DRIVERS OF INNOVATION IN EDUCATION AND TRAINING IN FOOD SCIENCE AND TECHNOLOGY

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19th August 2014, Montreal (Canada)

ISEKI_Food Session – 17° IUFOST

Education: goals and social responsability

<u>To improve and to allow the development of the society by</u>

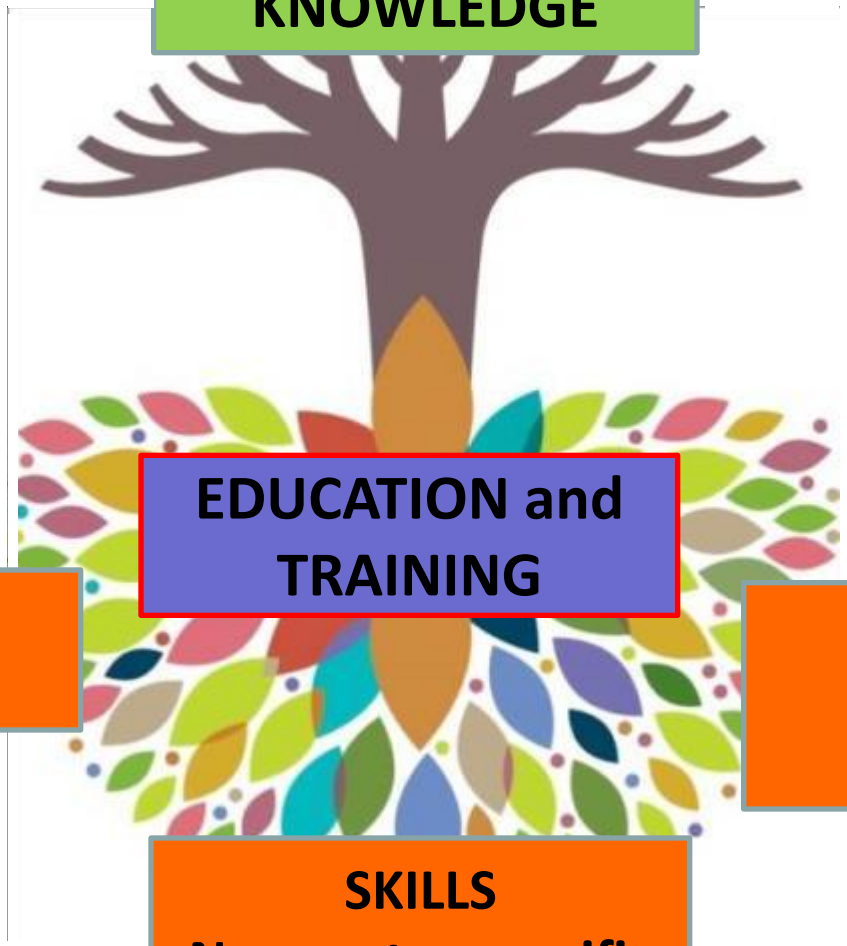
- transfer of knowledge
- development of skills and expertise of students and trainees,

meeting the expectations of

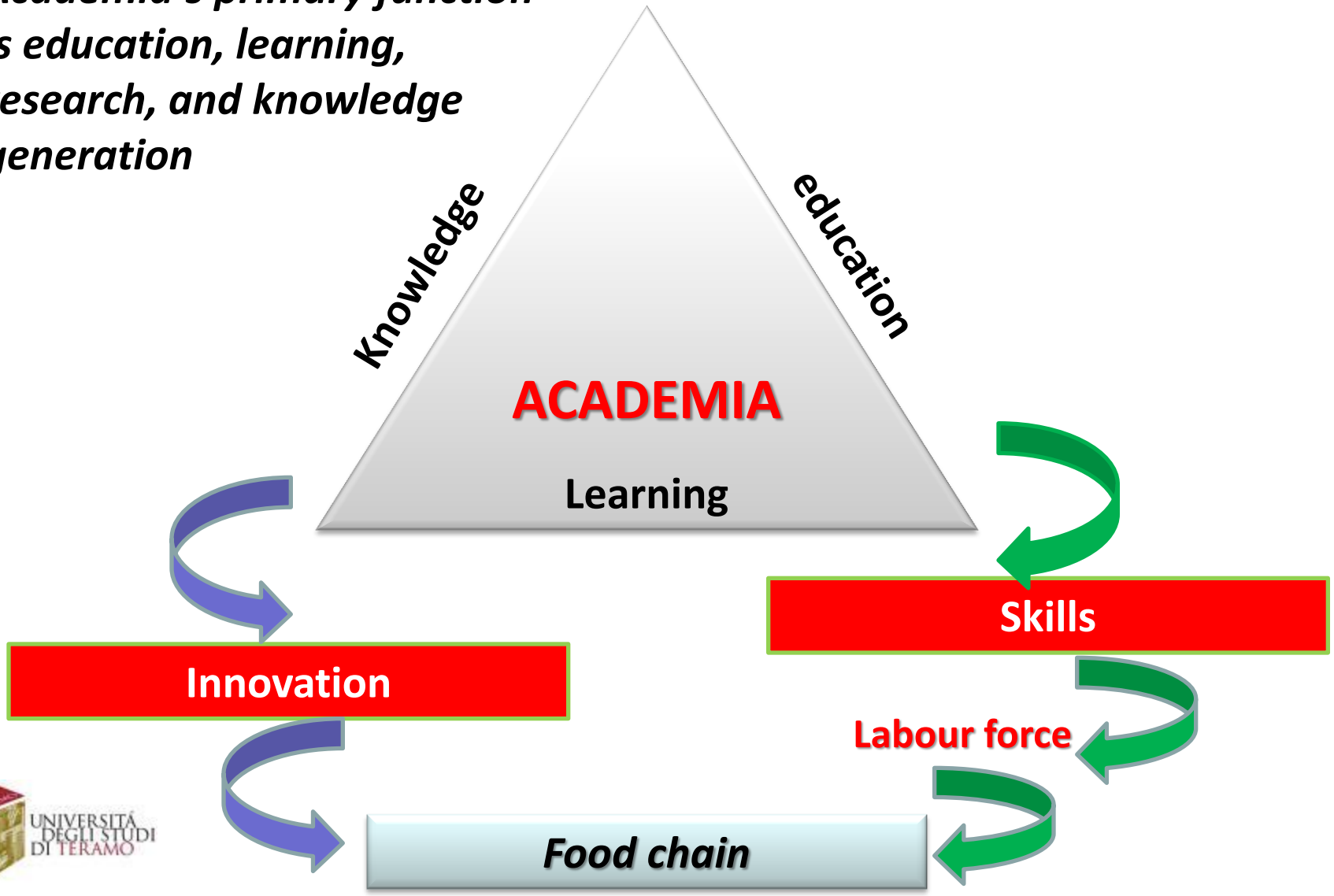
- consumers
- job market

Education

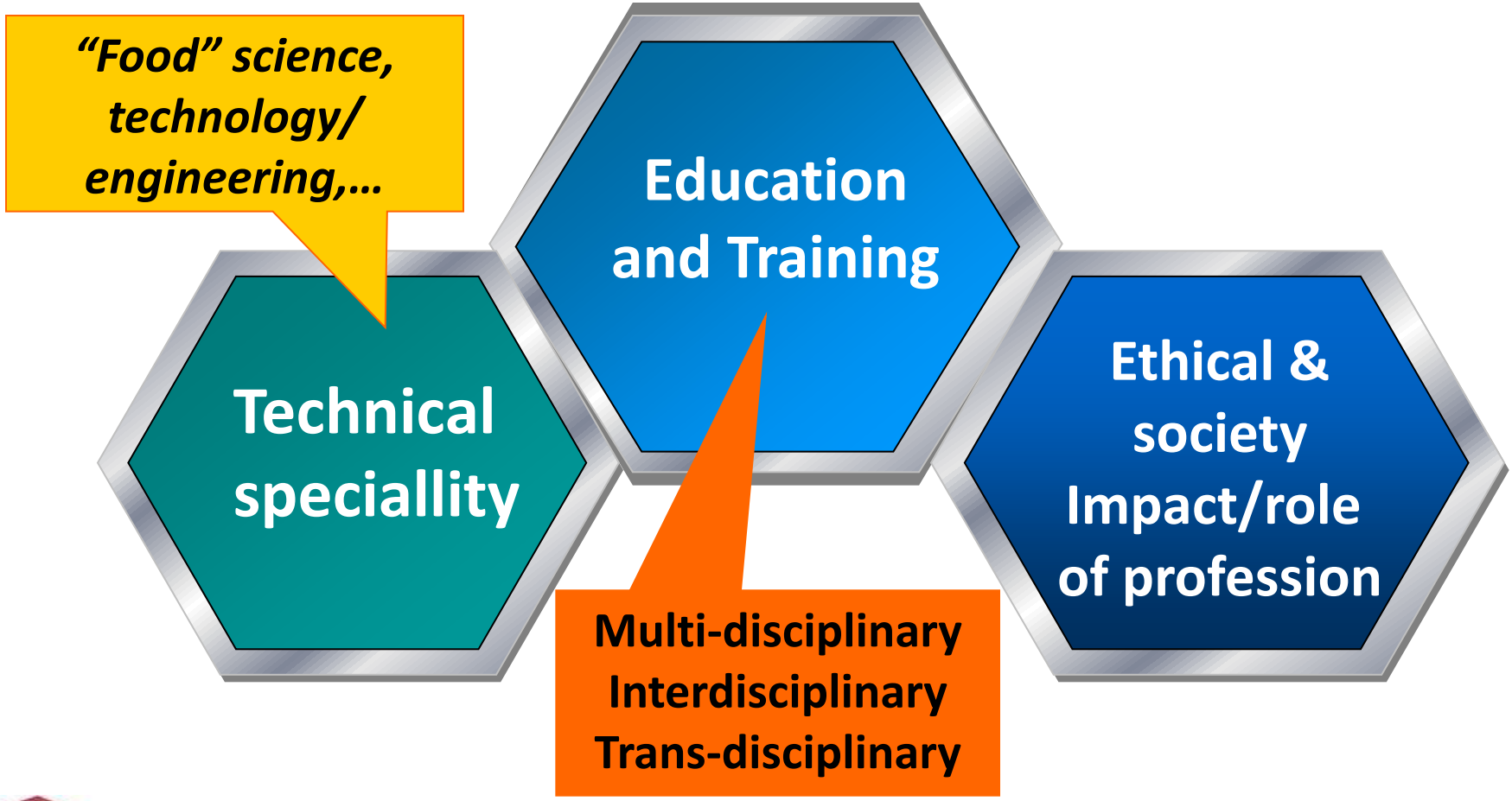
Education

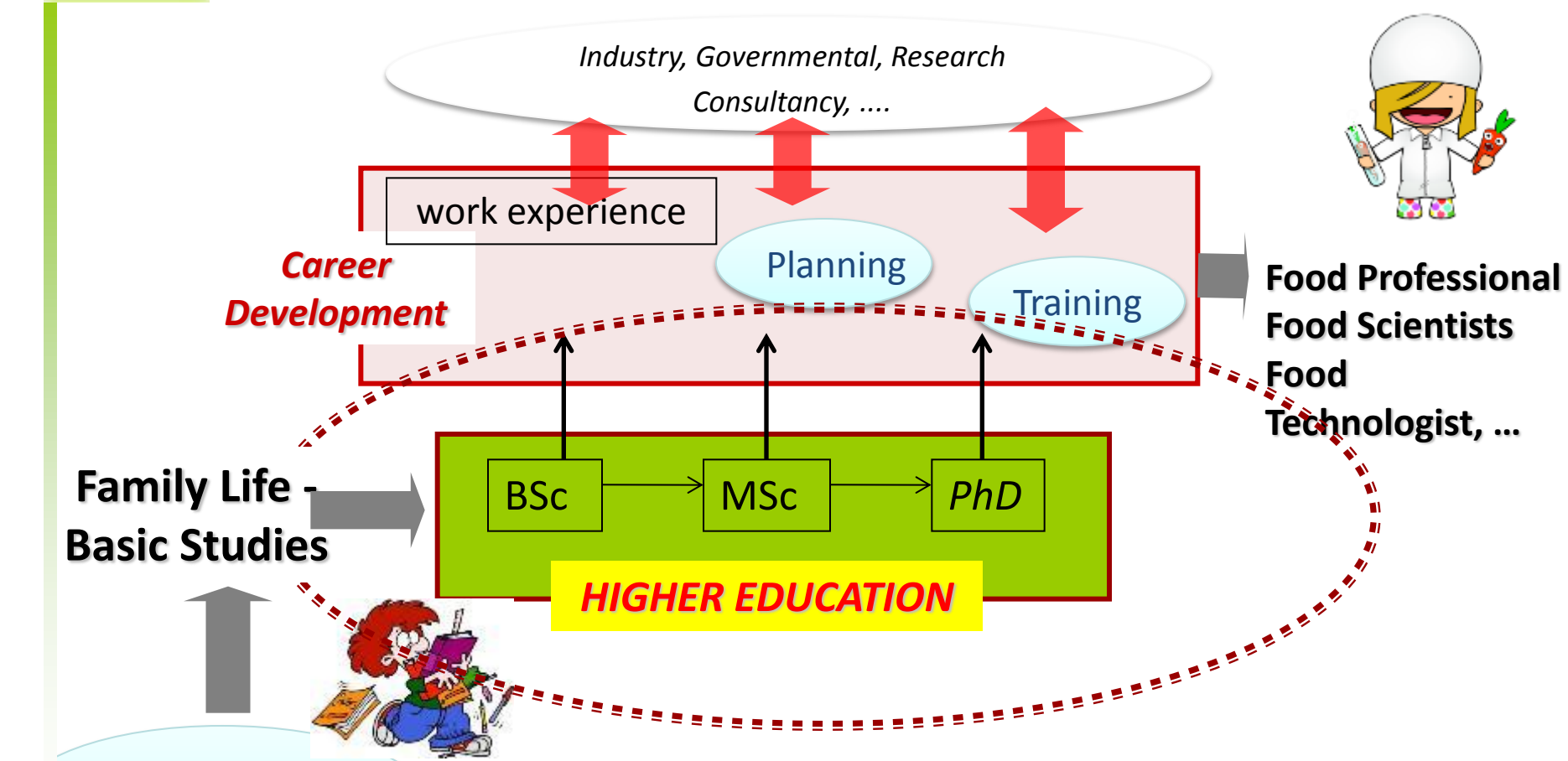

KNOWLEDGE
EDUCATION and TRAINING
SKILLS basic
SKILLS Food-sector specific
SKILLS Non-sector specific (soft)

Academia's primary function is education, learning, research, and knowledge generation



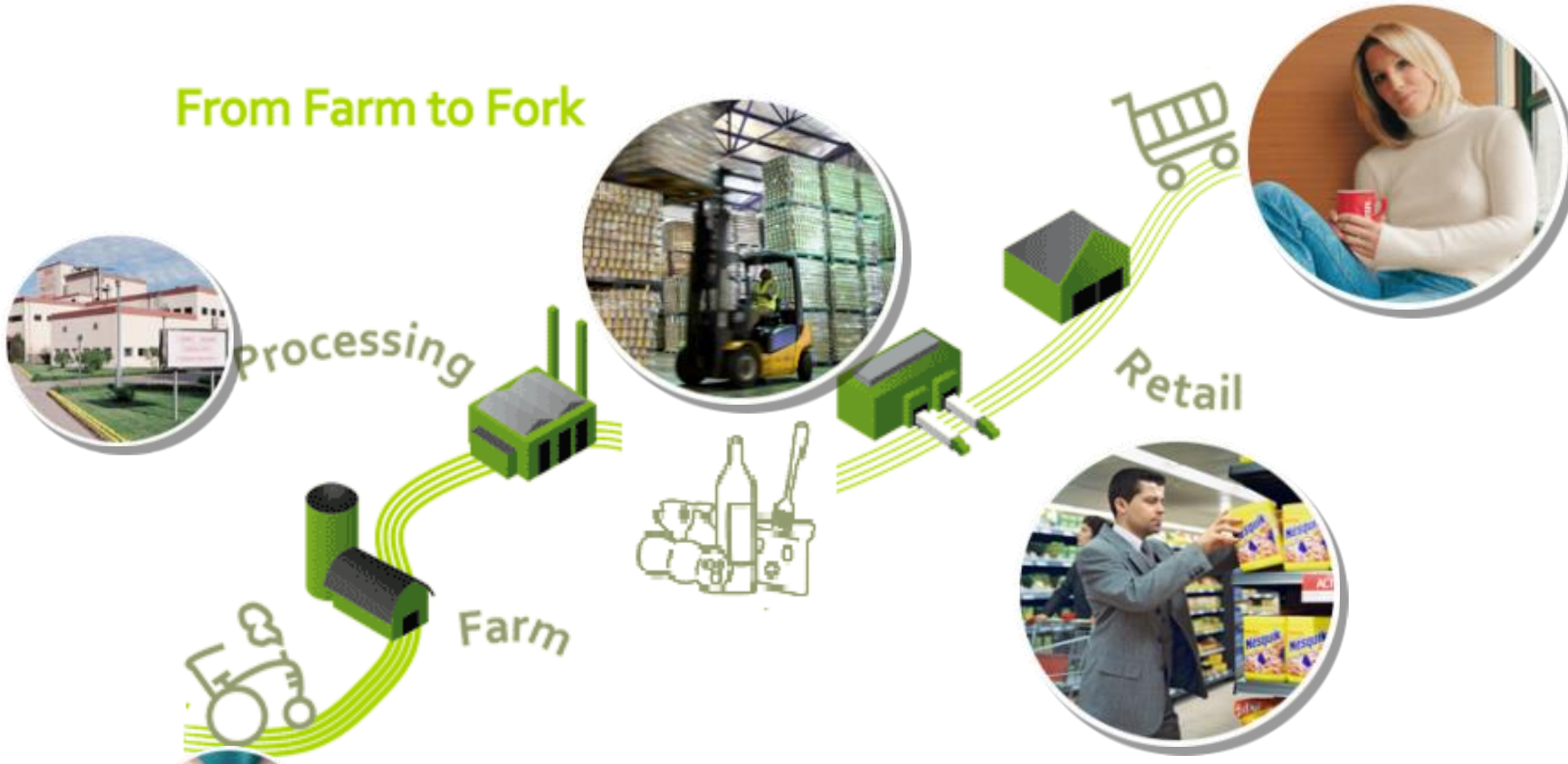
Key characteristics of graduates in HE "Food" studies





The «*environment*» of the education and the Food scientist /technologist / professional career path

The complex food chain system and its *actors*



The «environment» of the profession of graduates in FS&T/E

Academia (research/ education)

Government & IGO

Providers

Trade & policy-makers

«SOCIETY»

Food industry & associations

Media

NGOs

The complex food chain system and its actors

State of the art of HE in Food related-study programmes in EU

Bachelor degree: > 210

Leading countries (n.): DE, ES, IT, PT

Master degree: > 200

Leading countries (n.): IT, PT, UK, DK, BE

PhD: ca 100

(Track_fast & ISEKI_Food collection data, 2013)

Depending on the country, different trend in

- ***students enrollment***
- ***study programmes availability (opening vs closure)***

Evolution of the food study programmes

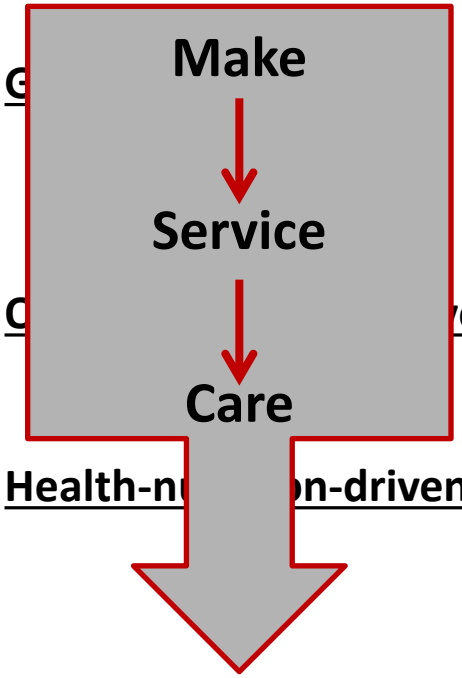
1950 **Sector specific** Milk science and Technology, Meat Science, Processes of animal products, Viticolture & oenology

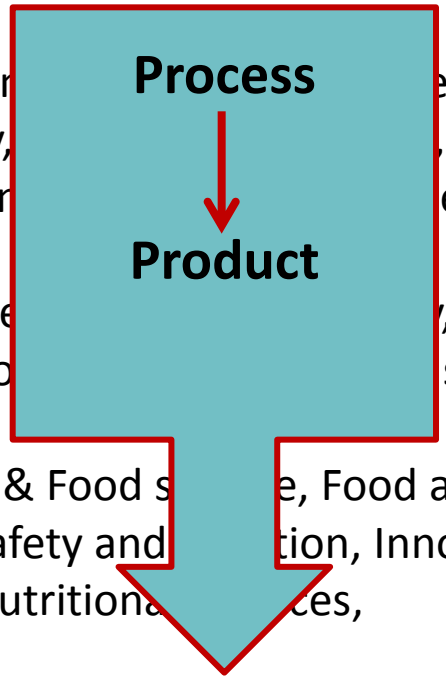
1970 **G** Food Scie eering, FS&Eng, Food chemistry, , Food microbiology, Food scie emistry, …

1990 **C ven** Food biote , Food quality and safety, Pro science Technology,

2000 **Health-n n-driven** Nutrition & Food s e, Food and nutrition, Food quality, safety and tion, Innovative Enology, Human Nutritiona ces,

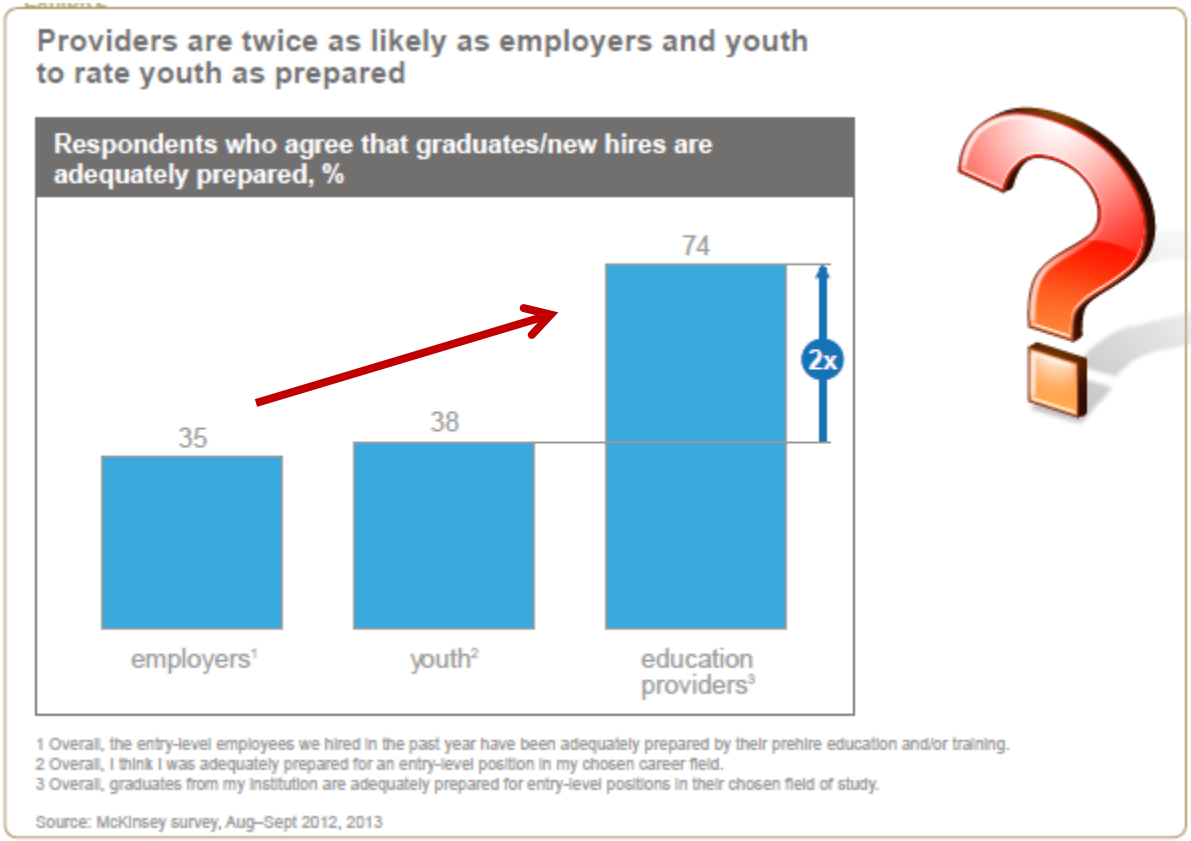
New trends (?) ?





(Track_fast & ISEKI_Food collection data, 2012)

Is Academia providing the proper education to the current students generation ?



Innovation in education and training in food science and technology

WHY?
WHAT?
HOW?
WHERE?

Education in a changing world

Education is a process that requires a continuous change and innovation:

- to meet the societal (and consumers) needs
- to meet the job market needs (skills)
- to favour the transfer the new knowledge (research)
- to allow progress and innovation of the food sector

In the Food Science and Technology/Engineering sector various and different and diverse factors led/are leading changes in the training and education of the future generation of the labour force.

(1) Societal innovation drivers

Society

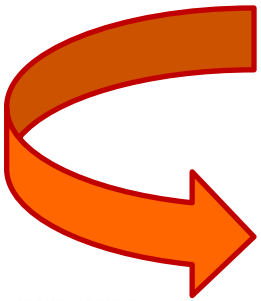
- Increasing population
- Aging
- Globalisation
- Ethical issues (religion, culture, diet)
- Economic crisis

Malnutrition/obesity
Food security
…

Environment

- Climate change
- Floods/earthquakes
- Land erosion
- Pollution and waste management

Food security
Food emergency
Food waste
Emerging pathogens



New skills…

Food quality
Food safety
Nutrition
Sustainable development and ecological integrity
LCA

Europe 2020 strategy - a European strategy for smart, sustainable and inclusive growth

- 75% employment rate for women and men aged 20-64 by 2020
– reduction of school drop-out rates below 10%
– at least 40% of 30-34–year-olds with third level education (or equivalent)

owth

economy based on knowledge and innovation

Sustainable growth

More efficient, greener and more competitive economy

Inclusive growth

Fostering a high-employment economy delivering social and territorial cohesion

Innovation
innovation union»

Education
«Youth on the move»

Digital society
«A digital agenda for EU»

Climate, energy and mobility
«Resource efficient EU»

Competitiveness
«An industrial policy for the globalisation era»

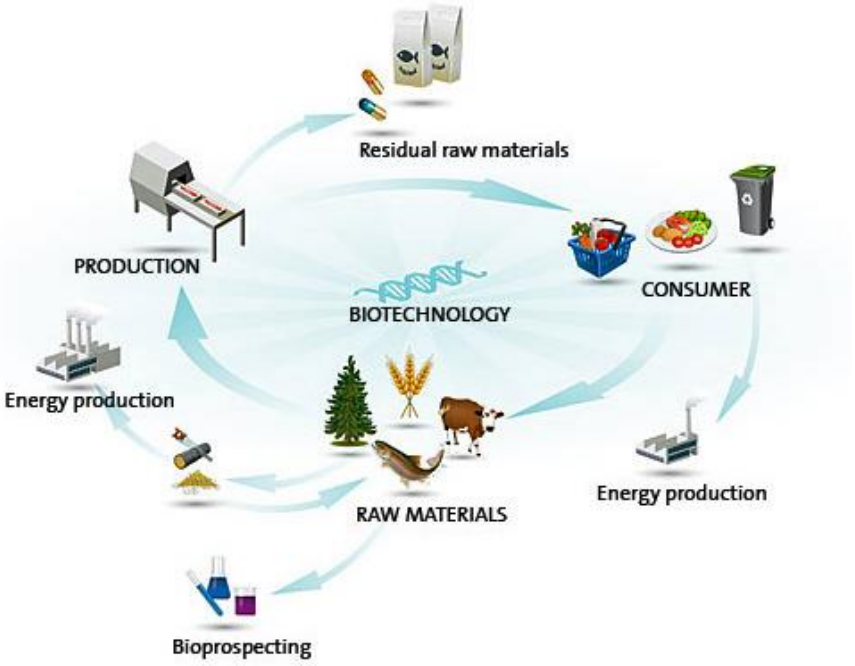
Employment and skills
«An agenda for new skills for new jobs»

Fighting poverty
«European platform against poverty»

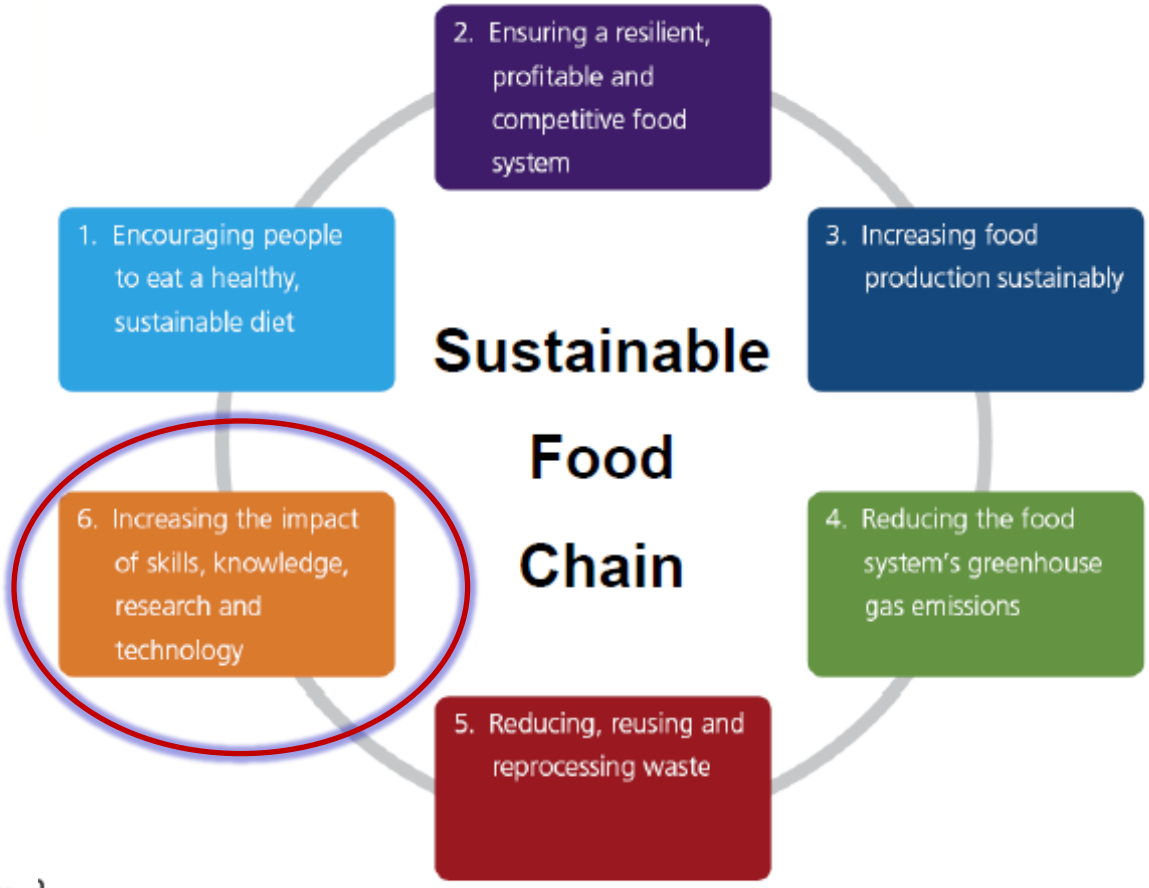
Europe 2020 strategy - a European strategy for smart, sustainable and inclusive growth

Bio-based Economy

- Providing food security to Europe and globally while adapting to a changing climate
- Providing healthy food
- Reducing environmental impacts



Europe 2020 strategy - a European strategy for smart, sustainable and inclusive growth



Source: "Food 2030", DEFRA, 2009

(2) Drivers from knowledge and innovation… (*new knowledge /knowledge needs*)

<u>Research</u> provides the sound and knowledge that support teachers in education and training and allows the development of culture and society.

❖ Research (basic, applied) is a core element of the HE mission.

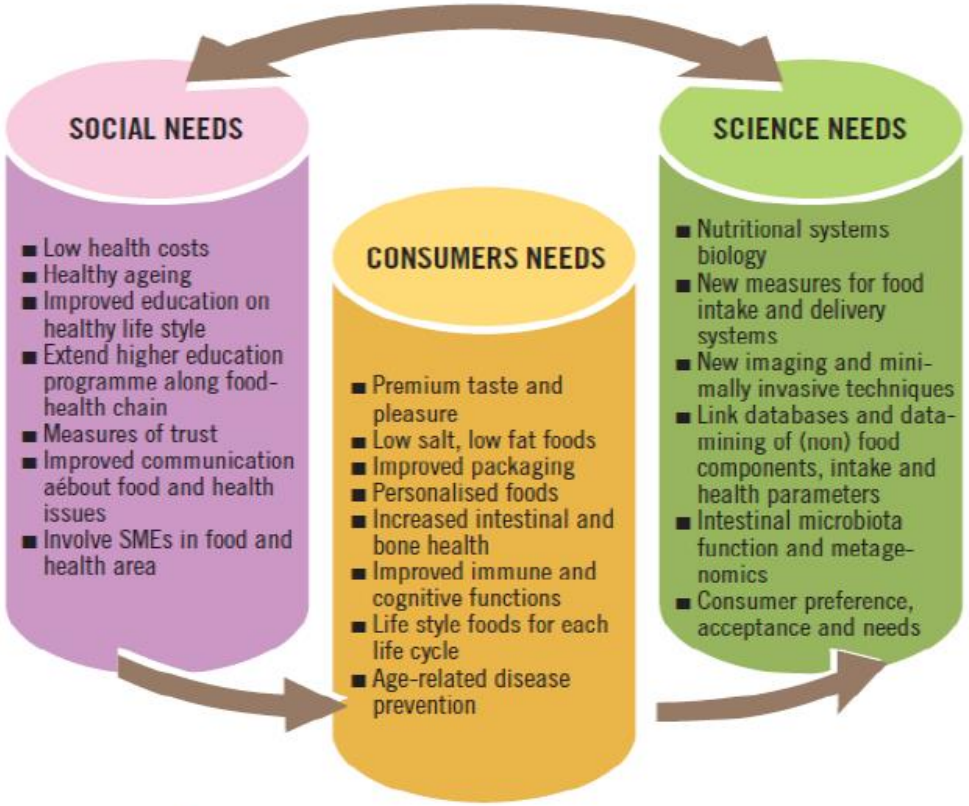
❖ The extent to which HE institutions are engaged in research and development activities has a key role in determining:

- status and quality and contribution to economic and social development
- specialization
- development of specific skills in the FS&T graduates

Drivers..skills…

- **Research & Development & innovation**
- **Knowledge trasfer**
- **Training of scientists /researchers (PhD programmes, post-doc…)**
- **Technology trasfer to industry (who?, which competences? Specific training programmes?)**

(2) Drivers from knowledge innovation… (new knowledge /knowledge needs)



The integrated picture- social, consumer and science needs (Source: European Technology Platform "Food for Life", Strategic Research Agenda 7-2020, http://etp.ciaa.be/documents/CIAA-ETP%20broch_LR.pdf).

Nanotechnolgy
Nutrigenomics
Proteomics
Metabolomics
….

Drivers..skills…

Responsible Research & Innovation skills in Food Science and Technology education

- **Governance**
- **Gender**
- **Ethics, …**

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(3) Employment and job market needs

Food scientists and technologists are employed by food-processing industries as well as food chain -related, government and as well as by universities, where they are employed in research and teaching positions.

(3) Employment and job market needs

Job offers (taken from various websites…)

- Senior Product Technologist
- Development Manager
- Int. Senior Product Manager
- Industrial by –products sales
- Process improvement Manager
- Food packaging

- Sales Development Manager
- Manufacturing Management
- R&D / Lab Food Technologist
- Quality assurance officer

….

Food service

Restaurants (gastronomy/molecular)

«Culinologist»

….

(3) *Drivers* from food industry

The food and drink industry

- has the largest annual sales turnover of any manufacturing activity worldwide but
- **traditional, low technology** industry.

Many economy analysts consider it now as a «**mature**» industry.

(3) Food industry and job market trends

EU: 4.2 million people (**+0.4%** compared to 2011)
Leading employer in the EU (15.5%) (CCIA 2014)

U.S.: In 2012, the U.S Bureau of Labor Statistics (BLS) recorded that 13,680 people were employed in food science and technology.

2012-2020 trend: **10,8% growth**(*www.bls.gov*).

New Zeland

Pay
Food technologists usually earn
$40K-$65K
PER YEAR
Source: New Zealand Institute of Food Science & Technology Inc.

How many people are doing this job?
2012 972
2011 994
2010 971
Source: Ministry of Business, Innovation and Employment, '2003-2012 Occupation Data' (prepared for Careers New Zealand), 2012.

Job opportunities
POOR AVERAGE GOOD
Chances of getting a job as a food technologist are good due to a shortage of skilled people in the role.

Drivers..skills...?

(3) Food industry: challenges for the future

Top impact R&D strategy in 2013

	First-Place Votes	Total Score
Food Safety	47%	2805
Contributing to Cost Reduction	23%	2399
Organic/Natural	10%	2004
Dietary Guidelines	7.3%	1837
Palliative Health	6.1%	1556
Preventive Health	4.0%	1368
Sustainable/Eco-Friendly/Fair Trade	1.6%	1748

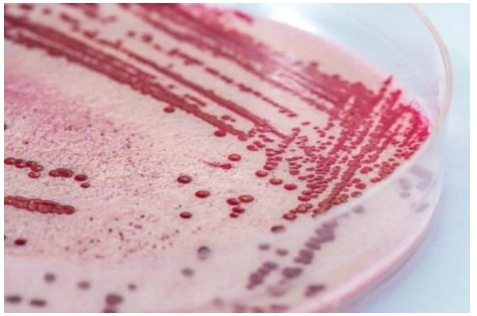
*Total score applies 7 points for a first-place vote, 1 point for 7th place, etc.

D.Fusaro, Editor in Chief of Food Processing magazine, 2013

Manufacturing priorities for 2012

	Rating average	First-Place Votes
Food safety	8.2	53%
Cost control	7.6	30%
Inspection/certifications	6.3	21%
Automation	5.5	13%
Labor (recruiting, training, turnover, reductions)	6.3	13%
Sourcing & materials	6.7	13%
Energy issues (sourcing, cost)	6.2	12%
Environmental concerns	5.9	11%
Water issues	4.9	11%
Consolidation challenges	4.7	5.5%

Ref.: Bob Sperber, Plant Operations Editor | food processing, 01/09/2012



Listeriosis, 12 people died, small meat company, Denmark, 12° August 2014

(3) Food industry and job market trends

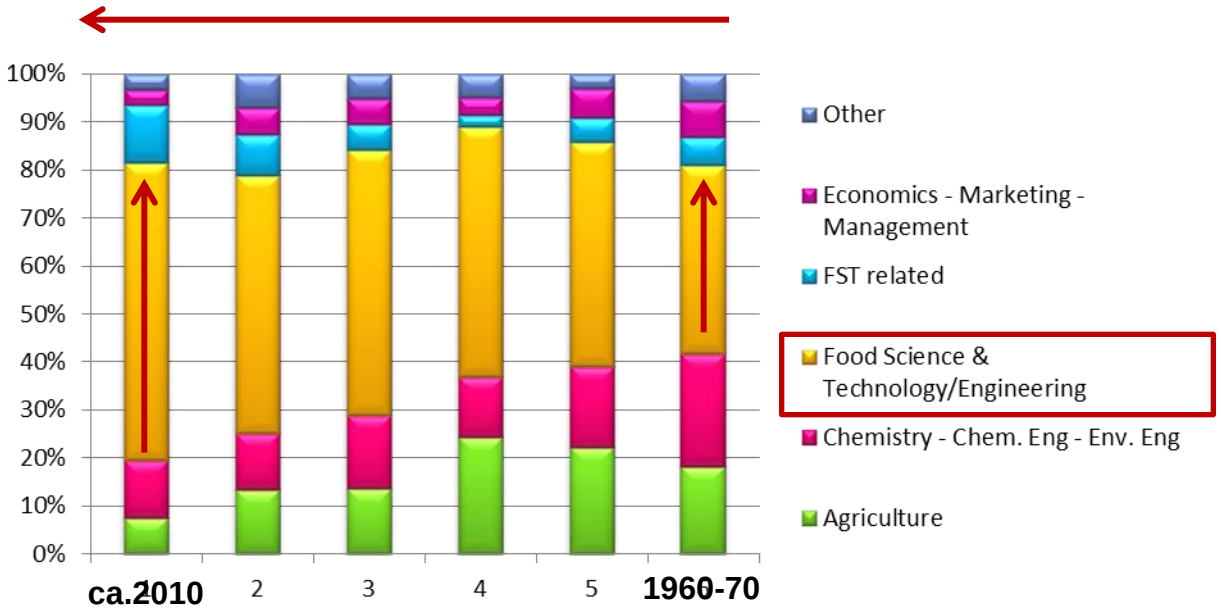


Figure: Effect of the age of the respondents on the fields of higher education studies before entering the 1st workplace (1=<25, 2=26-30, 3=31-35, 4=36-40, 5=41-50, 6=>50 years old).

Oreopoulou et al., submitted to Int. J. Food Studies (2014)

(3) Food industry: challenges for the future

Table 5. Food skills of the FST professionals evaluated by the employers

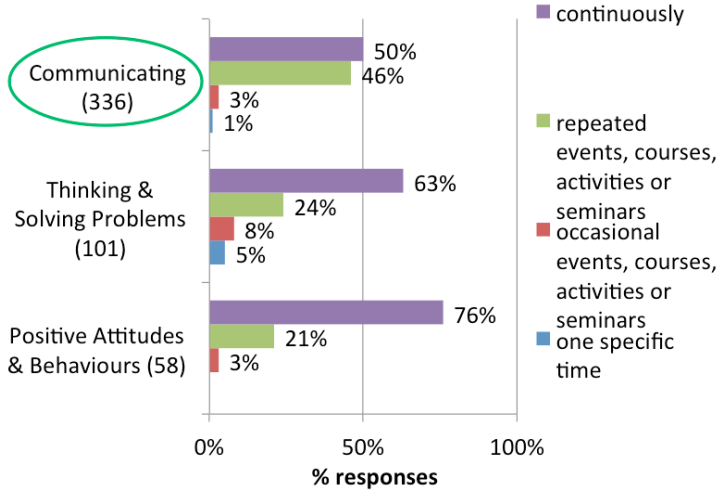
Skill	%*
Food safety management, food hygiene and food safety control	80.2
Product development	74.3
Quality management, quality assurance and quality control	67.2
Production management/operations	65.6
Food legislation and control	62.5
Research	55.3
Engineering maintenance	41.5
Consumer & nutritional sciences	34.4
Health, safety and the environment	32.0
Transportation	18.2
Other	3.6

* Percent of employers that believe the skill is found in the average FST professional in their organization.

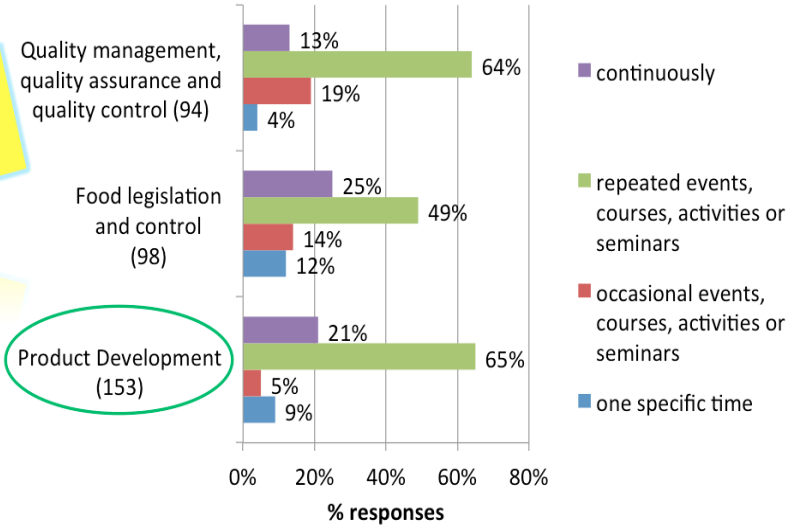
Mayor et al., submitted to Eur. Food Res. & Technol. (2014)

(3) (New) skills to meet job market requirements

TOP 3 Soft Skills



TOP 3 Food Skills



→ **Which competences ?**

→ **Where, when, how, how often?**

track_fast
Europe's Food Science and Technology on a Fast Track

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Source: FP7 Track Fast project, 2012, Flynn et al., 2012

(3) (New) skills to meet job market requirements: PhD graduates

Top 3 most relevant competences

ACADEMIA

INDUSTRY

GENERIC

To demostrate flexibility an open-mindedness, when working with different environments and people

To show ability to handle difficulties in research in an appropiate manner.

To show ability to react quickly and effectively to unpredictable situations.

To write reports fluently and efficiently

To show ability to communicate effectively to a broad framework of audiences.

SPECIFIC

To demonstrate original, independent and creative thinking.

To formulate and apply solutions to research problems and effectively interpret research results.

To develop new research projects

To apply effectively project management

Gonzales C., 3° ISEKI-Food Conference, 2014

Academia: innovation needs

- **Maturation «plateau» state**
  - Crisis of the knowledge/research-based university model
  - Graduates employability («new skills» for new jobs)
  - Quality assurance/accreditation
  - Internationalisation (students, JP/DD study programmes)

- **New generation of students and ITC**

  …while an «old fashion» generation of teachers…

What a boring program… Let's switch to another channel…

Academia: innovation needs

Millennium student characteristics* («Google generation»)

- ICT-minded
- Multitasking
- Media literate
- A-linear, a-synchronous
- Explorative, interactive
- With a positive attitude
- Target oriented
- Social, connected
- As partners with educators…

….

- ***No improved information literacy despite increased access to technology***
- ***⇧ Speed of searching results with little time on evaluating the relevance, accuracy or authority of information***
- ***Poor understanding of their own information needs***
- ***Preference for use of natural language***
- ***Problems in selecting relevant materials from long lists of hits.***

**New Millennium, New Student*, M. Moonen, MSc Thesis, KU Leuven, 2012

Academia: innovation needs

Different ways of learning

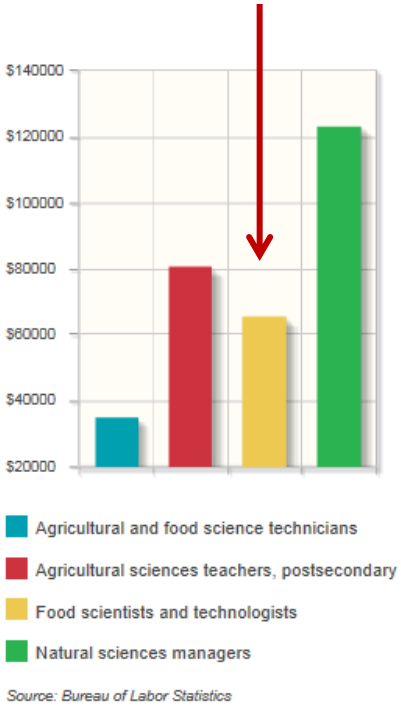
F2F learning
E-learning
Networked learning
Distributed learning
Interactive learning
Game-based learning
Tele-learning
Online learning
Virtual learning
Mobile learning
Computer-assisted learning
Distance learning
Technology-enhanced learning
Blended learning
…….

- **New teaching approaches and methods**
- **Upgrade/modernisation/Improvement of educational skills of teachers**

Academia: innovation needs

…more FS&T sector specific

- **«Competition» from other scientific areas**
- **Lower/higher importance of the HE food science and technology graduates and role of the FS&T profession**
  - Misconception of the FS&T role
  - No regulation of the profession
  - No recognition of the social role
  - 'New' areas /fields of employment (molecular gastronomy, «culinary» science, …)



www.bls.gov

Innovation in education and training in food science and technology

WHY?....drivers
WHAT? ….contents? Skills?

HOW? …actions…

Actions for innovation in HE EDU in FS&T/E

1. Teaching and education

- Objectives (learning outcomes and skills)
- Methodologies (tools)

See also presentations R.P. Singh and K. Flynn

Actions for innovation in HE EDU in FS&T/E

New concept of skills….

Changing world – changing skills

Classical	New social/educational framework
Knowledge **is information** i.e. know, facts, what	Knowledge is **capacity** for action, i.e. know-how
Workers **apply** the **existing** knowledge	Workers **contribute to knowledge** production (creative thinking)
Skills are **practical abilities** or technical knowledge for a particular job	Skills are a **more wide concept** and include team-work, problem solving, networked thinking, communication skills

Modified from Petersen, 2013

Actions for innovation in HE EDU in FS&T/E

2. Innovative study programmes and study pathways

- Innovative study programmes
- Work-oriented study programmes

Evolution of the food study programmes

1950	**Sector specific**	Milk science and Technology, Meat Science, Processes of animal products, Viticolture & oenology
1970	**Generalists/specialists**	Food Science, FS&T, Food Engineering, FS&Eng, Food chemistry, Food and Agriculture, Food microbiology, Food science and agricultuarl chemistry, …
1990	**Quality and safety driven**	Food biotechnology, Food safety, Food quality and safety, Process Engineering, Life science Technology,
2000	**Health-nutrition driven**	Nutrition & Food science, Food and nutrition, Food quality, safety and nutrition, Innovative Enology, Human Nutritional sciences,
2010	**New trends: YES**	***Food enterprise development, Food product development, Food Business, Food Innovation Management, Food Innovation, Food Service, Food & Business, Food Innovation Management, Gastronomic Sciences, …***

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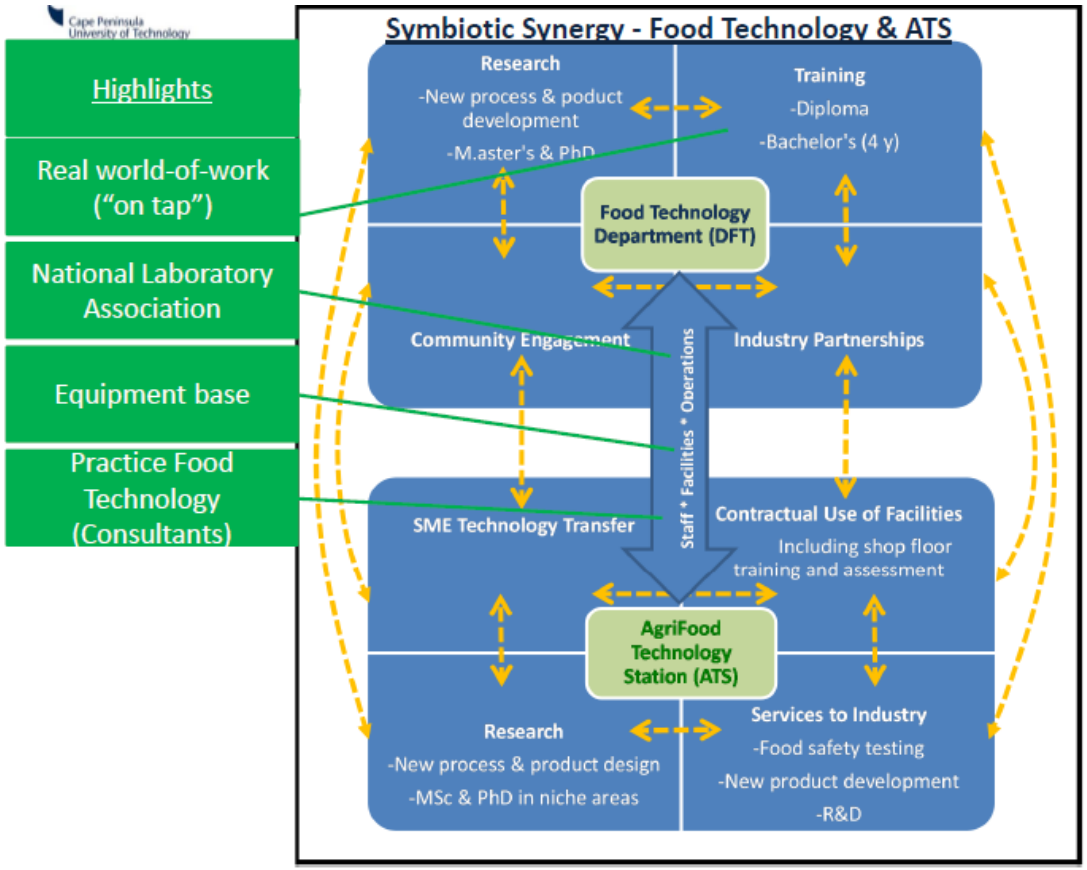
(Track_fast & ISEKI_Food collection data, 2012)

Actions for innovation in HE EDU in FS&T/E



The integration of work-integrated Learning (WIL) modalities as teaching tools towards complex practice of Food Technology, *Jessy Van Wyk, 3rd ISEKI_Food conference 2014*

Actions for innovation in HE EDU in FS&T/E

Response to a key public health priority, essential to health protection and economic development

Led by IUFOST with the support of GFSP and facilitated by the World Bank

Actions for innovation in HE EDU in FS&T/E

2. <u>Innovative study programmes and study pathways</u>

- Innovative study programmes
- Work-oriented study programmes
- Industrial doctorate (very few in the FST/E sector)

Actions for innovation in HE EDU in FS&T/E

- **Innovative academia models:**
  - **Professional/Entrepeneurial** academia models (*business - oriented* vs *research/knowledge-based* universities, in collaboration with industries)
  - **Distance /virtual** teaching universities
  - **Multi-campus**

Example: MIT (USA)

- http://watch.mit.edu

Association KU Leuven: Multicampus

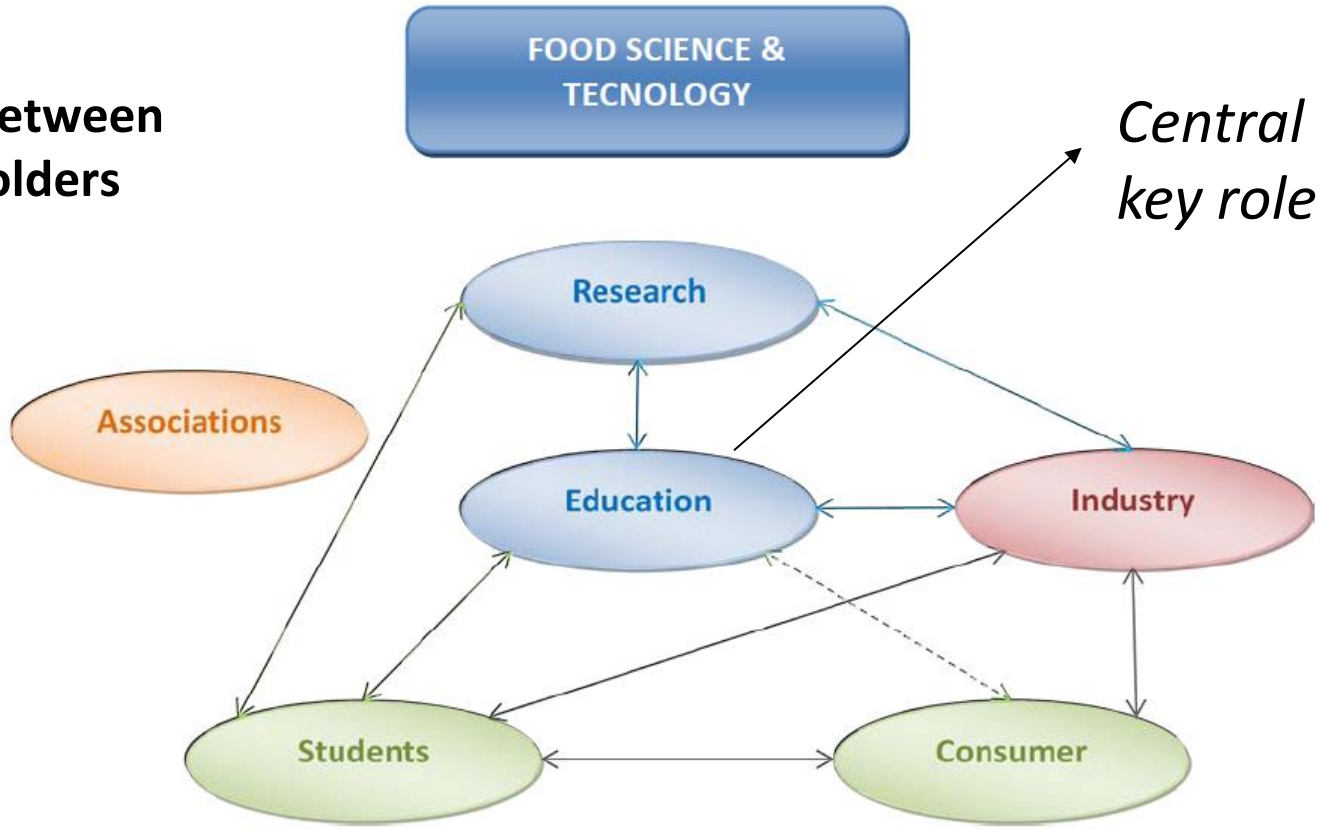
Actions for innovation in HE EDU in FS&T/E

3. Policy, management, engagement and social inclusion

- Networking
- Interactions (strenghtening/new, with stakeholders)
- Interfacies (new)

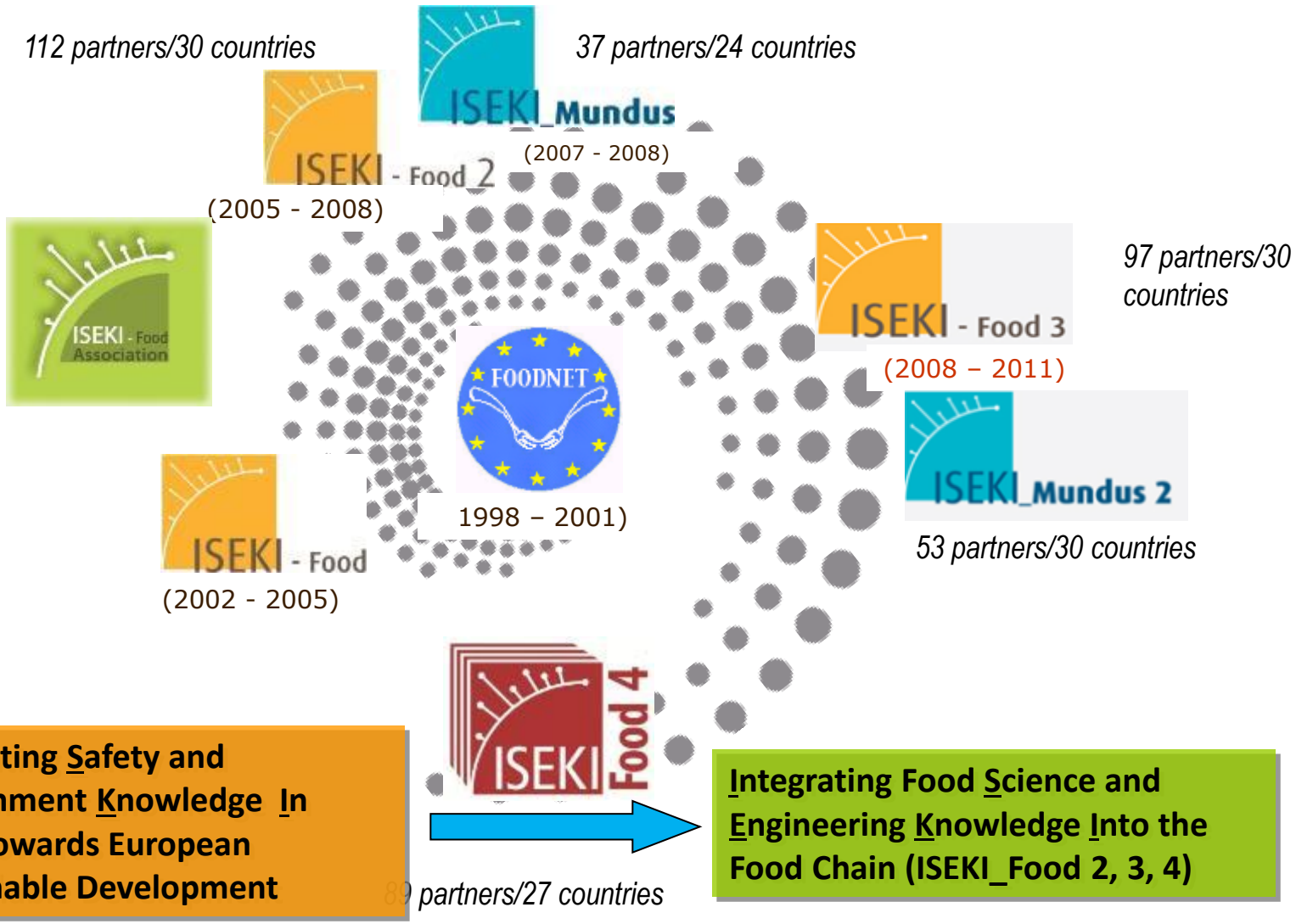
Actions for innovation in HE EDU in FS&T/E

Bridges between stakeholders



From "Hystory of the Food network before ISEKI_Food", E. Dumoulin, 2011,
www.iseki-food.eu/

The history of the ISEKI_Food projects…to today

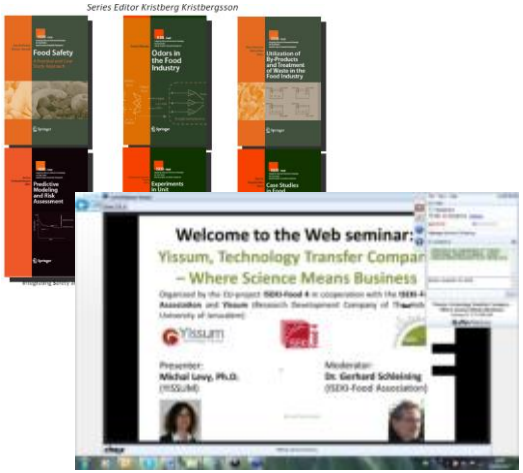


Main products of the ISEKI_Food projects…to today

Improvement of the HE and quality of Food Studies

EQAS-Food Award: European Quality Assurance System for Food Study Programmes

Innovation in teaching



Bridging education-reserach-industry

International Journal of Food Studies

www.iseki-food-ejournal.com/

4° ISEKI_Food conference (6-8 July 2016, Vienna –AT)

http://www.isekiconferences.com/

ISEKI_Food-4: Towards the innovation of the Food Chain through the modernisation of Food Studies (IFOOD4)

Objectives

- Modernisation and upgrading the education and training of Food studies
- Implementation of the labour market role of the third level of education in promoting the employability and entrepreneurship of the graduated FS&T and Food professional
- Lecturing qualification of university teaching staff

86 EU partner from 27 eligible countries

3 no EU partners

+ 50 associated partners from all over the world

www.iseki-food4.eu

Main outcomes of the ISEKI_Food 4 projects

Improvement of the HE and quality of Food Studies

Pilot Training school for teachers

Innovation in teaching

Serious game on fish canning

Bridging education-reserach-industry

Virtual platform for PhD

New skills for new jobs

Toolbox

CONCLUSIONS and PERSPECTIVES

- **The process of innovation Higher Education is becoming more**
  - ***i*nternational,**
  - ***i*ntercultural,**
  - ***i*ntergenerational,**
  - ***I*nterdisciplinary,…(*i*-Learning)…**

with a high potential impact on the competitiveness of the food supply chain

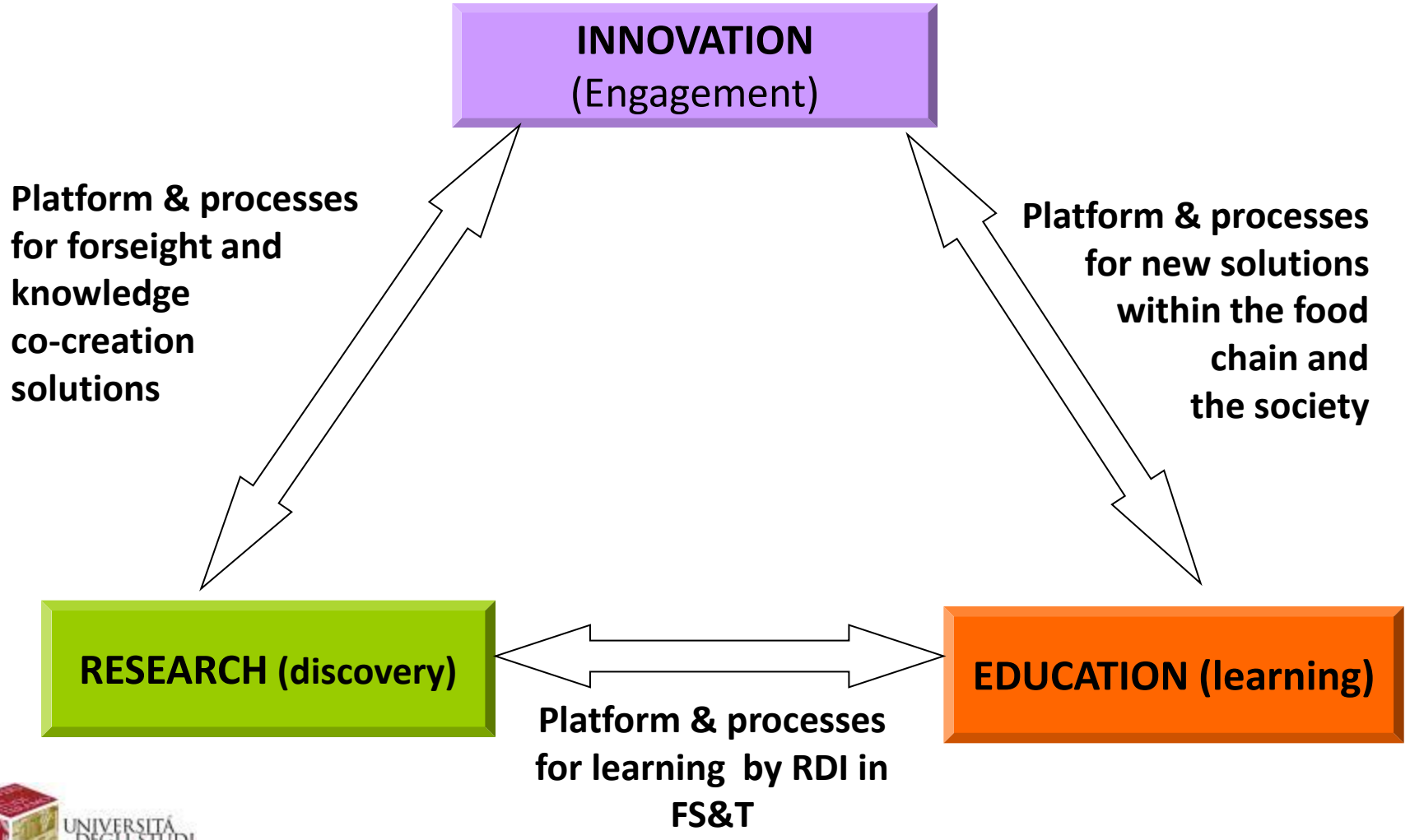
- **Need of sharing best practices, approaches, tools,…**

CONCLUSIONS and PERSPECTIVES

- **FS&T Higher Education needs to develop a "systemic" approach to achieve the deserved recognition in the society,**
  - **by defining and building constructive interactions,**
  - **By synergies and**
  - **By new interfaces**

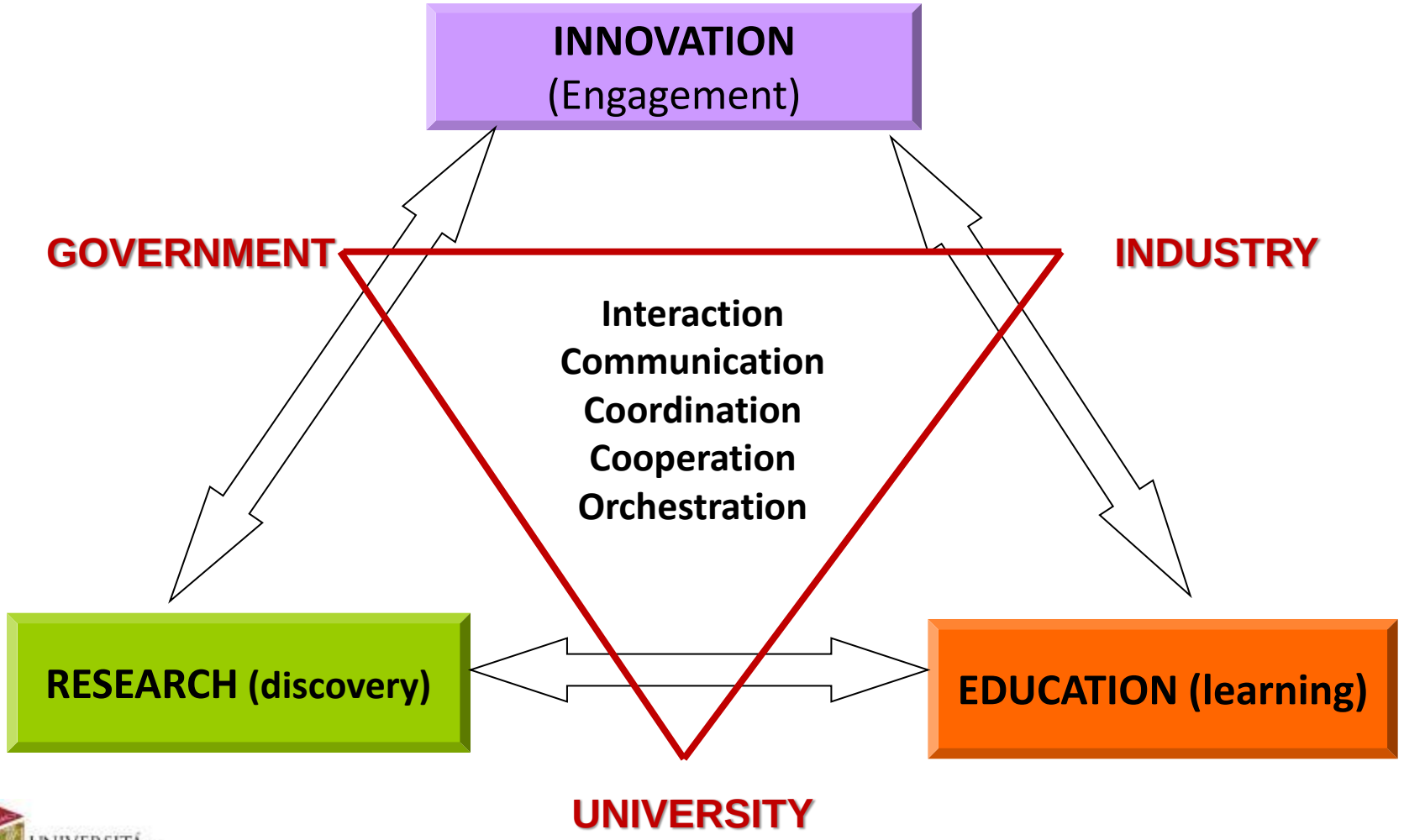
  with the key stakeholders within the food supply chain

The Knowledge Triangle



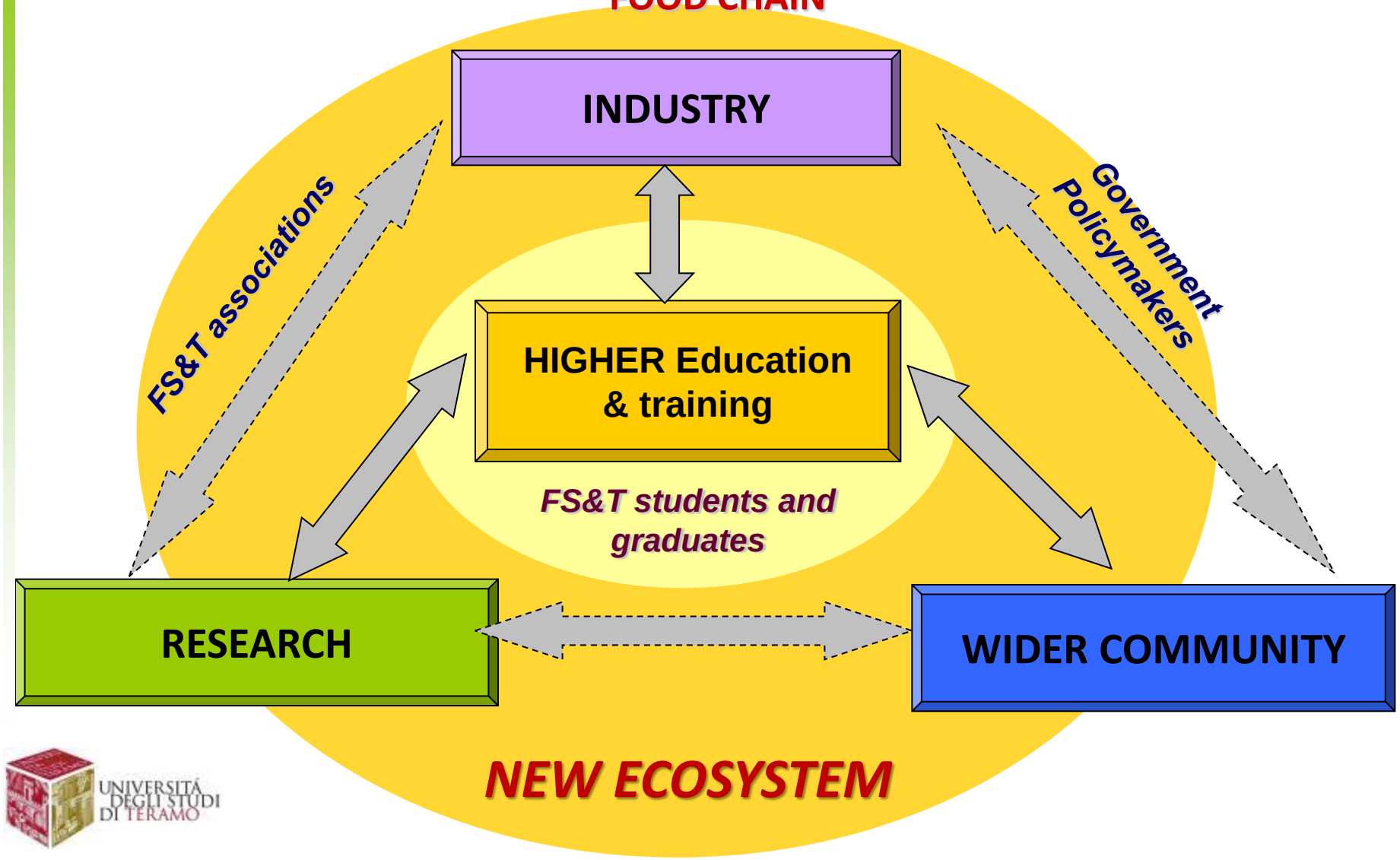
Modified from Markkula 2011

The Knowledge Triangle + the Triple Helix



Is this sufficient?

EDUCATION- INTERFACES TOWARDS THE INNOVATION OF THE FOOD CHAIN



CONCLUSIONS and PERSPECTIVES

- **A new (and more complex) "eco-system" with higher number of stakeholders,**
  - **- at different levels (regional, national, …international)**
  - **that could also permit to the Higher education in FS&T**
  - **- to innovate**
  - **-…..to resonate!**

Thank you all for the kind attention

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