Strengthening U.S. Competitiveness Through
Smart Manufacturing

CESMII
THE SMART MANUFACTURING INSTITUTE

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mission. strategy. role.

CESMII THE SMART MANUFACTURING INSTITUTE

Driving the **next wave** of manufacturing productivity, energy productivity and competitiveness through **smart manufacturing innovation**.

U.S. Department of ENERGY

2017

Founded by the **D.O.E**, A Program in **UCLA**

$200M+

Private/public partnership

Improve energy productivity

through **sensing, control, modeling, analytics & platform** technologies

How.

Fund the **Innovation and R&D** necessary to dramatically **reduce the cost & complexity** of using real time operations data to drive revenue & cost improvements.

CESMII represents the voice of manufacturing; engaging the smart manufacturing ecosystem through a membership model

210+ Members

Manufacturers
Small, Medium & Large

System Integrators & Consultants

Machine Builders

Technology Providers

Academia & Labs

Accelerating the Democratization of Smart Manufacturing

CESMII is enabling smart, sustainable operations for ALL manufacturers, driving the next wave of manufacturing productivity, energy productivity and competitiveness through smart manufacturing innovation.

Technology
Enabling Technologies that Decrease Cost & Complexity and Standards Advocacy
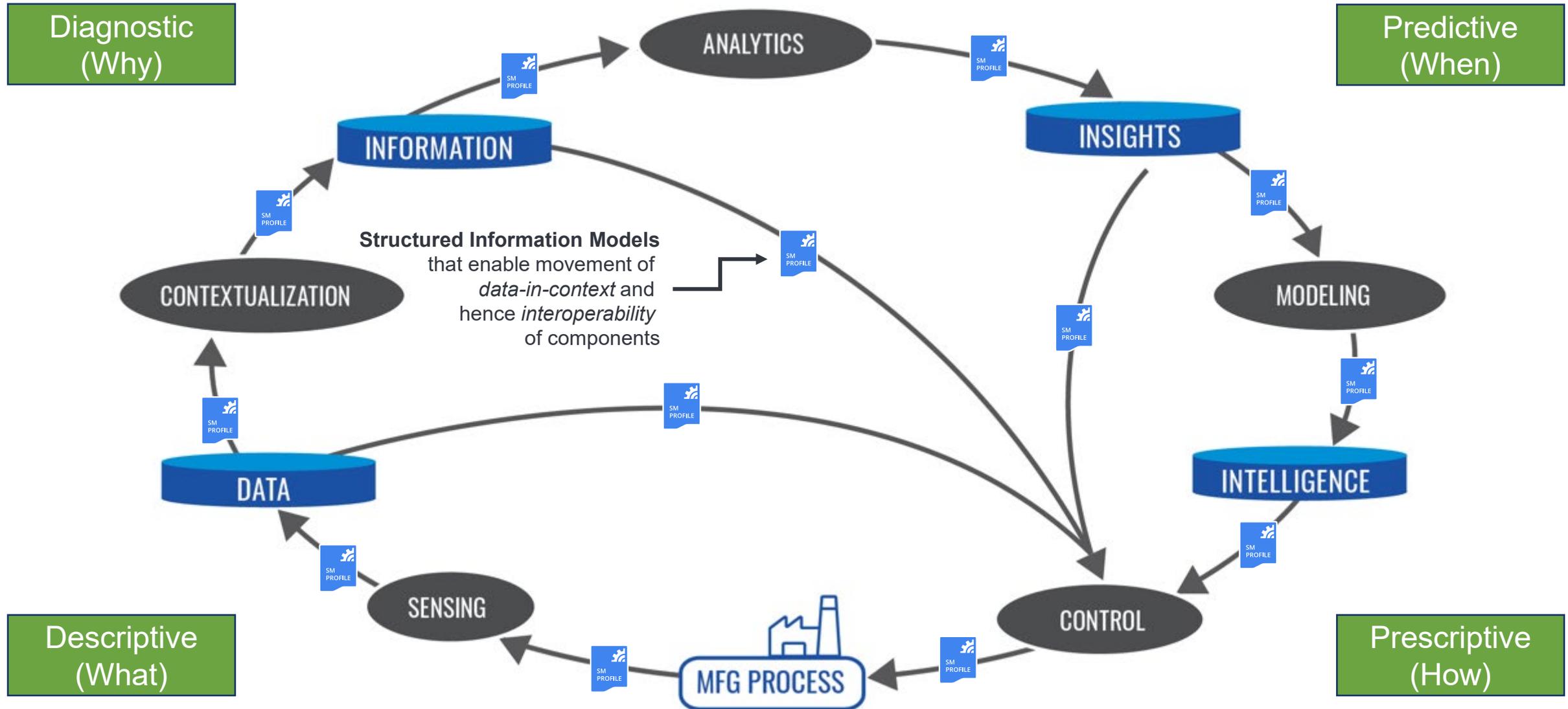
Knowledge
Education, training and organizational capabilities that align resources & people for success

Ecosystem
Convene all relevant industry stakeholders to accelerate the adoption of Smart Manufacturing

SM Technology Building Blocks and Information Flow

Diagnostic (Why)

Predictive (When)

Structured Information Models that enable movement of *data-in-context* and hence *interoperability* of components

ANALYTICS

INFORMATION

INSIGHTS

CONTEXTUALIZATION

MODELING

DATA

INTELLIGENCE

SENSING

MFG PROCESS

CONTROL

Descriptive (What)

Prescriptive (How)

The CESMII Story

THE SMART MANUFACTURING INSTITUTE

1
Develop SM technologies to solve manufacturing problems

SM Building Block Technologies

Multiple Industry Verticals
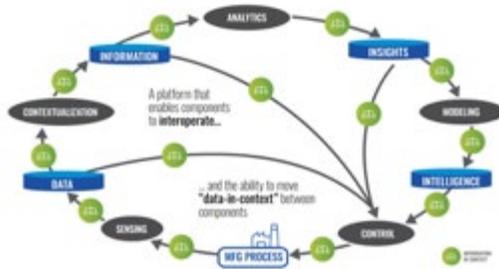
10-25% economic impact
on operations and energy

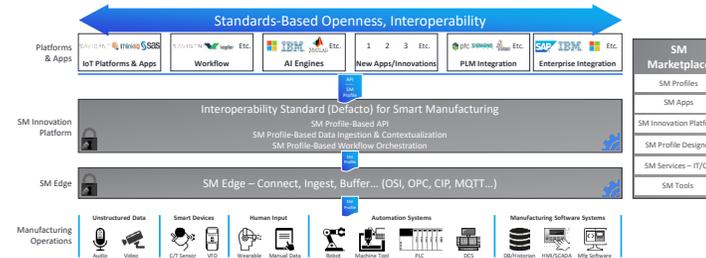- ✓ **Productivity**
- ✓ **Quality, Yield, Waste**
- ✓ **Energy consumption**

2
Accelerate SM Adoption in SMMs and Supply Chain

SM Innovation Platform, Profiles, Marketplace

Small & Discrete Manufacturing

25-50% reduction in SM
implementation costs

- ✓ **Performance & Productivity**
- ✓ **Implementation Cost/Complexity**
- ✓ **SMM & Supply Chain Adoption**

3
Upskill the Workforce Through Education, Training

SM Education and Training

Talent Pipeline & Incumbent Workforce

6+ new curriculums, >2000/yr
students and professionals trained

- ✓ **Education & Training**
- ✓ **Upskilling**
- ✓ **SM adoption**

Smart Manufacturing Innovation Centers (Dissemination of Technology and Training)

Industries We Impact

Steel	Ag...
Additive Mfg	
Metal	

...e | Pulp & Paper

...e | Supply Chain & Warehousing

~60 Collaborative R&D Projects

55+ Participating Member Organizations

15 Industry Verticals
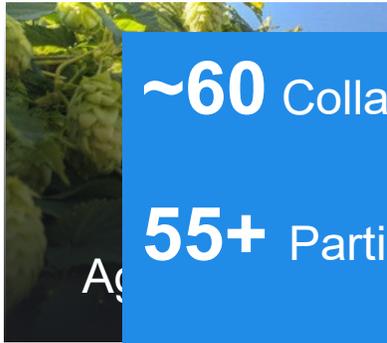
10-35% in Energy Reduction Demonstrated

10-40% in Productivity Improvement Demonstrated

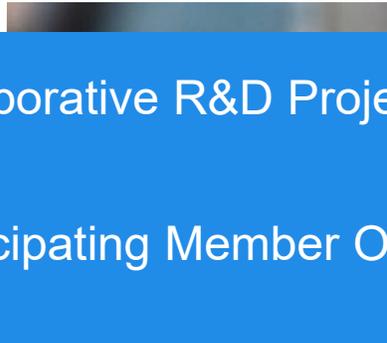**25-50%** in SM Implementation Costs Demonstrated
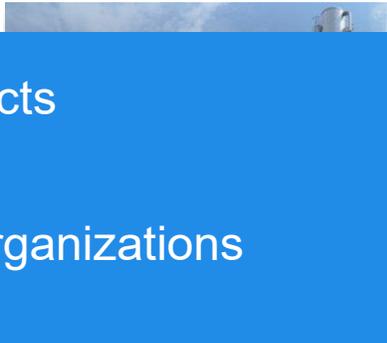
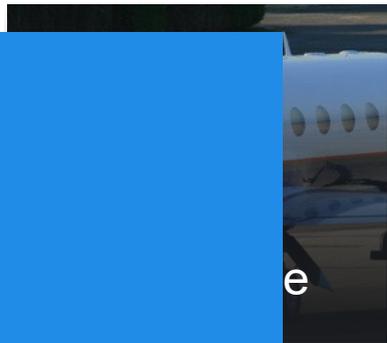**28** Projects Using ML, Predictive Modeling
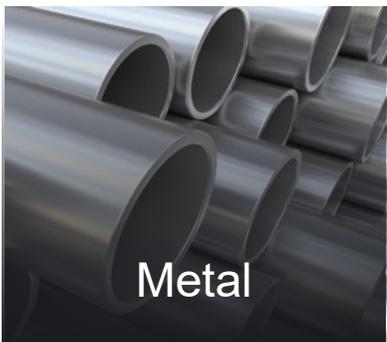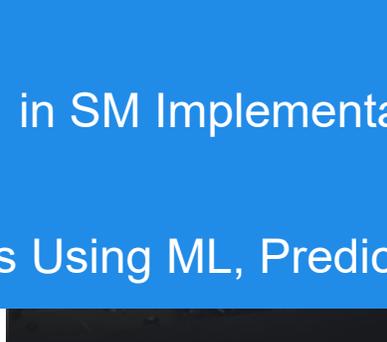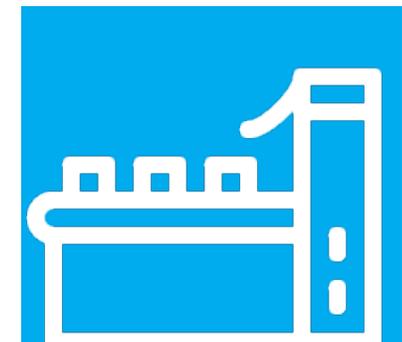
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SM Interoperability Architecture

Industry Apps	AI	Analytics	Digital Twin & PLM Integration	Enterprise & SC Integration	New Capabilities

Smart Manufacturing Marketplace

- SM Apps
- SM API
- SM Profiles

Standard API

Consumes the interface to Discover & Access Contextualized Data

SM Interoperability Platform
- Instantiate SM Profiles (Objects)
- Persist Instance Objects, History & Relationships in a Graph
- Support Multiple Open & Standard Data Sources

Azure
Google Cloud
aws

CLOUD ON-PREMISE

SM Profile Composition & Ingestion

Defines the object model & interface

SM Edge
Support Multiple Edge Services

Bind to Data Sources & Name Spaces via SM Profiles

Cloud Library (Open Specification)

| Unstructured Data	Smart Devices	Human Input		Automation Systems			Manufacturing Software Systems		
Audio Video	C/T Sensor VFD	Wearable Manual Data	Robot	Machine Tool	PLC	DCS	DB/Historian	HMI/SCADA	Mfg Software

Education and Training:
Meeting manufacturers 'where they're at'

Demo Day/Roadshow Opportunities

SM Introductory Presentations and Demonstrations

½ Day Workshops
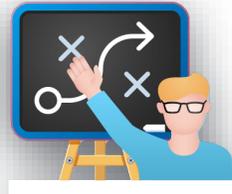
Leadership Workshops

1-2 Day Workshops/ Bootcamps

Hands-On Technical Training

Education Catalog

Workforce Training Programs

AWARENESS → **EDUCATION** ← **IMPLEMENTATION**

SM Strategic Roadmap

SM Roadmap Professionals

SM Implementation Projects

Smart Manufacturing Integrators

Ecosystem

Convene all relevant industry stakeholders to accelerate the adoption of Smart Manufacturing

CESMII Membership
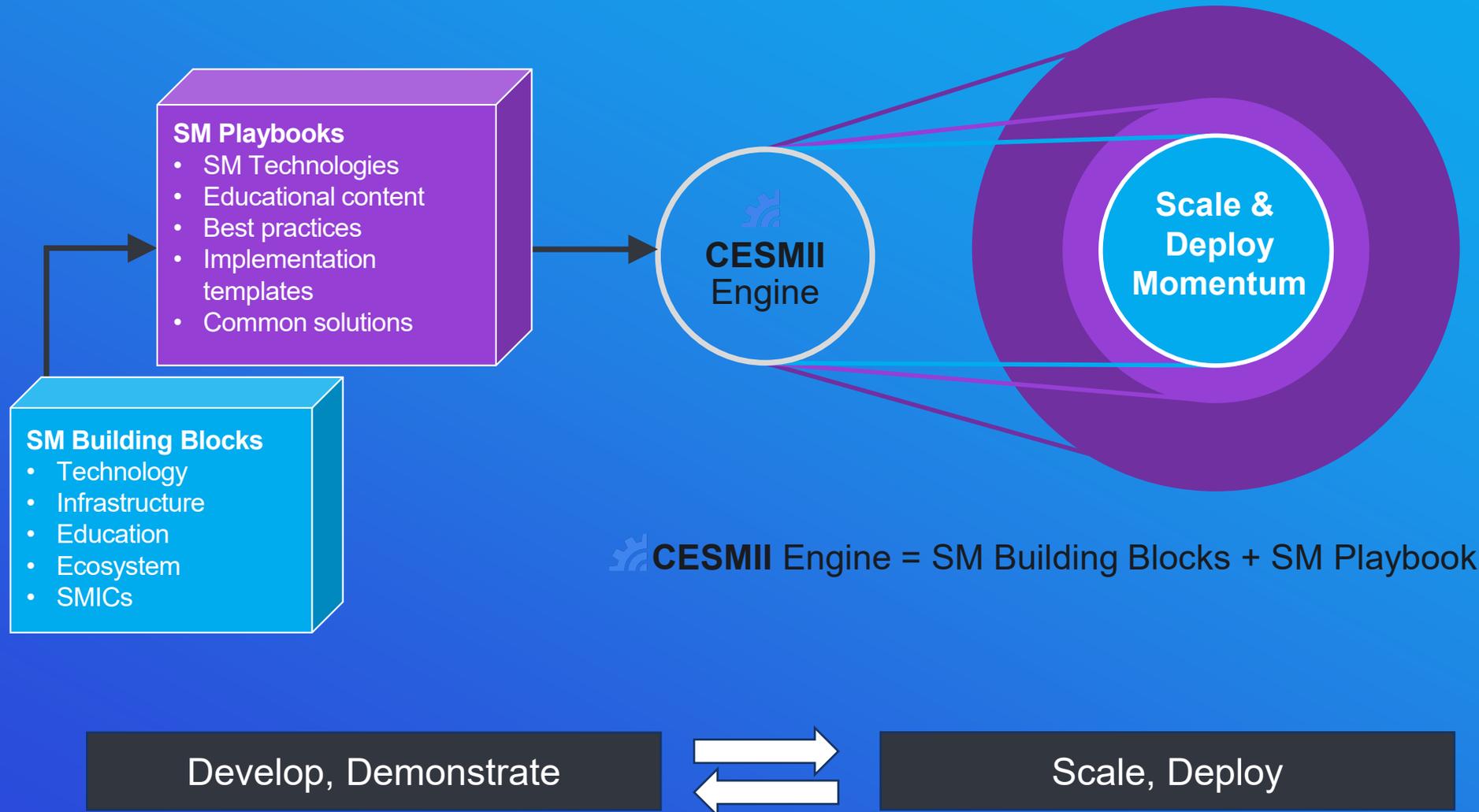
Manufacturing Extension Partnerships

SM Innovation Centers

SM Executive Council

Focus on Scaling and Deployment

SM Playbooks
- SM Technologies
- Educational content
- Best practices
- Implementation templates
- Common solutions

SM Building Blocks
- Technology
- Infrastructure
- Education
- Ecosystem
- SMICs

CESMII Engine

Scale & Deploy Momentum

CESMII Engine = SM Building Blocks + SM Playbook

Develop, Demonstrate

Scale, Deploy

What is Needed for Broad SM Adoption

- Cost effective, vendor agnostic, standards based, interoperable infrastructure technologies to democratize and proliferate SM

- Educate and train the workforce in SM – understand, implement and sustain SM solutions

- Industry Use Case Driven SM Adoption across small, medium and large manufacturers

- Ecosystem of technology and education partners that can provide expertise and collaboratively drive SM adoption

**Join us
in making a dent
in the Smart Manufacturing Universe!**