Generative Design and Fabrication:

A One Touch Experience for Additive Manufacturing

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RIZE / Lightweight Engineering
Dassault Systemes
WHAT is Generative Design?

A New Way to Design

Traditional Design:
- Based on established practices
- Based on designer experience
- Leverages existing design iterations

Generative Design:
- Optimal design is computer-generated
- Requirements driven
- Results based on the function of the part

Rather than asking, “Does this shape meet the requirements?” we are asking, “Which shape best meets the requirements?”

Engineering in the age of Experience | Towards Cognitive Augmented Design (CAD)

Past Knowledge-based Engineering

Exact Geometry

Exact Design

Knowledge-based Engineering

Generative Design (Experience driven)

Automated & Intelligent Guided Design

Experiential Engineering

Generative Design (Leveraging Enterprise patrimony)

Rule-based Automation

Multi-discipline Template-based Automation

Learning-based Automation

3DEXPERIENCE PLATFORM
Big Data-Centric, Revealing Patrimony, Guided Creativity

V4 1999 Past
V5 2009
V6 2014
The Path to Intelligent Parts

Digitally Augmented

✓ Industry 4.0 Technologies
  Blockchain / AR/VR/ Digital thread/digital twin

Cognitive Augmented

✓ Generative design acceleration

Intelligent parts

✓ Embedded sensors, actuators in 3D Printed parts
Intelligent Parts journey

1. Increase Sales with 3D Printed Parts and Digital Quotes
2. Complete Designs Faster by 20%
3. Cut tooling Costs with custom jigs/fixtures/tooling
4. Increase equipment uptime with service parts

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RIZE – Building momentum

Company
- Growth stage; VC funded; HQ in Boston
- Experienced leadership from 3D Printing, CAD, ERP/PLM
- Unique patented technology
- 100+ systems in 15 countries
- Customers in Auto, A&D, Life Sciences, Education
- Strategic partnership with Dassault Systemes

Lighthouse Customers
- Merck
- ConMed
- HMS Industries
- ZF
- NASA
- ThermoFAB
- Production Service Management
- U.S. Army

Partnerships

Industry Recognition
- "IDC Innovator 2018"
- "Frost & Sullivan 2019 Best Practices Award"

"Rize is the #1 startup driving innovation in 3D printing."
-American Society of Mechanical Engineers
3DS/RIZE—creating Smart Spaces

- **Intelligent parts in design, manufacturing and service**
- **Digitally connected and Augmented experiences**
- **Sustainable and inclusive innovation**

"Connected, interactive and intelligent environments"... Gartner
RIZE – Platform for creating intelligent parts

Simplicity - minimal post processing, ease of use

Safety – zero emissions; people-safe, environment safe

Intelligent parts – marking; authenticity; augmentation

Color / Carbon – new applications; new users; new industries

Full Color and multiple materials
Industrial 3D Printing – made easy

5+ stakeholders + 3-6 weeks per iteration

Digital 3D Model → Mold Making / Tooling → Part Quality → Part

Industrial 3D Printing – made easy

Need expert users Investment in additional facilities

Digital 3D Model → Pre-Processing → 3D Printing → Post-Processing → Part Delivery → Part

1 person; quick turnaround

Digital 3D Model → RIZE → Part

1/3rd the cost; much less time
APD Voxel level control printing leveraging industry first hybrid process

MATERIAL EXTRUSION
RIZIUM ONE

MATERIAL JETTING
SPECIAL INKS

AUGMENTED POLYMER DEPOSITION

US Patent 9227366 Process for fabrication of three-dimensional objects
US Patent Application 20160096324 Process and Apparatus for fabrication of three-dimensional objects
US Application No.: 62/381,300 Method of fabricating a three-dimensional object with removable support structure
One-Touch 3D Printing

Digital augmentation
Leverage AR/VR; Block chain
Digitalize value stream processes
Rize – Intelligent parts

Embedded in Innovation Process

- Digitally Augmented Parts
  Connect to PDM/PLM/ERP

- New Experiences
  AR/VR/MR

- Assembly Instructions
  Service Instructions

- Marketplaces

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Smart Spaces with RIZE

Product Innovation

• Accelerate time to part with faster iterations
• Increase Product Performance
• Generative shapes – new & lightweight designs

SI2 Technologies

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<th>CHALLENGES</th>
<th>SUMMARY</th>
<th>RESULTS</th>
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<tbody>
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<td>SI2 wanted one machine that could combine 3D printing and ink jet printing</td>
<td>SI2 produces functional parts for the Department of Defense with their</td>
<td>• $2K savings per part</td>
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<td>capabilities.</td>
<td>RIZE ONE 3D printer up to 6X faster and at a cost savings of $2K per part.</td>
<td>• 6X faster time to part</td>
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<td></td>
<td></td>
<td>• Easy post-processing on complex parts</td>
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<td></td>
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<td>• Highly accurate parts of an assembly for a precise fit</td>
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<td>• Ink marking provides improved communication</td>
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Smart Spaces with RIZE

- Smart Spaces for Product Innovation
- Smart Spaces for Manufacturing Innovation
- Smart Spaces for Service Innovation
Smart Spaces with RIZE

Manufacturing Innovation

- Faster and flexible manufacturing process
  - Design to manufacturing handoff
  - Zero setup time
  - Assembly consolidation
  - Low cost setup
- Lower cost of custom tooling, jigs and fixtures

New Hudson Facades

CHALLENGES
New Hudson Facades wanted to speed production, cut costs and increase product quality without incurring the high cost of hiring or training 3D printing specialists or building specially-equipped additive manufacturing facilities.

SUMMARY
NHF’s CNC users operate RIZE ONE 24/7 in an office to save $200K annually, increase production speed 15% and inspection frequency 5X within the same timeframe.

RESULTS
- 15% increase in production speed
- 5X reduction in inspection time
- $200K savings per year on fixture costs
- Improved production accuracy
- 50% reduction in assembly inspection times
Smart Spaces with RIZE

Service Innovation

- Spare Parts Management with ‘Take One Make One’
- Simplified Supply Chain
- Streamlined Sales Process
- Elimination of Obsolete Parts

Azoth

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| PSMI wanted to find a better solution for sourcing machine spare parts. Orders are traditionally very costly due to small-batch quantities, and needed quickly. Parts can be difficult to source because they are old and OEMs have gone out of business or parts became obsolete and prints do not exist. | PSMI created a wholly-owned subsidiary, Azoth, to provide its customers with on-site AM solutions. Azoth partnered with RIZE to build digital tool cribs. Manufacturing parts together on demand eliminates bottlenecks and saves money. | • Reduced some part costs by as much as 98%  
• Cut lead times by as much as 8 weeks  
• Ink marking capability ensures full traceability  
• Safe, easy production of industrial parts provides compliance with plant safety policies |
## Innovation with Smart Spaces

### Increase Sales

**Why Additive:**
1. New Customer Experience for sales
2. Replicate and augment in service parts
3. Worldwide sales team demoes with printed parts shortening sales cycle

**Why Rize:**
1. Safe and Easy operation by non technical employees – sales and marketing
2. Accurate replication & Fastest time to part
3. Branding with Marking Inks

### Complete Designs Faster

**Why Additive:**
1. Faster iterations of prototypes
2. Haptic Experiences
3. Functional prototypes to test product

**Why Rize:**
1. Minimal post processing enables faster time to part – more iterations for the design engineer
2. Marking of parts enables full traceability
3. Marking of parts enables multiple iterations to be printed and tested simultaneously

### Reduce Manufacturing Costs

**Why Additive:**
1. Increase life of critical tooling
2. Custom jigs and fixtures
3. Increase uptime of equipment through replacement of critical parts

**Why Rize:**
1. Print tool holding arbors with marking to enable better storage and increased life
2. Print custom jigs and fixtures with marking and QR codes to ensure proper usage
3. Print critical spare parts/obsolete on demand
Questions
Diversity of Applications/Parts

3D PARTS GALLERY

Browse our gallery below to view 3D printed parts produced on the Rize ONE and XRIZE full-color, multi-material, industrial 3D printers.

Large Gear
Large gear printed in RIZELITE CARBON offers even greater strength for transmitting torque. This part is strong enough for functional loading.

Post-Processing Time: 3 minutes

Connecting Rod
Prototype illustrates the stresses incurred by this connecting rod design as it operates a piston, a great improvement over 2D illustrations for spatial visualization.

Post-Processing Time: <1 minute

Topographical Map
0% model with accurate scaled altitudes, textured features and annotations used in architectural, transportation and telecommunications planning.

Post-Processing Time: <1 minute

Soda Can

Clamp for Aluminum Extrusion

Stamping Fixture