



ΣΥΝΔΕΣΜΟΣ  
ΜΕΤΑΛΛΕΥΤΙΚΩΝ  
ΕΠΙΧΕΙΡΗΣΕΩΝ



## **EIT RawMaterials: 4<sup>th</sup> Greek Raw Materials Community Dialogue**

11<sup>th</sup> -12<sup>th</sup> December 2019, New Hotel Fillelinon 16 Str., Syntagma, Athens, GREECE

**“Industry 4.0 and social innovation. Impact on the mining activities”**

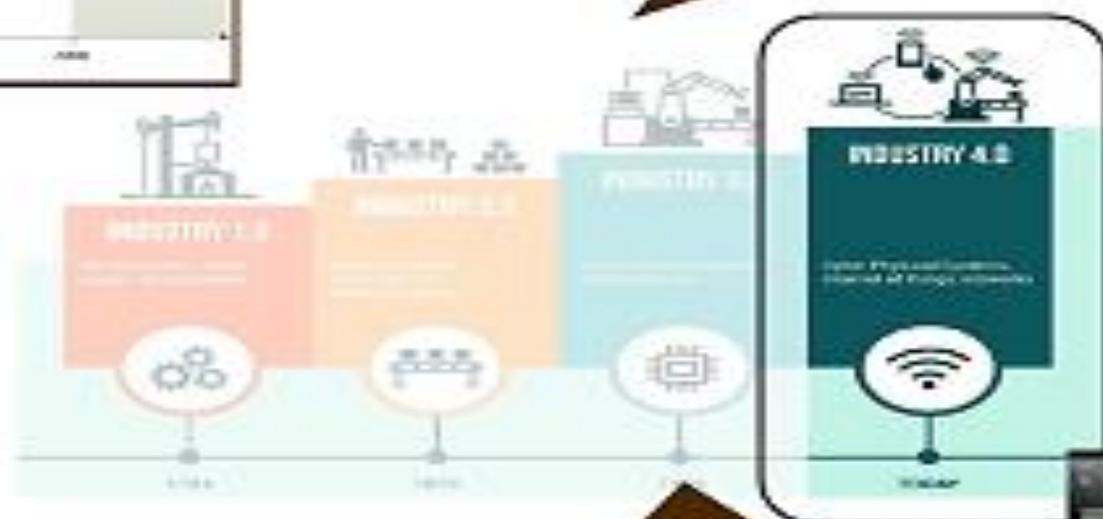
Christos Kavalopoulos, general director of Greek Mining Enterprises Association



# Mining both drives the 4<sup>th</sup> Industrial Revolution and stands to benefit considerably



*Minerals are key enablers for new tech*



*New tech has opened up a new realm of possibilities*

*and acts as an Operational Excellence lever*

*Discussed in detail overleaf*



# SOCIAL INNOVATION



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New social practices that aim to meet social needs in a better way than the existing solutions by introducing new models of entrepreneurship, based on industry 4.0, which offer sustainable economic, environmental and social prosperity





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# SOCIAL INNOVATION

## Megatrends:

- ✓ Technological development
- ✓ Acceleration and complexity,
- ✓ Network,
- ✓ Globalization
- ✓ Commercialization
- ✓ Economic growth

All the above are driving the 4<sup>th</sup> industrial revolution which is rapidly transforming the nature of work and services

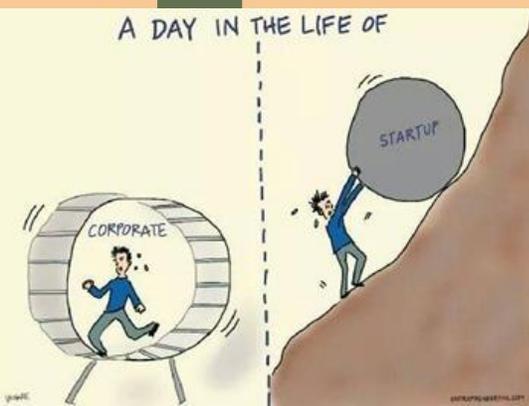


# THE NATURE OF THE NEW WORK AND WORKING ACTIVITIES



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- ✓ Online working
- ✓ New office environments
- ✓ New human- machine interfaces
- ✓ Cybersecurity
- ✓ Internet of things
- ✓ Interconnectedness of things and people
- ✓ Self education-training systems
- ✓ Data analysis
- ✓ Robotics



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- ✓ **Hierarchical** organization tends to be slow. An Alternative structure is **Wirearchy**, a new business model that can evolve rapidly from a startup to a global behemoth



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## Wirearchy:

- Alternative structures
- Dynamic flows of power
- Trust
- Information and authority among enabled, interconnected staff



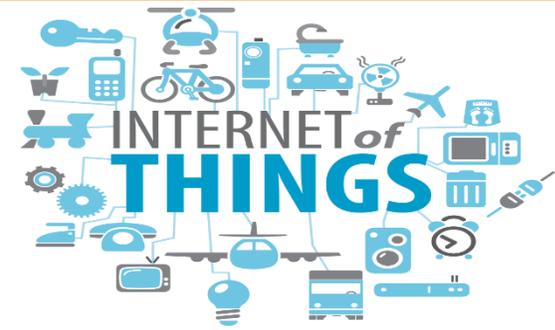
# THE NATURE OF THE NEW WORK AND WORKING ACTIVITIES



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## Wirearchy leads to (1):

- Non office environment
- Increasing number of self-employees
- New organizational and leadership forms
- An increasing pressure on employers-reskilling and upskilling
- An increasing pressure on employers to introduce new educational and training systems. Cost



# THE NATURE OF THE NEW WORK AND WORKING ACTIVITIES



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## Wirearchy leads to (2):

- End of routine boring work. The new nature of work is limitless, completely creative
- The value chains are being replaced by value networks





## Promised capabilities

## Expectations

### Cyber-physical systems

*Softwares command and control the physical world*

### Internet of things

*Connected objects and sensors measure the world*

### Cloud computing

*Computing power and space are available everywhere*

### Cognitive computing

*Artificial intelligence will outperform the human brain*

### Big data analytics

*The machine can read through a gigantic amount of data*

Agility

Connectivity

Power

Adaptability

Comprehension

Real-time

Reliability

Predictability

Safety

Traceability

Customization

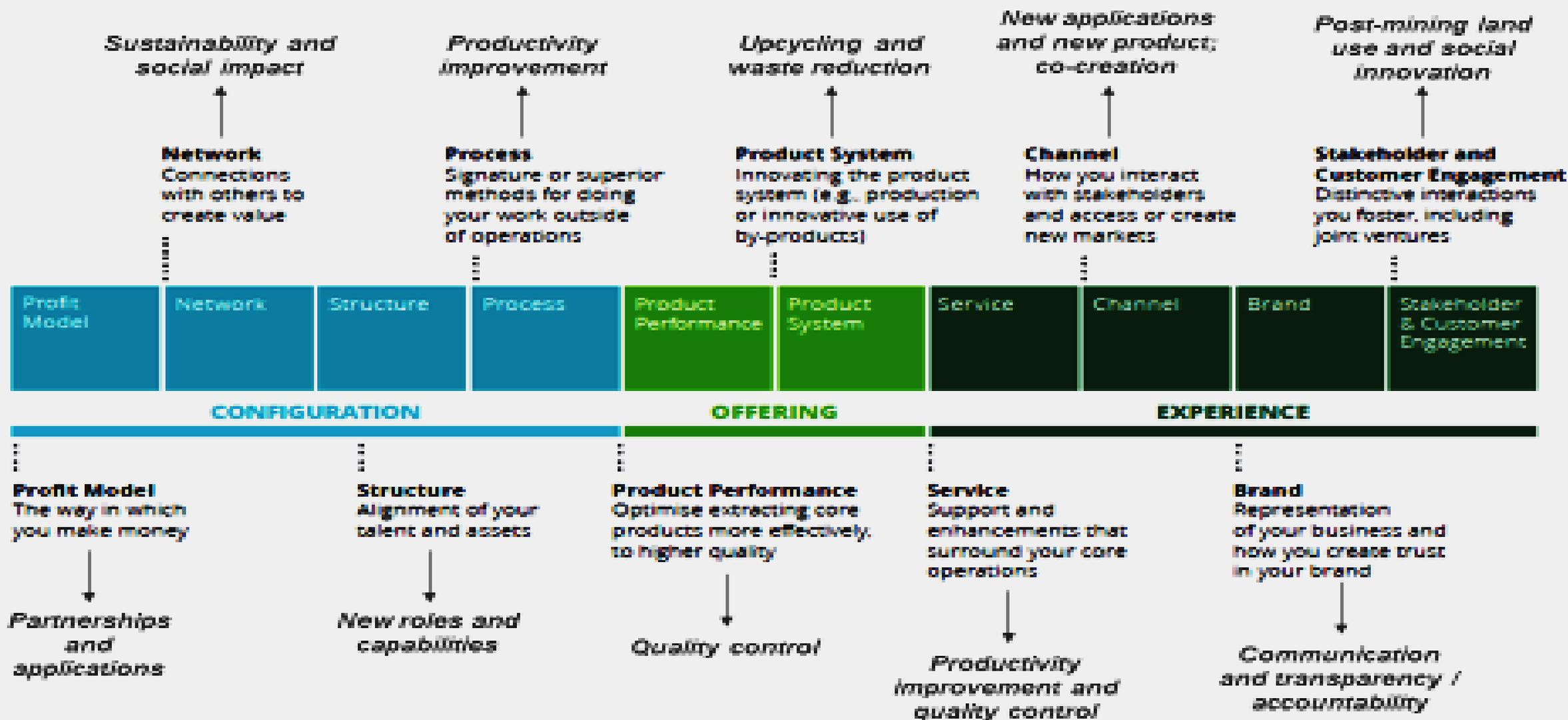
Customer intimacy

Digital mine

Smart factory

End-to-end integration

# Ten Types of Innovation (i.e. the creation of a new, viable business offering) across Mining Value Chain



# The 4<sup>th</sup> Industrial Revolution is very applicable to mining and can be key in addressing some of the long-standing challenges in the industry



## Key Challenges

- Keep up with productivity to respond to squeezing margins
- Slash costs to maximize competitiveness and resilience to market and commodity price fluctuations
- Retain access to valuable reserves and resources
- Maintain social license to operate

### Productivity

- Automated drilling
- Autonomous vehicles
- Tunnel boring systems
- By having these machines operating 24 hours a day, every day, at high levels of productivity and with lower personnel costs, could add USD 56 billion in value to the industry

### Safety

- Autonomous vehicles to balance reachability and risk
- Drones and smart sensors facilitation equipment predictive maintenance, reducing failures
- Digitization is estimated to potentially save an estimated 1k lives and avoid 44k injuries per annum

### Quality

- Smart sensors and IoT offer advanced detection capabilities and scale
- Automation and digitization can reduce unpredictable events, human errors, and failures

### Resource access

- Mines are getting more geographically remote and deeper
- Companies are looking for opportunities to cut their operating costs as operating with conventional vehicles and generators, the costs of ventilation and refrigeration can be expensive and challenging

### Social impact

- Upcycling / Recycling to maximize resource utilization
- Live environmental impact tracking in the interest of transparency
- Social innovation through post-mining land use
- Partnerships for capability building



## 3D printing

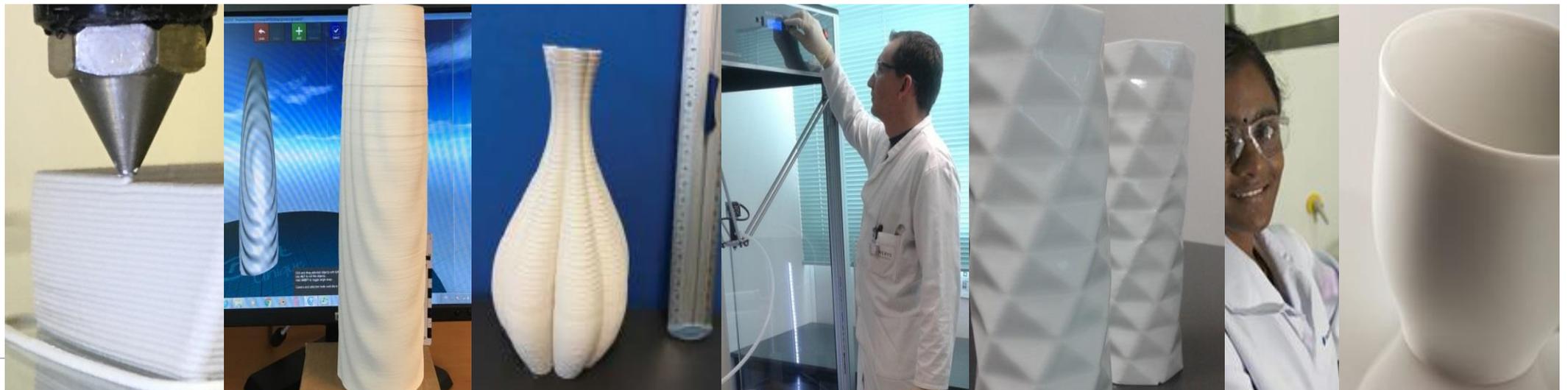


*Solutions for tableware and sanitaryware 3D printing - prototypes and short series*

*Possible developments in precision casting, special concretes, technical ceramics*

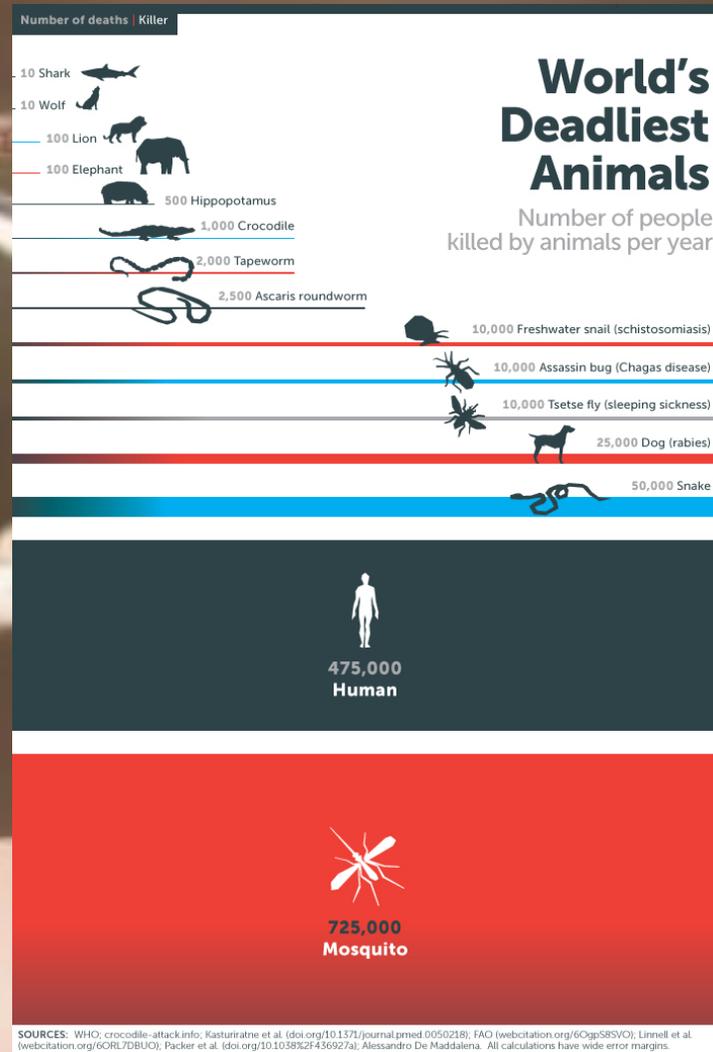
- *Fast and flexible*
- *Repeatable*
- *Waste reduction*
- *Plastic cartridges recycling*

- **Opens a new area of value creation**
- **Revolution of the ceramic industries ?**





# The physical world (still) needs physical solutions



Half of the world is exposed to vector-borne diseases

212 millions new cases of paludism in 2015  
429 thousands died of malaria in 2015

Mechanical insecticides from amorphous silica have been developed (mineral: diatomite)  
Non-chemical and affordable



# The physical world (definitely) needs physical solutions

Over 500,000 children under 5 die each year from diarrheal diseases, caused by lack of clean water or adequate sanitation



**Imerys  
low cost  
water filter  
solution for  
households**

Capacity: 14 liters  
Dimensions (assembled): 25x25x60 cm  
Inner box packing size: 28x28x38 cm  
Weight in box: 2.4 kgs

ImerPure, a filtration cartridge was developed to clean water at ~ \$0,04 per day and per family



## For what impact ... for what idea of progress?

- In the industry, technological progress is an indisputable mean to competitiveness
- In society, the replacement of social relations by cyber relations in all kinds of human activity can be subject to debate, but positive aspects are numerous
  
- But:
  - ◆ Repetitive tasks disappear ... when jobs are not replaced 1:1
  - ◆ Capital is massing ... when inequalities don't decrease
  - ◆ New desired services emerge ... when basic needs remain critical
  
- The real question is: **how do we contribute to progress**, and how do digital technologies help us for that?
- There, we find progress still relies strongly on materiality  
and a **materials industry can help!**