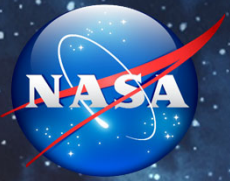


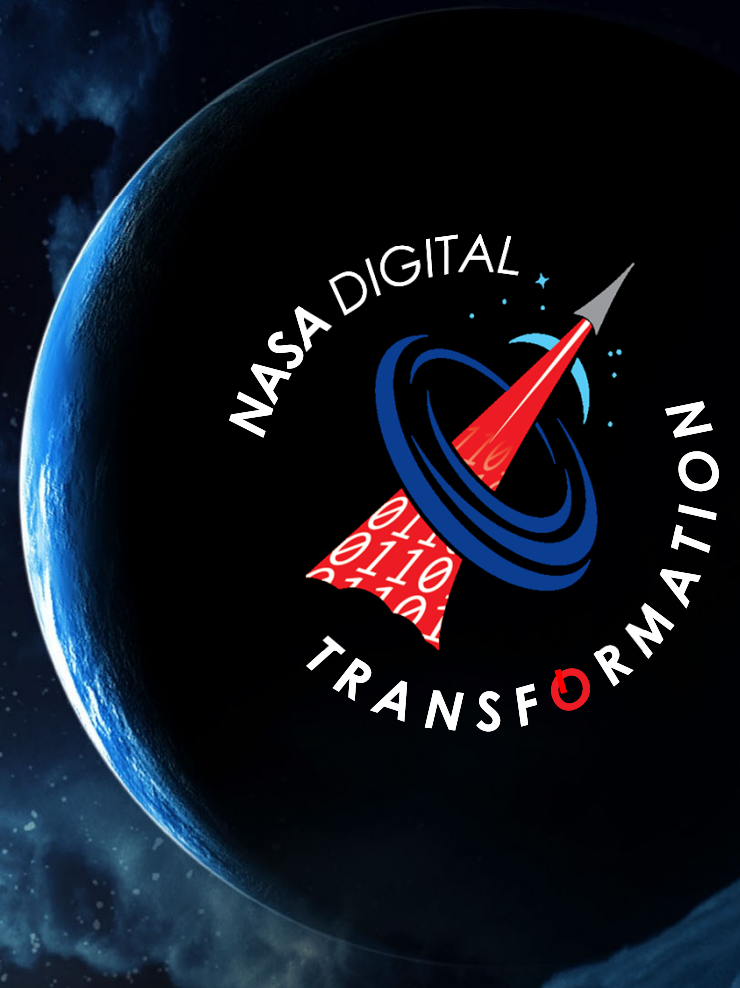
# Enterprise Digital Transformation



Jill Marlowe  
*Digital Transformation Officer*

February 7, 2024

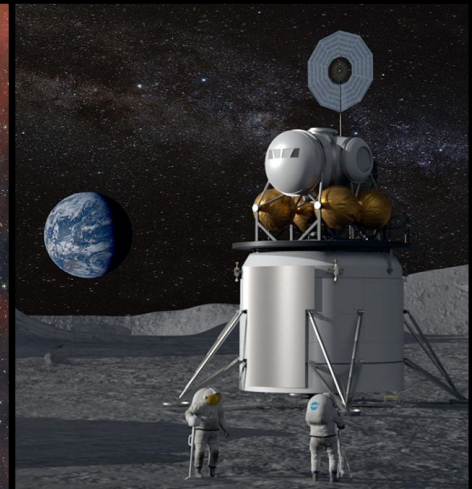
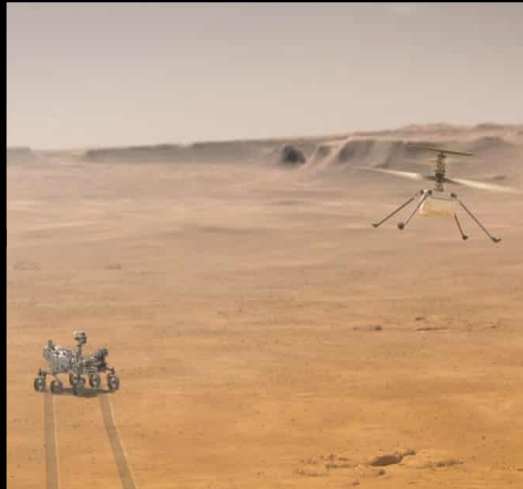
*"It is not necessary to change. Survival is not mandatory."  
(W. Edwards Deming Institute, 2019)*



# Why Digitally Transform NASA?



**ENDURING  
BOLD  
MISSION...**



# Why Digitally Transform NASA?



**ENDURING  
BOLD  
MISSION...**



**BENEFIT  
ALL  
HUMANKIND**

**REVEAL  
THE  
UNKNOWN**

**...NOW IN A CHANGING WORLD**

- Increasingly bold & complex missions
- Increasingly partnered
- Increasingly fast
- Increasingly affordable
- Increasingly transparent
- Increasingly inclusive



# Digital Transformation

[**dij**-i-tl trans-fer-**mey**-shuhn] noun:

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**TRADITIONAL**



**DIGITIZED**



**TRANSFORMED**



**From Maps to Apps...**  
Digital Transformation  
has already changed our world

**DT ≠ IT**

DT = transformation focused  
IT = technology focused

“WHEN DIGITAL TRANSFORMATION IS  
DONE RIGHT, ITS’ LIKE A CATERPILLAR  
TURNING INTO A BUTTERFLY.  
BUT WHEN DONE WRONG, ALL YOU  
HAVE IS A REALLY FAST CATERPILLAR.”

- GEORGE WESTERMAN, MIT SLOAN  
INSTITUTE ON THE DIGITAL ECONOMY



# NASA's DT Strategic Framework



## 3 FUTURE STATE GOALS

- Transform the way we **Work**
- Transform the experience of our **Workforce**
- Transform the agility of our **Workplace**

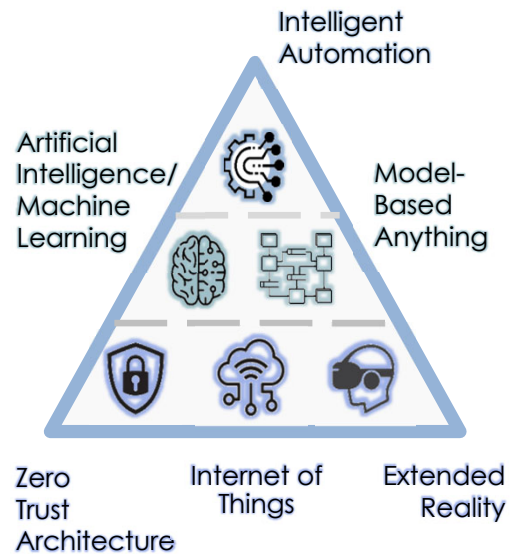
## 4 TRANSFORMATION TARGETS



## 5 DIGITAL LEVERS

- Establish Interoperable **Architectures**
- Transform Critical **Processes**
- Maximize the Impact of our **Data**
- Adopt Common **Tools**
- Strengthen Inclusive<sup>3</sup> **Teaming**

## 6 TECHNOLOGY FOUNDATIONS



## 7+ MISSION OUTCOMES



 **One Future NASA**

# Enterprise Data Platform

Impact: Enabled Foundation for Faster, Evidence-Based Decisions/Discovery



FY21: Partnered w/OCIO to create tech demo of enterprise data integrator w/data analytics; delivered **COVID Executive Decision Lens** to integrate & visualize case rate data for **real-time on-site operations decision making**



FY22: Team w/SMD to demo capability/benefits of **integrated intelligent search across disparate Earth Science data sets**; scaled by SMD to enable TOPS Year of Open Science

End of FY22: Expanded adoption to >150 decision dashboards & teamed w/OCIO to **operationalize EDP1.0 one year early**; enabled OCHCO to deliver **FEVS graphical insights & trend analyses in 2 weeks vs. months**

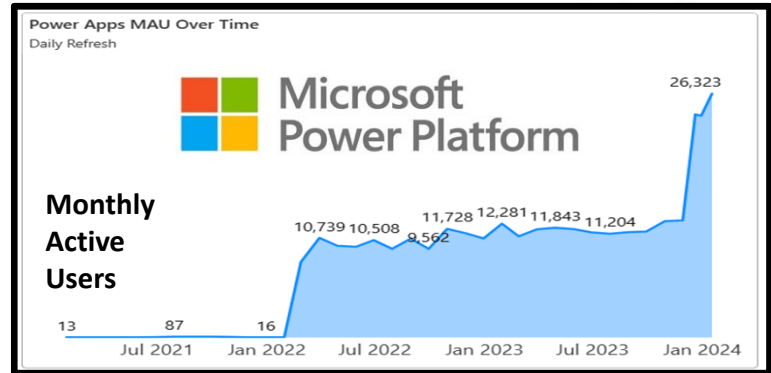


# Microsoft Power Platform "Power Palooza" Challenge

Impact: Radically increased skills & usage of "free" automation / analytics tools



FY24: Hosted **Power Palooza Challenge** that concurrently formed a Power Platform Community of Practice (600 users), held 3 half-day training classes (500 attendees) and launched an internal challenge competition to design the "best app" (160 participants); **235% increase in monthly active users** of Microsoft Power Platform and **upskilled employees to self-develop 14 applications** focused on **saving time, centralizing data, reducing errors and streamlining workflows** in just 2 months.



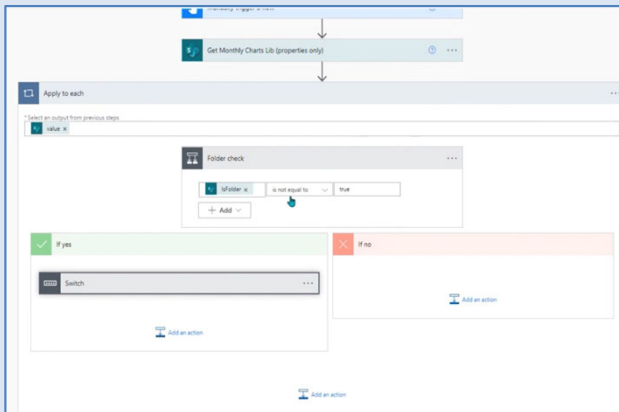
Alexander,  
I've been waiting for something like this. Begging for it even...then I saw this invite for this event. Felt like an answered prayer. haha  
Looking forward to the adventure and learning opportunity. I'm sharing with everyone that will listen.

Sample employee-developed apps

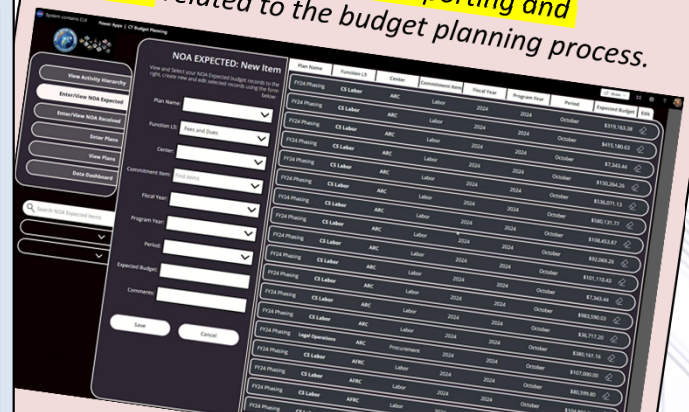
**Certificate of Aircrew Qualification Approvals** – Created workflow to **save time & eliminate bottlenecks** in aircrew approval request ingest, processing & final PDF approval generation.



**Document Transfer Automation** – Automated the **repetitive rote work** required for migrating monthly document submissions to a central repository on Teams for monthly reviews.

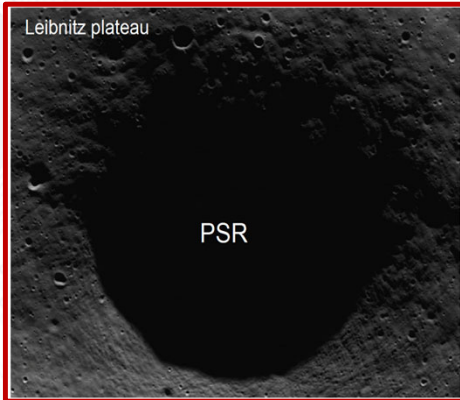


**Cost Transparency Budget Planning** – Application designed to **better integrate budget submissions, centralize data and simplify reporting and analytics** related to the budget planning process.

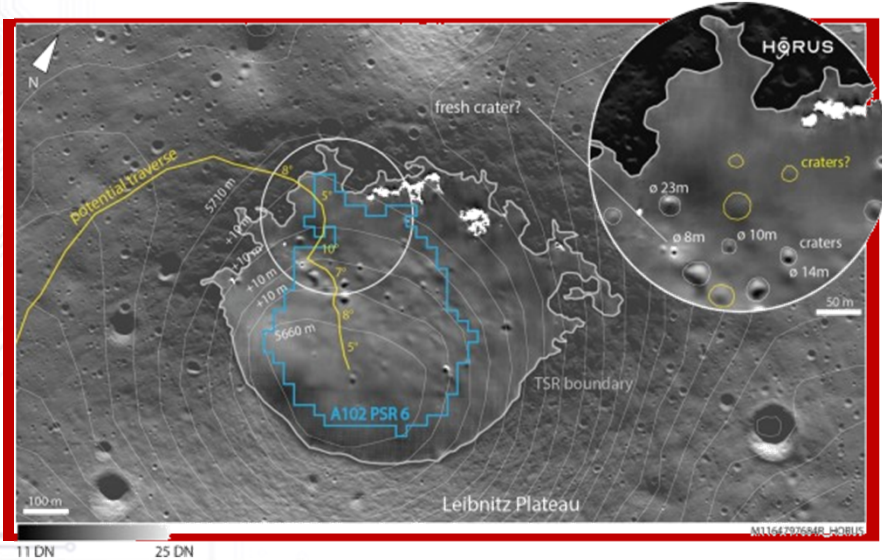


# AI/ML Prototypes

Impact: Accelerated AI/ML Learning, Scaled Access, & Demo ROI



FY21: ARC leveraged **ML for image processing** of lunar dark-side data to produce >4,000 validated, high-resolution, low-noise images (22TB) with ~3 m feature resolution to **significantly reduced uncertainty** for landing site / traverse planning & science target selection for VIPER & other future missions



- Scaled access to **affordable, secure AI/ML tools** on cloud platforms
- Created **AI/ML CoP** of early adopters & **AI/ML Knowledge Hub**
- Accelerated **AI/ML use-case testing** including examples shown + severe weather patterns, reverse design of materials, lessons learned digital assistant...



FY22: ISS demo of an **AI/ML prototype Astronaut glove inspection model** that performed diagnostics & generated a **GO/NO-GO recommendation in 45 seconds** on the glove condition, a process that normally is performed by a group of people taking multiple days.



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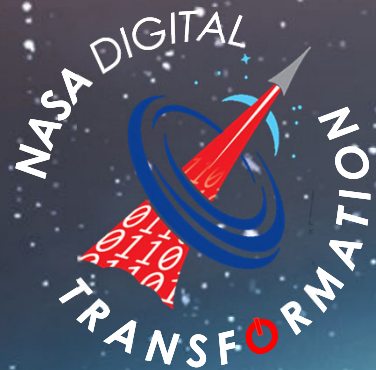
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Thank you!





**BACKUP**

# NASA's DT Implementation Approach



*We are here*



## Ignite Transformation

Facilitate **Tx Target Community-owned Roadmaps** & near-term priority actions to align DT intent & goals across NASA

*Dec 2022*

## Connect Plans

Coordinate like **Organizational DT Plans** that respond to the DT Strategic Framework to synchronize DT intents

*Mar 2023*

## Integrate Solutions

Analyze **Integrated DT Solutions Portfolio** vs. Roadmaps / priorities for redundancies & gaps to identify leveraging opportunities & inform investment decisions by OCIO, DT & other organizations

*May 2023*

## Facilitate Adoption

Measure **DT Progress** on funded Org DT Plans vs. Roadmaps/Priorities; elevate & address cross-cutting barriers via **DT Catalyst Projects**; celebrate & share **DT Successes & Exemplars**

*Synchronize DT Plans*

*&*

*Catalyze DT Progress*

# DT Myths



| What DT is not...  | What DT is...  |
|--|--|
| <b>Digitization</b> – standardizing IT platforms/tools and/or automating what we are doing now to do it faster/cheaper in the future                                       | <b>Transformation</b> – about driving change... challenging ourselves to deliver new value in a changing world (leveraging digital advances)   |
| <b>Program</b> – discrete set of IT modernization goals/projects with centrally managed hard schedules, resources and milestones   | <b>Journey</b> – recognizing our “value” will be a moving target as expectations evolve with technology advances   |
| <b>Separate Team</b> – specific named individuals, separate from the rest of the org, charged with DT deliverables   | <b>Pervasive Mindset</b> – cultural focus on the changing value we must deliver and being agile in (new) ways to achieve it  |
| <b>NASA Flavor-of-the-Month</b> – an internal strategic initiative with a catchy bumper sticker that will last only as long as the senior leader champion who sponsored it | <b>Global Movement</b> – Gartner 2020 survey among 100 Fortune 500 CIOs found that 77.3% prioritized digital transformation for their 2021 budgets <i>over any other business activity</i> |
| <b>More Work</b> – additional taskers over and above all the traditional work we are already doing today   | <b>Working Differently</b> – relentless, objective action to reinvent work by eliminating/optimizing/automating (new) value-streams  |
| <b>Cost Center</b> – just another competitor for limited resources today   | <b>Investment</b> – a deliberate choice to create/seize a new future   |
| <b>One-off Experiments</b> – a bunch of isolated technology tests/demos that are super cool but have minimal operational impact  | <b>Campaign</b> – systematic exploration, maturation and infusion of new approaches that harness technology to deliver new value   |
| <b>Eliminating Jobs</b> – having bots take jobs away from people   | <b>Creating Opportunities</b> – freeing people to do things bots can’t   |
| <b>OCIO-only</b> – label for just the OCIO-led IT modernization/services   | <b>NASA-wide</b> – integrates org transformation plans & enabling tech   |
| <b>Optional</b> – discretionary effort that we do as time/budget allows  | <b>Inevitable</b> – required for us to be relevant in a digital world  |

# Perspectives on the “T” in DT



**“There is no alternative to digital transformation. Visionary companies will carve out new strategic options for themselves – those that don’t adapt will fail.”**

**- Jeff Bezos**

**“IT IS NOT NECESSARY TO CHANGE. SURVIVAL IS NOT MANDATORY.”**

**- W. EDWARDS DEMING**

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**“The enterprise that does not innovate ages and declines, and in a period of rapid change such as the present, the decline will be fast.”**

**- Peter Drucker**

# DT Business Case by the Numbers



Global annual investment in DT projected to go from \$2.16T today to **\$3.4T** by 2026 (Statista)

The *failure rate* for digital transformation initiatives ranges from **70% to 90%** (McKinsey)

**56%** of CEOs said that their digital improvements have already improved profits

Benchmarks show organizations with *successful enterprise DT initiatives* are investing at **~1%** of gross budget

**70%** of organizations have a digital transformation strategy or are working on one (ECM Consultant)

The top benefits of adopting a digital model are it improves **operational efficiency (40%)**, allows for faster time to market **(36%)**, and helps meet **customer expectations (35%)**

At least **40%** of all **businesses will die** in the next 10 years if they don't figure out how to change their entire company to accommodate new technologies (Chambers)

**85%** of business leaders believe that digital transformation is **critical to the success of their organization** (Deloitte)

Organizations that have embraced digital transformation are **26% more profitable** than their peers (McKinsey)

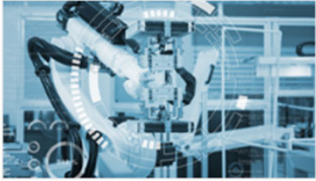
**High stakes**  
**High risk**  
**High reward**  
**High priority**

**87%** of business leaders think that digital transformation will **disrupt their industry**

Among 100 Fortune 500 CIOs, **77.3%** prioritized digital transformation for their budgets over any other business activity (Gartner)

**55%** of businesses believe they have **less than a year** before they start losing market share if they don't undergo a digital transformation (Economist Intelligence Unit)

# FY24 DT Catalyst Projects



## **Engineering For Tomorrow**

Build & scale NASA's Digital Engineering architecture via a multi-center cloud-based PLM and integrated toolchain that enables integrated digital engineering workflows and concept-to-flight digital twins of our missions, co-created with our partners



## **SPARTA (Smart Projects & Reviews with Transformative Analytics)**

Transform NASA program & project management reviews by integrating data and automating processes, increasing speed and fidelity of evidence-based decision making



## **NASA Digital Service Pilot**

Harnessing human-centered design and agile development to accelerate & transform how OCIO designs, tests & scales integrated digital solutions to solve customer problems



## **Digital Academy**

Up-skilling NASA workforce with digital competencies, starting with *Data Acumen*, followed by *Digital Engineering* and *Artificial Intelligence*

# Digital Upskilling

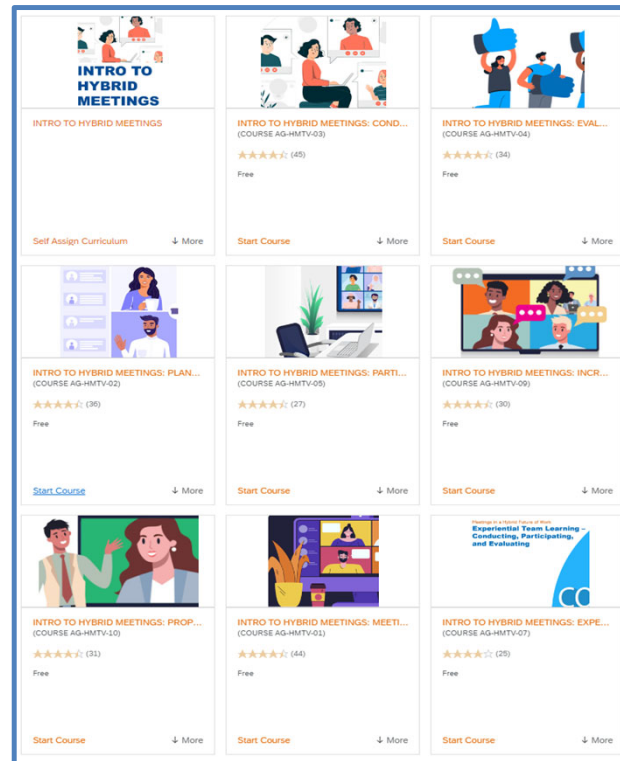
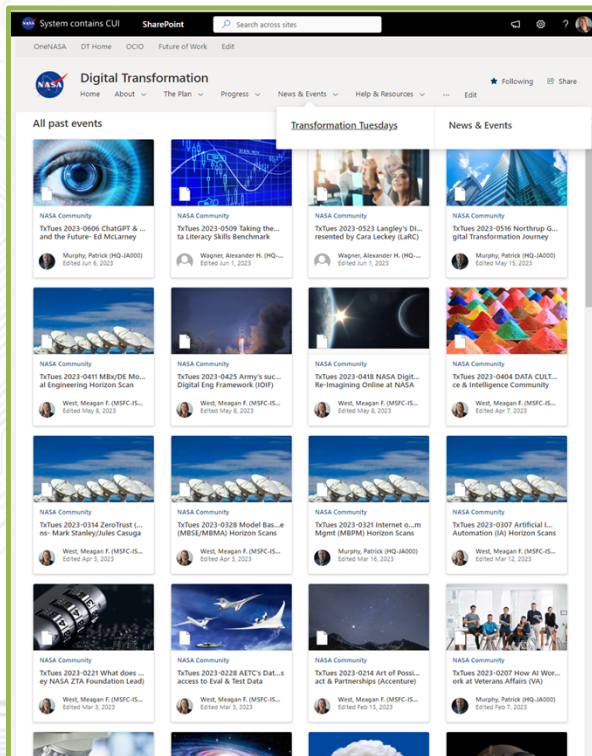
## Impact: Grew Digital Savvy & Knowledge Sharing across NASA Workforce



FY21: Launched “**Transformation Tuesdays**” seminar series (draws >2000 participants annually), showcasing >100 internal / external DT exemplar stories to illustrate what DT in action looks like and promote leveraging of solutions/learning.

FY22: Delivered 10 course “**Intro to Hybrid Teaming**” on-demand training curricula to jump start NASA’s proficiency with critical behaviors to ensure inclusive environment for all hybrid team members, regardless of location; >2300 completions & 4.5★ review

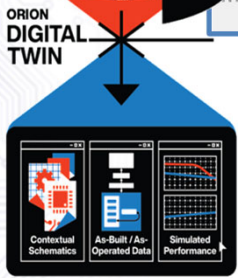
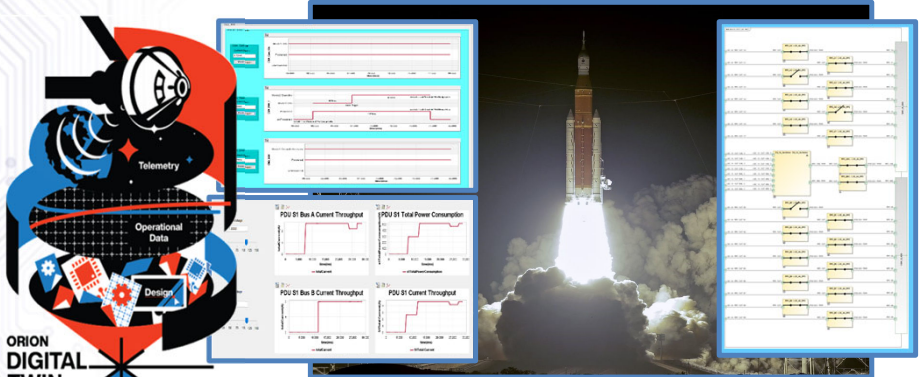
FY23: Launched v2.0 of “**Digital Academy**” inside SATERN training portal to facilitate digital skills development, leveraging Percipio for personalized learning journeys; quick indicator of delivering unmet need was ~200 course completions in first month





# Digital Engineering

## Impact: Catalyst for Modernizing & Integrating Engineering Across NASA



FY22: Orion Electrical Power System Digital Twin served as a pathfinder for integrating NASA & partner models across engineering lifecycle to enable faster than real-time prognostics w/Artemis I flight data; documented CDRL lessons learned wrt partner models/data

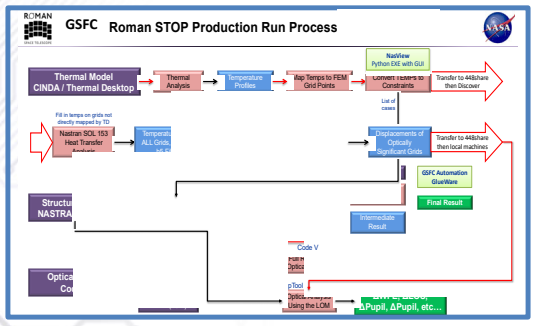
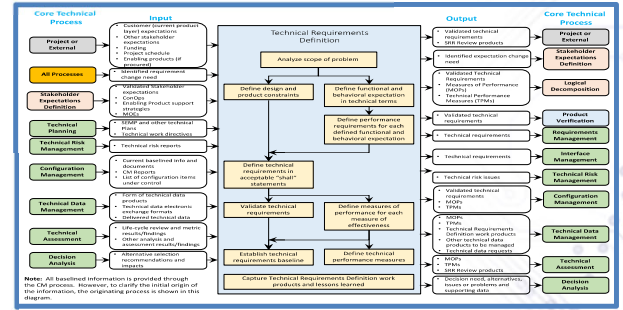
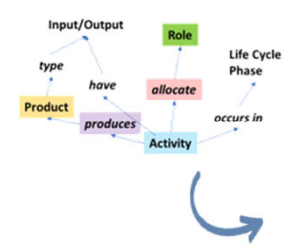
### NASA Digital Engineering Vision

Manage complexity, reduce cost and schedule, and improve product integrity via the integration of processes, digital tools and techniques along with seamless flow of information throughout the engineering system development life-cycle (concept development, design, testing and validation, manufacturing, and operations) to enable:

- Reduced cycle time from engineering concept and development to flight system development for new and complex missions that have never been done before
- Seamless collaboration with multiple internal NASA organizations and partners
- Data and model-driven reviews and decision making

FY23: EMB establishes formal NASA Digital Engineering Vision and formalizes two Working Groups to define & integrate action plans to enable interoperable engineering teams across NASA Centers & with partners

2.8.1 The Chief, SMA is responsible for advising the Administrator and other senior officials on matters related to risk, safety, and mission success and serves as the lead SMA TA. To provide independent oversight of programs and projects in support of safety and mission success, the Chief, SMA, is responsible for:



FY22/23: NASA Engineering Toolchain Benchmarking completed an inventory of engineering tools by center/ discipline, data passed between them (and formats), APIs & "glue ware" used to integrate; Finding of ~3,000 discrete tools & associated integration/sustainment challenges led to EMB optimized engineering tool chain decision & commitment to rationalize

FY22/23: NASA NPR 7123, 7120.5/8, 8705 modeled & validated by stakeholders to modernize technical processes; identified & resolved process discrepancies and disconnects affecting required 500+ deliverables & 50+ roles, models will serve as starting point to streamline & improve quality & self-consistency of requirements as backbone for digitalizing engineering processes