Visual Computing Lab
Information Technologies Institute

D-cube
IMMERSIVE SOLUTIONS

**Dr Dimitrios Zarpalas**

*Researcher* | *Co-Founder / CTO*

https://vcl.iti.gr/ | https://www.d-cube.eu/

Information Technologies Institute

CERTH
CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

# Centre for Research and Technology Hellas - CERTH

**Founded in 2000** and includes five (5) institutes:

- Chemical Process & Energy Resources Institute (CPERI)
- **Information Technologies Institute (ITI)**
- Hellenic Institute of Transport (HIT)
- Institute of Applied Bioscience (INAB)
- Institute of Bio-Economy and Agri-Technology (IBO)

> 1000 employees

> 2000 research projects

> 3000 international partners

CERTH
CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

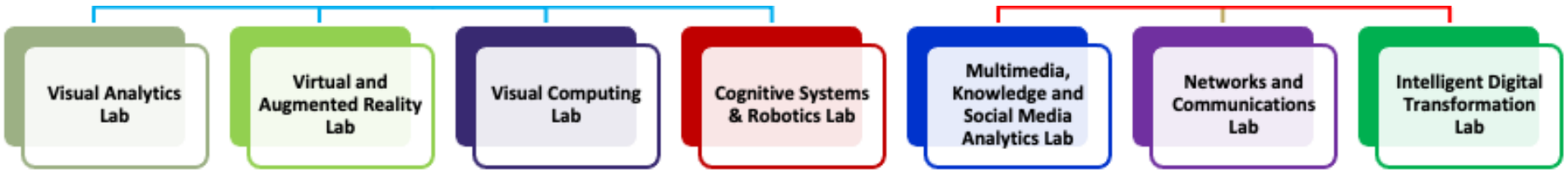
**Annual financing ~ € 45M**:

- 30% industrial research contracts
- 60% research projects
- 10% government institutional funding

Listed among **TOP-15 E.U. institutions** with the highest participation in competitive research grants

# Information Technologis Institute - ITI

- Founded in 1998 as a non-profit research organisation
- Part of CERTH since 2000, **> 480 employees**
- Leading ICT Institution in Europe
- Project record (> 500):
  - > 300 research projects funded by the European Commission (FP5-FP6-FP7 & H2020)
  - > 90 research projects funded by Greek National Research Programmes
  - > 120 Consulting subcontracts with the Private Sector (Industry)
  - **Around 20 M€ funding per year during the last 3 years**



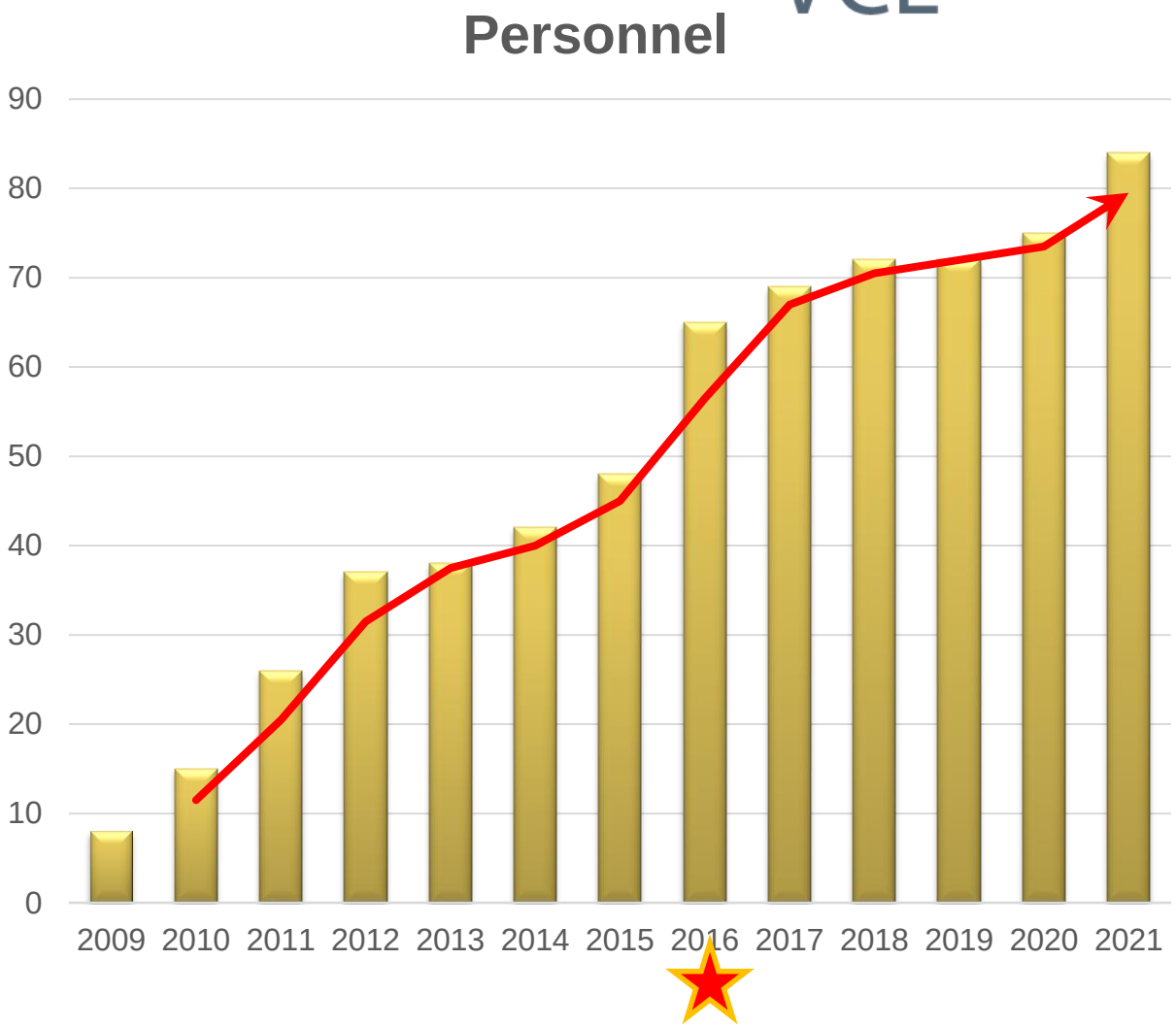
# Visual Computing Lab Overview / Research Priorities

- **Established in 2012**, active from 2009

- **84 Employees**
  - 4 Senior Researchers
  - 10 Post-Doc Fellows
  - 6 PhD Candidates
  - 61 Research Associates
  - 3 Administration Assistants

- **Research Priorities**

  Computer Vision and Machine Learning (CVML) in:
  - Security & Migration
  - IoT & Robotics
  - 4D Reconstruction & Tele-immersion
  - Media & Content Convergence
  - e-Health & Nutrition
  - e-Learning & Gamification



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IMMERSIVE SOLUTIONS

2016

Spin-off of Visual Computing Lab/Certh
to radically transform
research and excellence to
added-value products.

DIMITRIS KATSIKAS
Co-founder / CEO

PETROS DARAS
Co-founder / CRO

DIMITRIOS ZARPALAS
Co-founder / CTO

# VCL in H2020 projects




ICT-enabled
integration facilitator
and life rebuilding guidance


















LARGE SCALE INFORMATION
EXPLOITATION OF FORENSIC DATA








FACTORY2FIT

# Empowering and participatory adaptation of factory automation to fit for workers

H2020 Factories of the Future,  FoF-4 project

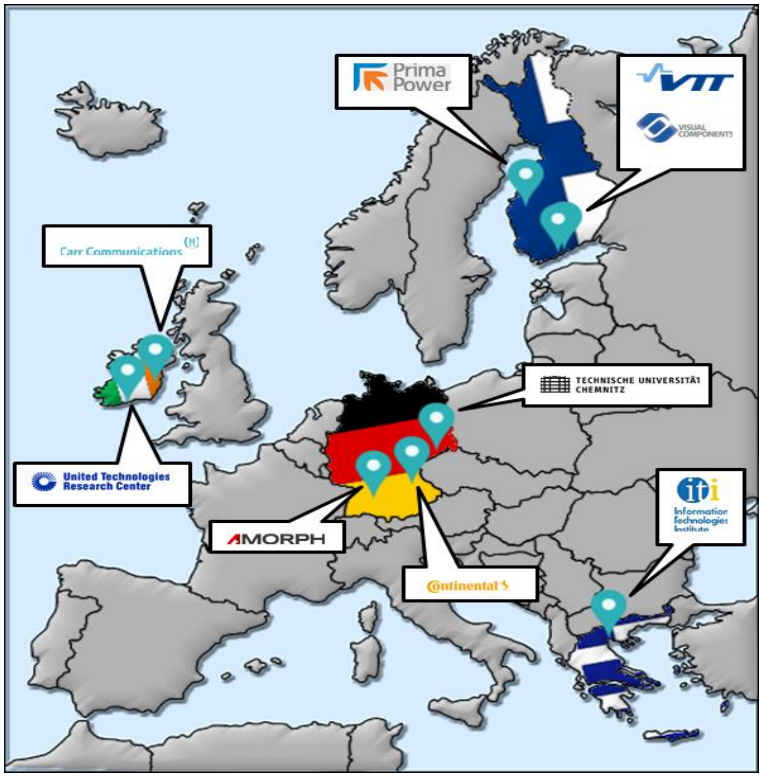
1.10.2016 – 30.9.2019

9 partners

EU funding 4,3 M€

The research leading to these results has received funding from Horizon 2020, the European Union's Framework Programme for Research and Innovation (H2020/2014-2020) under grant agreement no 723277

# Factory2Fit consortium




CERTH participated with 2 labs: VCL and VARLAB

| | Status[1] | Country |
|---|---|---|
| 1 VTT Technical Research Centre of Finland Ltd. | R | FI |
| 2 Amorph Systems GMbH | SME | DE |
| 3 Carr Communications | SME | IE |
| 4 Centre for Research and Technology Hellas | R | GR |
| 5 Continental Automotive GmbH | E | DE |
| 6 Finn-Power Oy (Prima Power) | E | FI |
| 7 Technische Universität Chemnitz | U | DE |
| 8 United Technologies Research Center | E | IE |
| 9 Visual Components Oy | SME | FI |

[1] R – research institute, U - university, SME – small or medium size enterprise, E – enterprise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# Factory2Fit Objective and expected impacts

**Main objective:**

Develop and pilot adaptive human-automation interaction solutions that

- improve the flow of working
- support the worker in understanding and developing his/her competences and
- engage workers to share knowledge and to participate in designing their own work and training.

**Expected impacts:**

1. **Increased the adaptability of manufacturing systems by 50% to fit for worker skills and preferences**
2. Further **increase work satisfaction** at least 15%
3. Work satisfaction further leads to 5-15% **increase in productivity** and 10-30% increase in **manufacturing quality**;
4. Increased **interest towards manufacturing jobs in the society** with wide dissemination activities
5. **Wide adoption** of the new developments in advanced manufacturing systems, based on active exploitation activities


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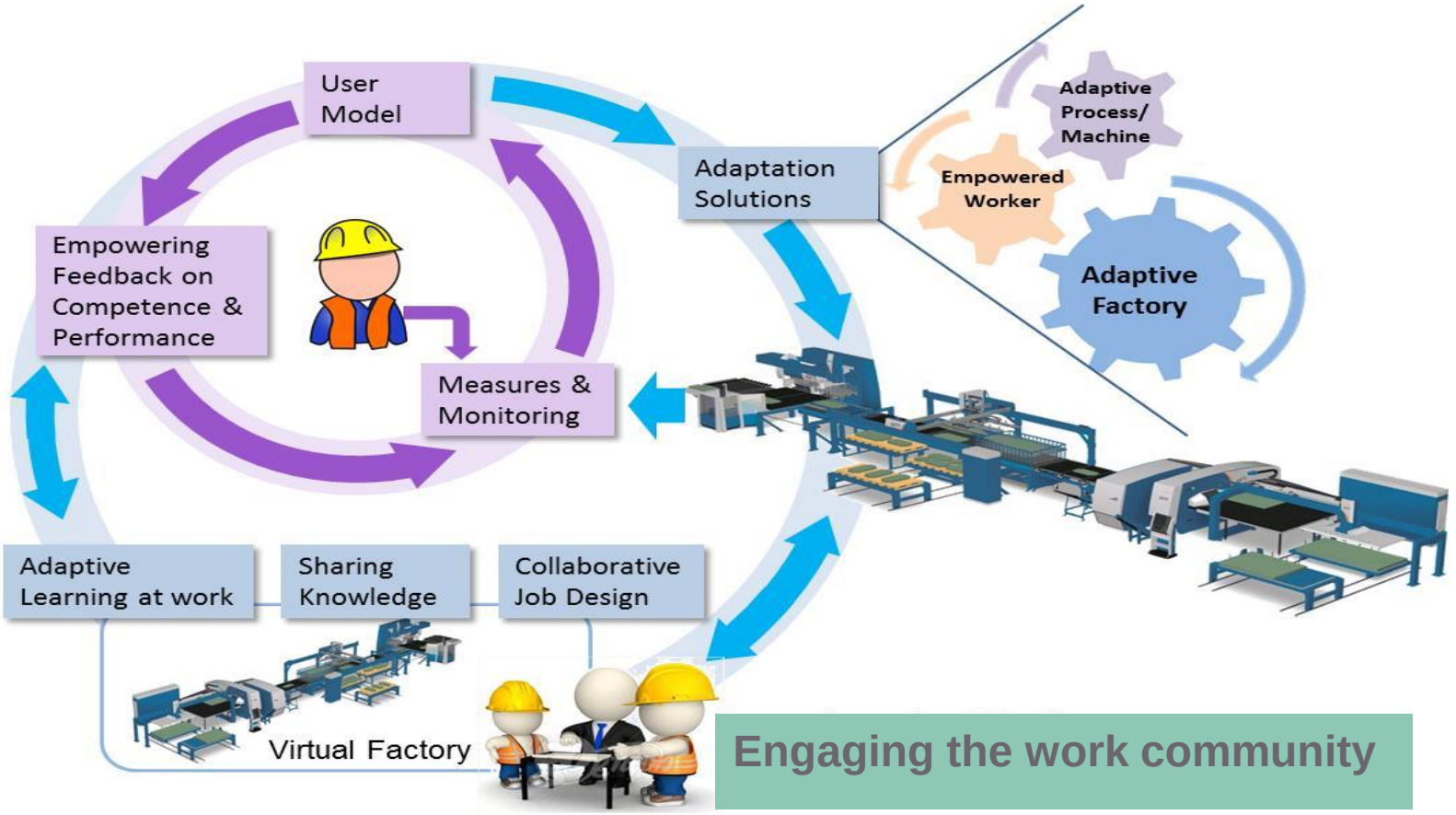
# Factory2Fit Approach

## Empowering the worker




## Engaging the work community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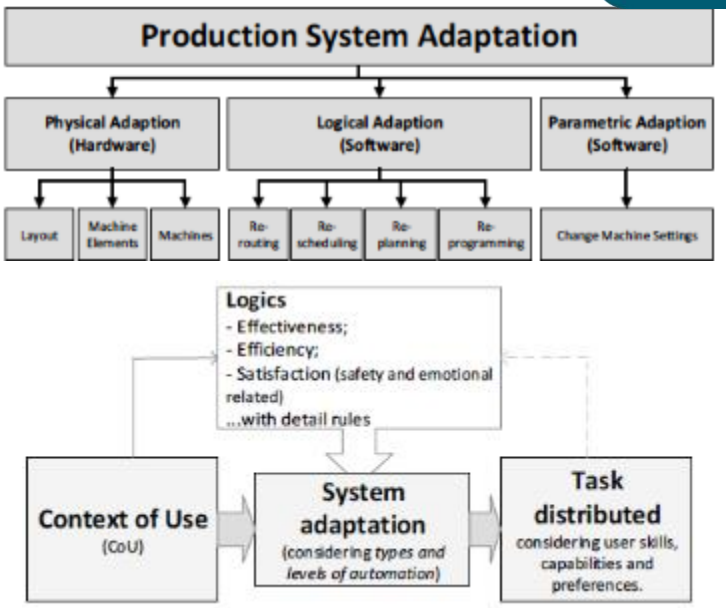
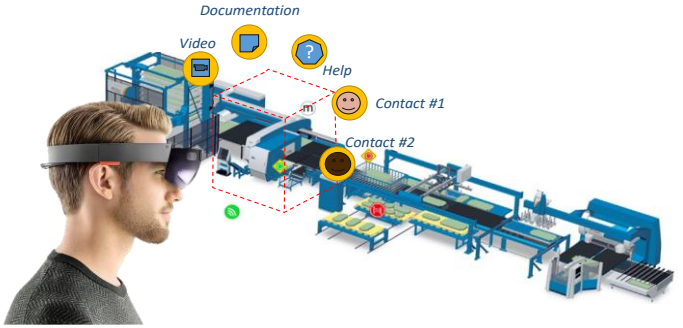
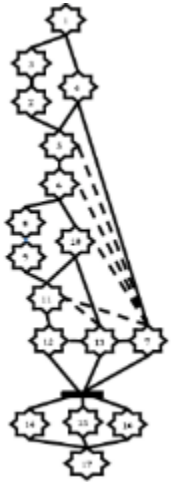
# FACTORY 2 FIT – CERTH ROLE

- **Worker Centered Adaptation and Training in FoF**
  - Adaptation and Task Distribution based on Levels of Automation
  - Capability driven workforce management and task sequencing optimization
  - AR/VR solutions for employee training and knowledge sharing
  - Augmented Reality based task assembly training and guidance
  - Mixed Reality application for enhancing Predictive Maintenance and supporting Corrective Maintenance.
  - Real time defect detection exploiting computer vision and machine learning techniques.
  - Real time remote support of technicians by allowing experts to directly intervene in their field-of-view.



# Experiences from F2Fit

Getting an inside look on which are the actual needs of such industries (both vertical and horizontal needs)

Having an opportunity to pitch your (already funded) ideas to them and get actual feedback

A factory is, by definition, a LARGE entity, with various departments. People usually in proposal preparation are not involved in project execution. Different opinions between them on what is important, valuable, of high priority, and feasible to be piloted within the project (production performance must not be affected).

Worker union disagreements …

Management’s investment priorities might change from the proposal phase to project execution.

# VCL Scientific Results Exploitation

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Alumil

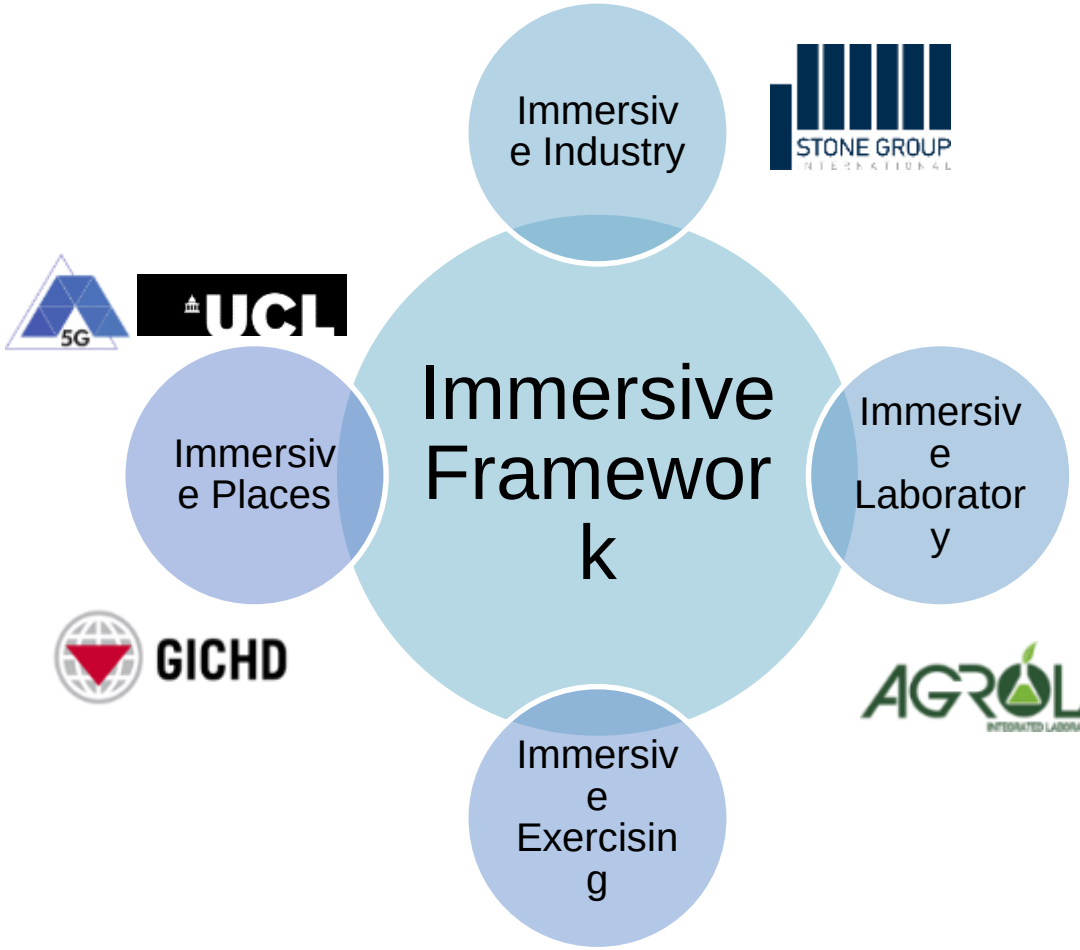
Founded: July 4th, 2016

CERTH/ITI/VCL Spin Off

Flagship Product

## Immersive Framework

An **I**nternet **o**f **T**hings ecosystem, relying on cutting-edge computer vision and machine learning algorithms, enabling machine-to-machine and human-to machine communication and interaction



# D-cube participation in H2020

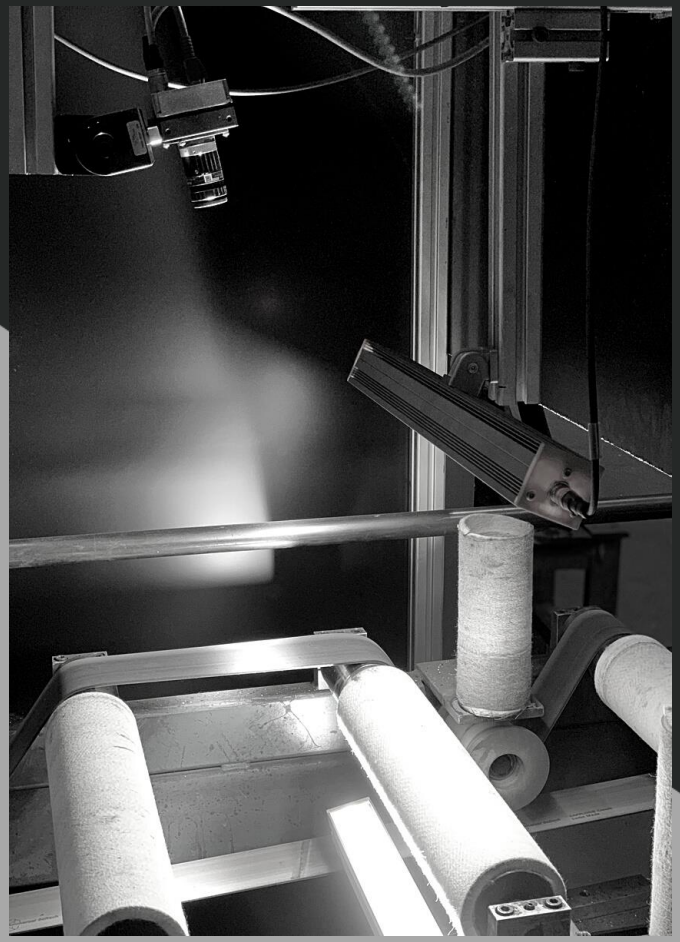
Open calls participation, dedicated to SMEs

- MARKET4.0: A Multi-Sided Business Platform for Plug and Produce Industrial Product Service Systems
- QUA4LITY: Digital Manufacturing platforms For Connected Smart Factories
- TRINITY: Digital Technologies, Advanced Robotics and increased Cyber-security for Agile Production in Future European Manufacturing Ecosystems
- MIDIH Manufacturing Industry Digital Innovation Hubs (I4MS ICT Innovation for Manufacturing SMEs)
- DIATOMIC (SAE Smart Anywhere Everywhere)

* SAE+I4MS overall funding cap

# OUR EXPERTISE

We specialize in cutting-edge visual quality assurance solutions for diverse industrial domains, using computer vision, machine learning, artificial intelligence and big data analytics.



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# OUR SOLUTIONS

## EXTRUSION 4.0

The Future of Aluminum Factories

## STONE 4.0

Marble Factory of the Future

D-cube
IMMERSIVE SOLUTIONS

# EXTRUSION 4.0

The Extrusion 4.0 solution is an innovative machine vision solution for inline quality control on aluminum extrusion and surface treatments.

The only solution in the world that guarantees early scrap identification, prevents unnecessary downstream processing,
and can be successfully applied to all aluminum industries, ensuring, for each of them, maximum production efficiency.

# Machine Vision System

## for inline quality control on aluminum profiles

**Artificial Intelligence** at the services of **yield optimization**, **scrap reduction** and **fast decision making**.

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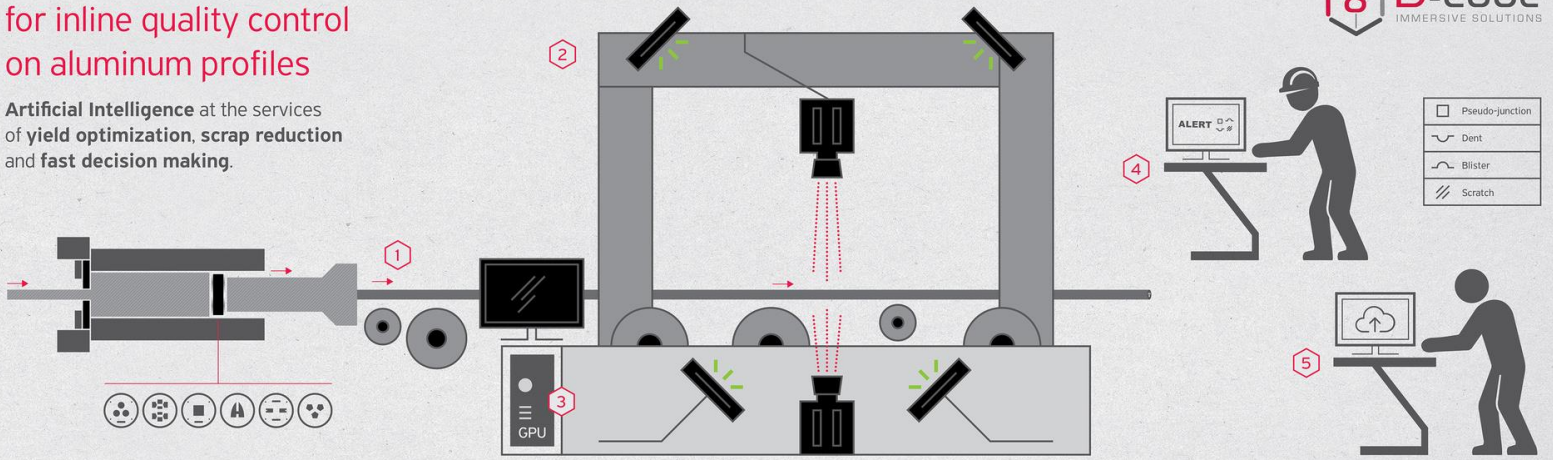


1. Profile exits extrusion press on the run-out roller conveyor

2. Profile enters CYRUS Smart Cage, just a few meters from the press

3. CYRUS captures extruded profile and artificial intelligence algorithms identify surficial defects in less than 50msec

4. Press Operator receives real-time scrap alerts and is instructed to tackle press parameters

5. Production manager monitors remotely and near real-time the production and has access to big data analytics, enabling yield optimization.

Cyber Physical Aluminum Extrusion (CYRUS) System using high-end GPUs and neural networks for surface inspection and early defect detection, in less than 50msec.

Basler industrial cameras with seamless recording style and powerful industrial LED lighting systems from Effilux, allow for early defect detection and localization in speeding profiles.

Alert press operator to frequent and repetitive blisters, dents, welds, scratches, oxides, skews and/or emerging die lines, in real time.

Big data on the cloud and Infrastructure-as-a-Service, reveal insights for yield optimization and bring aluminum business to the next level.

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# STONE 4.0

## MARBLE FACTORY OF THE FUTURE

Stone 4.0 is an industrial IoT ecosystem delivering quality assurance to tile and slab production, palletization, and
end-to-end tracking.

The only solution worldwide that guarantees inline defect detection and localization, objective sorting of natural stones and can be successfully applied to all marble and natural stone industries, combining maximum production efficiency with customer engagement.

# Innovative quality control solution

## for marble tiles & slabs production, palletization & end-to-end tracking

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IMMERSIVE SOLUTIONS

Machine vision, artificial intelligence and augmented reality at the services of smart tile and slab sorting, defect detection, palletization, real-time production monitoring & business intelligence.


1. Marble tiles or slabs exit processing machine on the conveyor belt towards packaging

2. Marble tiles/slabs enter the Machine Vision smart cage where a lase sensor identifies each tile/slab separately and the tracking process begins

3. Neural Networks process realistic captures of each tile/slab resulting to autonomous sorting and surficial defect detection (holes, scratches, spots, crystals, etc.) in less than 2 sec

4. A virtual mirror imprints sorting information on physical tiles/slabs through augmented reality, allowing for fast and human-error-free packaging

5. Data are shipped from the industrial floor to a private cloud providing near-real time production insights (ad-hoc statistics, virtual dry lay)

6. Customers logon to a dedicated extranet where they can track their orders, explore stock pallets and even browse tiles in a pallet or a box.

7. Retail customers have the opportunity to actually see what's in a box before buying it, through a smartphone app!

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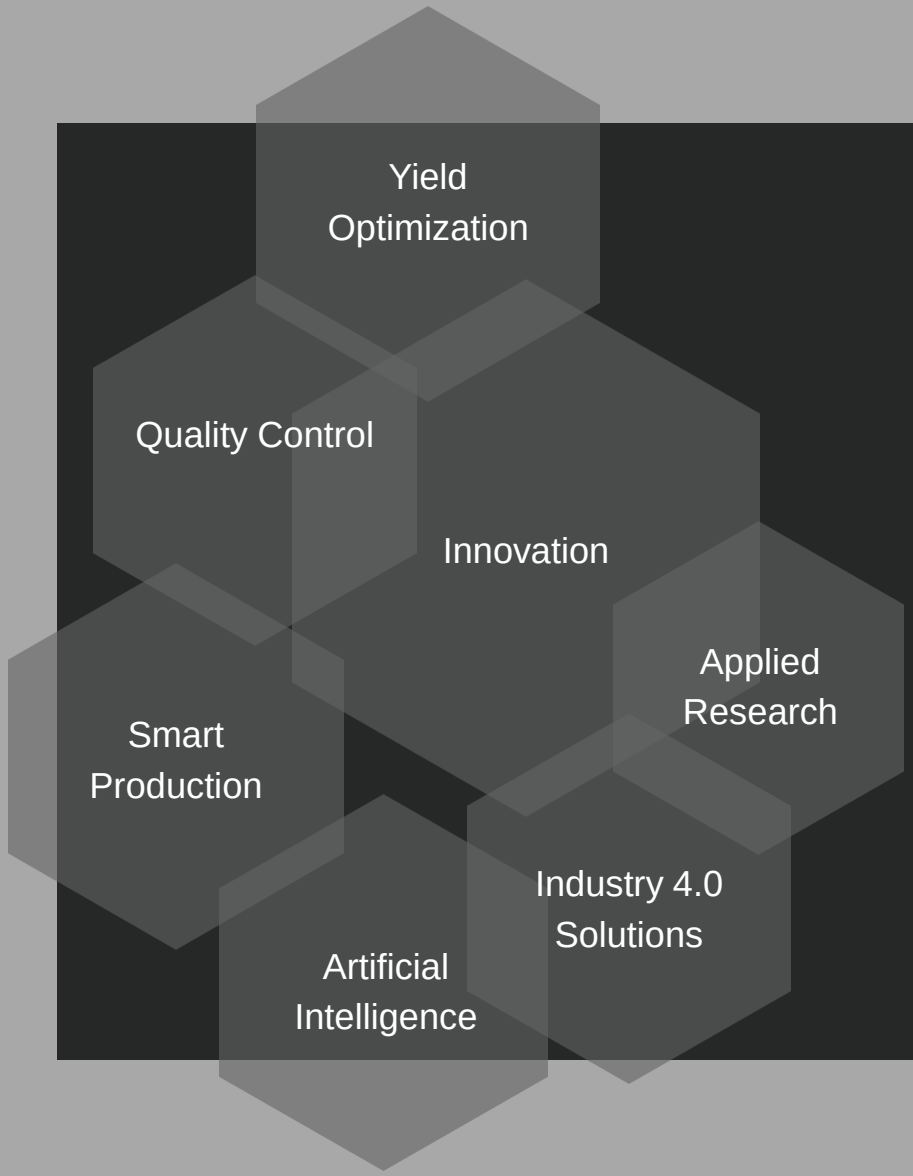


## WHAT WE OFFER

- Non-stop Yield Optimization
- Industry 4.0 Innovative Solutions
- Pave the way from Automation to Autonomy
- Downstream processing optimization
- Minimize human error
- Raw material savings
- Production cost savings
- Real-time production monitoring
- High-level decision making by low-level QA metrics
- Smart production by keeping humans-in-the-loop

# AWARDS

1ST PLACE in Accelerate category in BoostUp Competition, organized by EIT Manufacturing.

Extrusion 4.0, our innovative machine vision solution for the aluminum industry, was awarded as the best solution for sustainable, resilient,
and socially impacting Manufacturing, among start-ups ready to scale up their business.




# THANK YOU!

Let's start your journey
to the Factories of the Future!

Dimitrios Zarpalas

zarpalas@iti.gr

dimitrios.Zarpalas@d-cube.eu

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