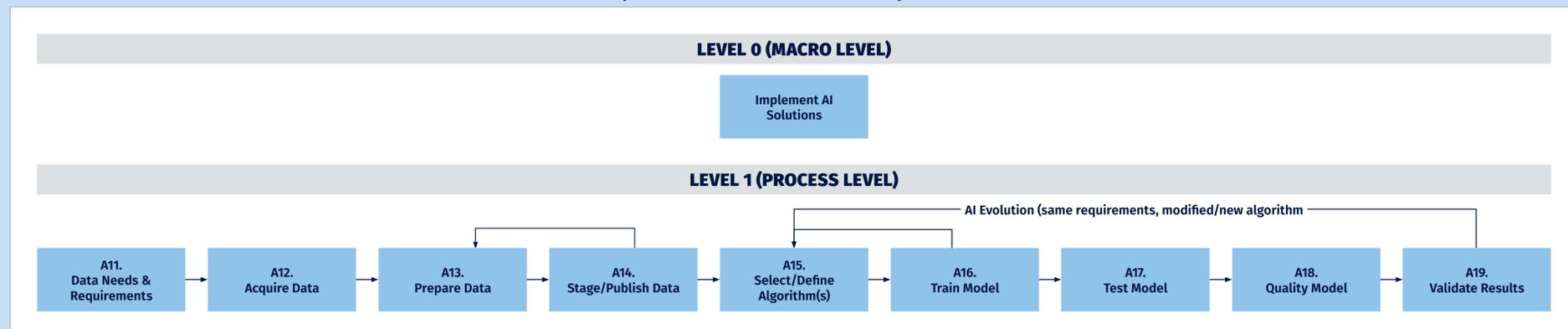
CULTURE (Including numbers and types of personnel)

MATURITY AREA	MATURITY FACTORS	MATURITY LEVEL CHARACTERIZATION				
		LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
Communication	Established channels for communication with feedback mechanisms.	No communication.	Random or ad hoc communications, likely one-way (no feedback loop).	Random or ad hoc communications with feedback loop.	Coordinated communications with feedback loop.	Coordinated communications with integration to results from executing on feedback. Could include an internal website or internal social media applications.
Procedures	Established procedures defining key roles, responsibilities, activities and processes.	No established procedures for AI life cycle management.	Ad hoc processes and loosely defined procedures for AI life cycle management.	Some procedures for AI life cycle management, not covering the full life cycle or not complete.	Procedures for all areas of AI life cycle management and integrated into the broader QMS.	Procedures regularly updated by feedback mechanisms for continuous improvement.
AI Mode Awareness and Understanding	Evolving from lack of understanding to trust.	Mistrust, black box.	Interest in AI and research as to how it is being used by others. ID the issue to be addressed.	Build trust, select algorithm.	Build model, better decision-making capability	Assume AI use and value. Routine AI use in business and/or operational efficiencies attained.
Technical Capability & Key Learning	Programs/initiatives to address culture issues related to AI.	No information shared.	Ad-hoc awareness program. More of a coding level.	Citizen data scientist—can ID opportunities for tools that do not require expertise.	Ability to discern if data from AI is correct/usable vs. what is not. Formal education system.	Continuous learning and benchmarking. Apply best practices.

GOVERNANCE & ORGANIZATION (Individual business departments/functions)

MATURITY AREA	MATURITY FACTORS	MATURITY LEVEL CHARACTERIZATION				
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Executive analytics orientation (Chief Information Officer, Chief Data Officer, Chief Executive Officer, etc.)	How well the AI outputs influence executive insights and strategic direction.	Limited, if any, understanding of AI output (may be limited to classical statistic and not true AI).	AI is used as a prospect tool for non-critical tasks and using non-sensitive data. AI Teams are experimental task forces mainly formed by internships or non-experimented people.	Beginning to understand relationships between data sets and outputs. AI is starting to be used for several critical actions (e.g., manufacturing) but with no access to sensitive data (e.g., AI Vision). Strategic initiatives in place.	Roadmap for integration of data for reliability (i.e., plan for a plan). AI tasks and results are part of the critical processes and sensitive data is used for AI model creation. AI activity is lead at the management level.	Strategic integration of outputs for synthesis of insights that directly influence and reflect the business strategy. Used for decision making at the highest level. AI activity is lead at an enterprise level
Good Data Science practices/ adoption	Available SOP. Consolidated structures. Organizational recognition and transversal support (SME).	Data scientists apply their own criteria, tools and data storage in order to get insights.	There are non-formal agreements regarding the AI tools (e.g., IDE and frameworks), data storage, and ways to present results.	There is a departmental strategy for AI tasks, mainly for the data, algorithm and model life cycle.	The AI practices are described in the Quality System framework.	The proposed AI practices have been followed for >1 cycle in the Quality System review and is integrated in the rest of global procedures.
Human Resource Structure and Technical Capabilities	How well the degree of technical capability & subject matter expertise aligns to organizational goals.	Hire/develop technical resources/ consultants. Data scientists workforce are based on internships and outsourcing.	Hire/develop data analysts. AI activities are only known from a reduced team limited to the AI resources, i.e., centralized model,	Hire/develop data engineer and specialized data scientists. They would likely operate under IT management structure.	Hire/develop data scientists/ Machine Learning Engineers + AI Manager. AI activity is known by collateral departments. More centralized model.	Establish AI team and along with CIO. AI is part of the cultural structure of the company managed as an asset. Analytically innovative at all levels, decentralized.
Competence of organization with AI-based tactics. Commoditization and democratization of AI and AI-based tools.	How well the rank and file understand, and are able to utilize AI-based tools and approaches.	Limited, if any, understanding of AI and tools based upon them. Find Excel stimulating.	Some individuals moderately proficient or many individuals generally aware.	Many beginning to understand and moderately capable with AI in functional applications. Can readily implement with some guidance. Same personnel using AI tools without interaction in daily work.	Many individuals can receive new AI tools and independently understand their application, power and operation. AI results used in critical processes.	Routine AI use in business andor operational efficiencies attained.

DATA MANAGEMENT (Including source types; temporal and geographical extent; and any stipulated exclusions)

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Data acquisition	Data quality and volume for use by AI	Paper based, collected by humans, not real time. Prone to human error.	Systems in place for data collection. Dataset with missing, partial, low volume information.	Transformation required from raw data to final format. Human interaction to attain data.	Removal of data bias and sampling noise. Automated process to attain data.	Real time quality data. Fault is understood and immediately corrected. System is aware of accurate data.
Data source	Data source and structure	Spreadsheets are primary data source. Minimal standards for data format and structure.	Minimal level of data collected from many systems with little to no curation. Structured and unstructured data. Human-data interaction needed.	Data sources and data management are integrated accurately but not systematically or totally automated.	Most data are curated, organized and accurate. Management of the data lifecycle.	All data are curated and best practices are in place.
Data integrity/security	Traceability, accuracy and validity of data	Paper-based data with uncontrolled access.	Manage access to data, address content protection. Strong access control and password management.	Conform to ISO IEC standards. FAIR principles. ALCOA+. Fully encrypted data.	Full traceability for changes and model version. Continuously validated state.	Data security/integrity in place to deal with continuous learning model (self-improving). Detects tampering.
Data availability	Data accessibility	Paper-based data archived, accessible manually.	Centralized electronic repository for critical data.	Organized use of structured and unstructured data. Critical data is still in siloed systems although there are initial initiatives integrating non critical data systems.	Hybrid data management practice in place. Leverage both cloud and on-premises data. Data centricity in place.	Fully data-driven business. Access to all required data for AI implementation and operation.

TOOLS & TECHNIQUES (Including individual applications and open source information)

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Depth of AI application in a company vs. breadth of application	Digitization level (across company: warehousing, R&D, manufacturing, quality, labs, etc.). For example, Product Development might be all over it, but the rest of the company still using clipboards. Or, the whole company might be employing some initial, basic steps.	General understanding of function but not the use of AI.	Operation of AI vs. understanding programming.	Elements of AI are present but it is not used broadly and comprehensively.	Degree of application to replace human actions. Models are dynamic vs. static. Models are implementation specific with updates from own measurements, self-calibrating.	Quantify the number of areas automated year over year. Use across multiple projects and departments within the company. Majority of personnel trained and using AI capability.
Analytics	Gartner's maturity model, bioforum maturity level, FDA maturity model Application of AI.	Basic descriptive analytics. Raw massaged data, not interpreted.	Advanced Descriptive analytics. (Hindsight) Interpreted data.	Diagnostic analytics. (Insight) First level interpretation.	Predictive analytics (Foresight) Know what the outcome is going to be with manual response to maintain controlled state.	Prescriptive analytics, Process control, Avoid failure, No need for human interaction for a controlled state.
IT	Proprietary software/libraries. Open source platform libraries. Software installation. Limited computational capabilities.	$ Ad Hoc. Software platforms decided by each Data Scientist. Platforms and algorithms self-maintained. No organizational control on the applications nor hardware.	$$ Part of the functional budget. Investment in AI as a potential opportunity.	$$$ Dedicated, but limited budget. There is a budget for AI, although AI is included in the same bag with the rest of technologies.	$$$$ Dedicated, strategic budget. Strategic platform management via life cycle and quality system approach. Version evolution.	$$$ Enterprise budget as a corporate service. Enterprise level strategy and support alignment. ROI supports cost of on-going AI growth plans.

Level Definition: Determine what level your department, site, or corporation is at currently and the level each is reaching toward. When you start with a specific department, site, business level or technical level it is best to carry that decision throughout the process. Keep in mind the economy of scale across departments and sites. Please note that levels are meant to be directionally correct but not necessarily linear. **Level 1:** a) May be inexperienced; b) experienced and excellent, but unfamiliar with and/or using the term AI incorrectly; c) owning AI algorithms and products, but not using them correctly at all; d) full understanding, but determined lack of intent to own or use AI now. **Level 5:** Intentionally defined as a stretch goal, transformational change, handling multiple AI models in an automated process control across multiple systems and functions in the organization. Looking at an iPad on the beach while AI functionally, practically, completely runs the show. "Mr. Smith, I've switched our product distribution provider to ABC Shipping because they employ sustainable, reclaimed pyrolyzed styrene fuel in their trucks. I knew you would want that."