Competitive Sustainable Globalization
Knowledge Enabling for Sustainability

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Agenda

- Globalization and Competitiveness
- Global Trends and Challenges for Sustainability
- Solution Concepts
- Leverage of Education
Globalization involves **economic integration** by transferring policies and **transmitting knowledge across national borders**.

It is a phenomenon of **increasing global interdependences of markets and value creation**.
Globalization reduces the barrier for countries, especially Newly Industrialized Counties (NICs), to connect to high value-added products and production processes.

The shift of labor-intensive value creation from Early Industrialized Countries (EICs) to NICs and the global mobility of technology have initiated a new era of growth for the markets of NICs.
Globalization has essentially empowered the development of NICs and fostered the emergence of global sustainability challenges.

[UNCTAD-2015; WEF-2015]
Local Manufacturing

Jovane:

- Rethinking manufacturing policy at the regional scale, requires reconnecting innovation policies and production policies to regional-scale institutions and intermediaries, ranging from research and development infrastructure to labor market intermediaries.

- Public policy at the local and regional scale improves manufacturing resilience, encourages the adoption of new models of production and consumption, and enables the ongoing viability of older industrial cities and regions.
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If the lifestyles of emerging and early industrialized communities will be shaped in the future by the existing, actually predominantly applied technologies, then the resource consumption will exceed reasonable economic, environmental and social boundaries.
The dynamics of global competition and cooperation shall be exploited for innovating and mediating manufacturing technologies towards the reasonable demanded sustainability on earth.
Selection of relevant global trends 2015 & 2016 according to the WEF

- Socio-economic Inequality
- Structural Unemployment
- Migration and Displacement
- Urbanization
- Climate change
- Environmental degradation
- Rise of cyber dependency

[WEF-2016]
The average income of the richest 10% among the countries of the OECD has grown to about nine times to that of the poorest 10% - which corresponds to an all-time peak.

The inequality is not only present between social groups but also between genders. In average, women earn 16% less than men.

[OECD-2014; WEF-2015]
The Most Likely Global Risks 2016: A Regional Perspective

Risk Category
- Economic
- Environmental
- Geopolitical
- Societal
- Technological

Central Asia including Russia
- Energy price shock
- Failure of national governance

Europe
- Fiscal crisis
- Large-scale involuntary migration

North America
- Data fraud or theft
- Cyber attacks
- Extreme weather events

Latin America and the Caribbean
- Failure of national governance
- Profound social instability

Middle East and North Africa
- Unemployment or underemployment
- Failure of national governance

South Asia
- Water crises
- Failure of national governance

Sub-Saharan Africa
- Failure of critical infrastructure
- Extreme weather events

East Asia and the Pacific
- Natural catastrophes
- Water crises

Europe
- Interstate conflict

Sub-Saharan Africa
- Failure of national governance

North America
- Energy price shock

Latin America and the Caribbean
- Failure of critical infrastructure

Middle East and North Africa
- Failure of national governance

South Asia
- Unemployment or underemployment

Sub-Saharan Africa
- Unemployment or underemployment

East Asia and the Pacific
- Unemployment or underemployment

[WEF-2016]
UN Sustainable Development Goals

- 169 targets to be achieved by 2030
- Adopted by 193 countries during the 2015 UN General Assembly (October)
Axiological Background

- "Act so that the effects of your action are compatible with the permanence of genuine human life". (Hans Jonas redefining Kant’s „categorical imperative“)

- Thesis of „the invisible hand of the market“: The public welfare is promoted through the economic competition of individual interests. (Adam Smith, 1776)

- Goal: A sustainable development of technology and areas of living with guidance from market dynamics, with imagination, creativity and organization competence from responsible world citizens. (CRC 1026)
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How can manufacturing contribute to cope with the challenges of sustainability?
Combining the breadth of systemic reference with the depth of production technology to enable for sustainable value creation.
Coping with environmental challenges:

Non-renewable resources to be utilized in multiple usage phases connected by product remanufacturing and material recycling in between.

Substituting non-renewable resources by renewable resources, but only to the extent that they can be regained.
Coping with social challenges:

Increasing teaching and learning productivity thus achieving global awareness about sustainability.

“Learnstruments” i.e. objects automatically demonstrating their functionality to the users.
Breadth of sustainability in economic perspective

Coping with economic challenges:

Selling functionality instead of selling physical products thus achieving more wealth with less physical resources exploiting market dynamics by applying innovative technologies.
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The awareness of societies about the global sustainability challenges must be raised by magnitudes.
Impact of Manufacturing

- Teaching and learning in diversity of different cultures and human values on globe
- Manufacturing providing comprehensive functionalities and objects for learning about sustainable value creation
- Manufacturing enabling for win-win among early industrialized and emerging communities
- Manufacturing enabling for responsible global citizenship by raising awareness about sustainability
Bottom-up approach

- Nations
- Unions
- Industries
- Governmental Organizations
- Big Enterprises
- NGOs
- Educational Institutions
- Schools
- SMEs

Governmental Organizations
Enterprises
Educational Institution
Non-Governmental Organizations
Learnstruments are objects which automatically demonstrate their functionality to the learner.

- use existing and new information and communication technology (ICT)
- aim at increasing the learning and teaching productivity
- provide adequate learning goals to the user
- support the user in achieving the learning goals

Learnstruments can be used directly in the work process.

- enable employees to overcome occurring problems
- improve the efficiency of the process
Learnstruments – Examples

- Smart Assembly Workplaces
- CubeFactory
- E-Hub-Assembly
- RecycleBin
Learnstruments – Smart Assembly Workplace
Learnstruments – Interactive 3D-PDFs: E-Hub Assembly
Learnstruments – CubeFactory
Learnstruments – RecycleBin
Education in Manufacturing Laboratory for Turkish/Syrian Scholars from the Turkish-German University in Istanbul
Help for Self-help in Turkey

- **April - July 2016**
  - Learning and practicing 3D-printing in Berlin

- **August 2016**
  - Procurement of 3D-printers in Istanbul

- **September 2016**
  - First drafts in Istanbul
  - First prints in Istanbul

**For Self-help in Turkey**

- **April - July 2016**
- **August 2016**
- **September 2016**
The EUROPEAN ENGINEERING TEAM (EET) is a new master module funded by the EU ERASMUS+ program.

A multidisciplinary and intercultural team of master students from four European universities are working together on a joint research project aiming for a sustainable technological innovation.

The innovation will be subsequently transferred into a sustainable startup established by the team of master students.
Development of Sustainable Innovations by Students – Micro Wind Turbine

Micro Wind Turbine
Development of Sustainable Innovations by Students – Micro Gas Turbine

- **Micro Gas Turbine**

- **Container Factory for Manufacturing in Emerging Countries**
Knowledge is the only resource expanded by utilization.
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