AmiEs-2015

*International Symposium on Ambient Intelligence and Embedded Systems, 24 – 26 September 2015, Oostende, Belgium*

# *The Massive Open Online Courses (MOOCs) engagement in Higher Education (the Destiny Project) and in Ambient Intelligence & Embedded Systems*

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TEI of Crete
Technological Educational Institute of Crete

SENTIMENT ANALYSIS

Developing Employability Skills Through Innovative Education using MOOCs for Youth
destiny

# Presentation Objectives

- Problem: **High Unemployment** among youth in Europe
- **Skills Shortage** in Engineering according to the Market
- Higher Education and Market Demands: **two diverging players**
- **The role of MOOCs** in enhancement of youth employability & the DESTINY project
- **The impact of MOOCs** in Higher Education – A case study in Crete
- **Identification** of Labour Market Needs
- Future Actions

# The Problem: High Youth Unemployment

- **In Japan** an estimated 700.000 young people have withdrawn from society
- **In North Africa** restless youth were at the vanguard of the demonstrations that toppled governments in Egypt and Tunisia
- **In USA** 20 –something college graduates forced into dead end or unpaid jobs
- **In Greece and Spain** more than half of young people are unemployed
- **In the Organization for Economic Co-operation and Development (OECD) countries**, more than one in eight of all 15 – 24 year olds are not in employment , education or training
- **The International Labour Organization** estimates that 75 million young people are unemployed. Including estimates of the **underemployed youth** this figure potentially would be tripled

# The Paradox……

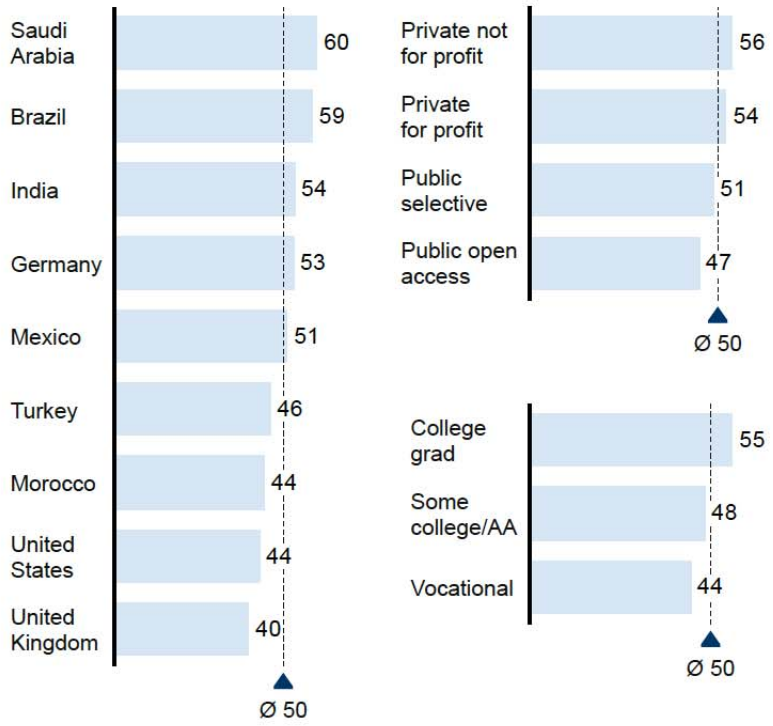
- **Critical Skills Shortage:** Transversal & Technical Skills
- **Only 43%** of employers surveyed in nine countries agreed that they could find enough skilled entry level workers
- **72% of education providers** believe that new graduates are ready to work!!!
- **The McKinsey Global Institute** estimates that by 2020 there will be a global shortfall of 85 million high and middle skilled workers
- **Education providers and Business World two non converging worlds:** 1/3 of employers do not communicate
- **In order to address the youth unemployment** two fundamentals need to be in place: **skill development** and **job creation**
- **This presentation focuses on how to use MOOCs to teach the skills that market demands** and thus enhance the employability of our graduates

# Higher Education and Business Worlds

Exhibit 1

## Only half of youth believe that their post-secondary studies improved their employment opportunities

Students who believe their postsecondary studies improved their employment opportunities[1]



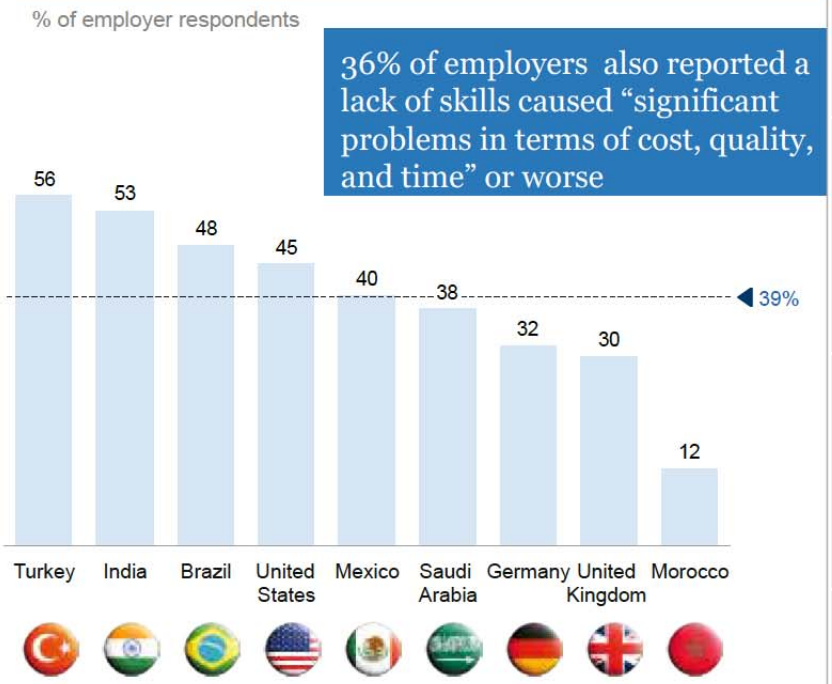

1 My post-high-school education improved my chances of getting a job.

SOURCE: McKinsey survey, Aug-Sept 2012

Exhibit 2

## 39% of employers say a skills shortage is a leading reason for entry-level vacancies

Lack of skills is a common reason for entry-level vacancies




SOURCE: McKinsey survey, Aug-Sept 2012

# Higher Education and Business Worlds

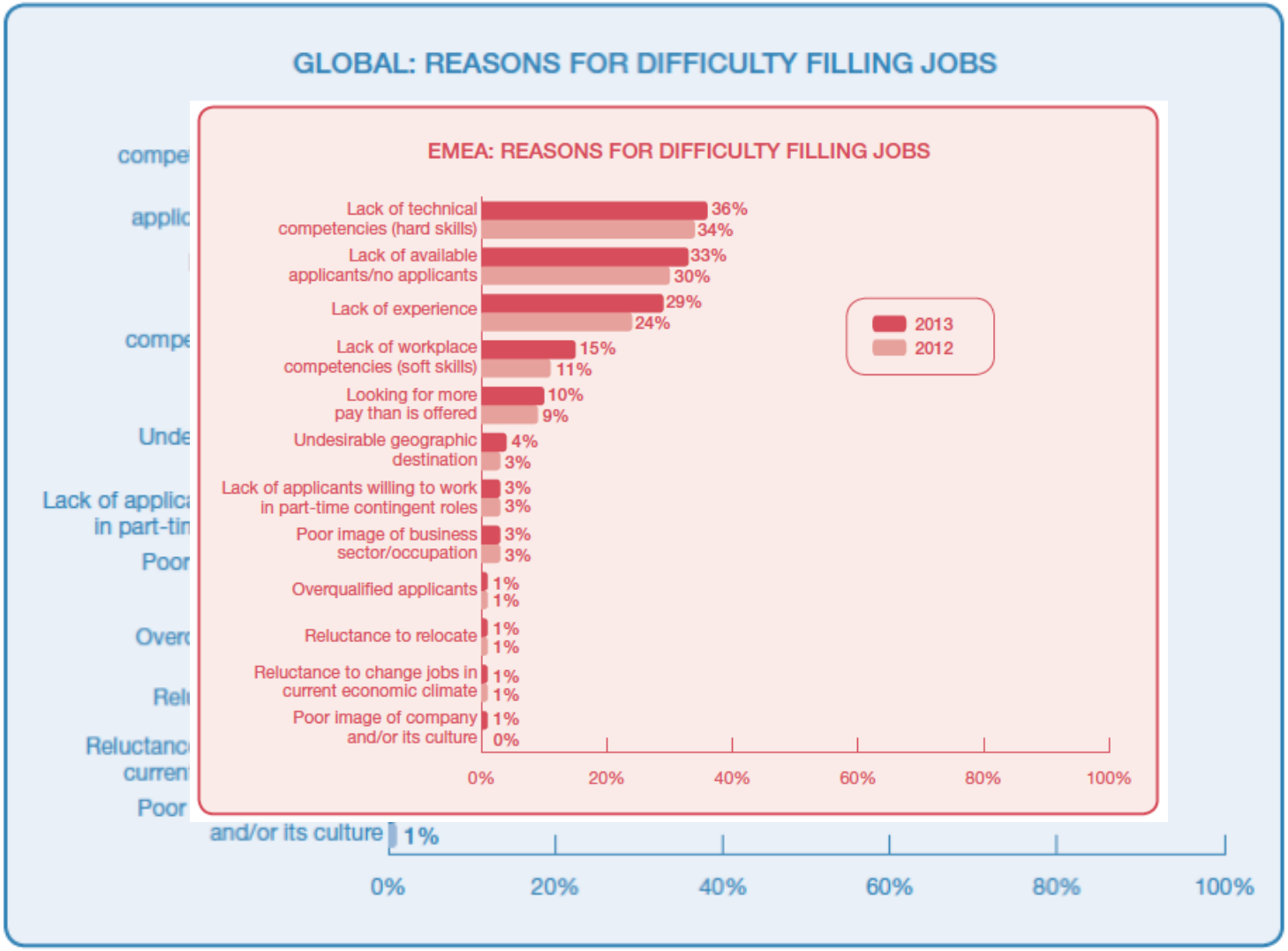
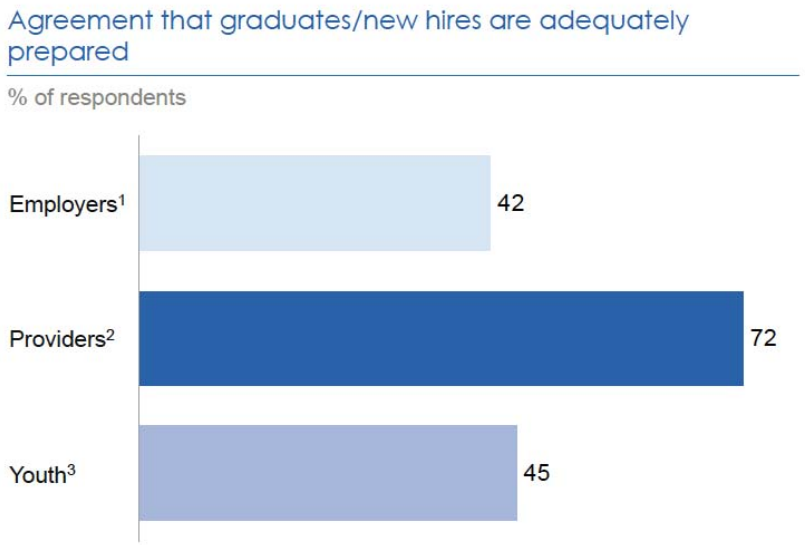


Exhibit 3

## Stakeholders hold different views about the readiness of graduates for the job market




1 Overall, employees we hired in the past year have been adequately prepared by their prehire education and/or training.
2 Overall, graduates from my institution are adequately prepared for entry-level positions in their chosen field of study.
3 Overall, I think I was adequately prepared for an entry-level positions in my chosen field of study.

SOURCE: McKinsey survey, Aug-Sept 2012

# The Destiny Project

- **An Erasmus Plus project** approved for funding in 2014
- **Duration three years 2014 – 2017**
- **A consortium of Higher Education Institutions & SMEs** from UK, Spain, Greece and Slovenia
- **Objective: To re-align education to labour market**, raise skills of WS, reduce youth unemployment and build institutional capacity using innovative education pedagogy including use of MOOC's (Massive Open On-line Course) a form of Open Educational Resource (OER)
- **DESTINY innovation**: the 1st project that investigates MOOC's from point of SUPPORTING learners to meet LOCAL LABOUR MARKET NEEDS (LLMN) especially in area of TRANSVERSAL SKILLS, and thereby linking MOOC's to IMPROVING PROSPECTS of both LEARNERS and local ECONOMY
- Destiny project envisions **the increase of Higher Education society impact** by enhancing the graduates employment rates and **re-invent the classroom**: blended courses

# Few words about MOOCs…

- **The education media declared 2012 the year of the MOOC**
- According to BCG group: **MOOCs the next big thing for the 21st century!**
- **In 2008** Canadian scholars **Stephen Downes** and **George Siemens** launched the 1st MOOC where 2200 students were registered as an online students
- **MOOC is a module** with a start and end date and that is open with no barriers to entry, neither cost nor education criteria. The courses are also online, accessed on the Web, and are massive, requiring a significant number of students to contribute to a connected learning environment
- **Sebastian Thrun's experience** as a teacher:

"One of the most amazing things I've ever done in my life is to teach a class to 160,000 students. In the fall of 2011, Peter Norvig and I decided to offer our class "Introduction to Artificial Intelligence" to the world online, free of charge"

# The impact of MOOCs in HEI: students perspective

# Research Characteristics

**Type of research**

Quantitative survey using a structured questionnaire

**Duration - data collection**

Wednesday11 of February – Tuesday 19 of February 2015

**Sample**

The sample size is at 1033 undergraduate university students

**Methodology**

Personal interviews to undergraduate students of technological and academic institutions of Crete. We follow the procedure of stratified sampling. The levels of the research are the three (3) Educational Institutions of Crete. The Crete Institutes of Technology the Technical University of Crete and the University of Crete. Carried weighting at the level of schools based on the number of enrolled undergraduate students. Data collection took place from 31 sections of fifteen (15) schools of technology and university education.

**Personnel field/ check**

Four (4) researchers and one (1) supervisor

**Typical statistical error**

+/- 2.97% at confidence interval

95%

**REGISTER OF BUSINESS ENTITIES AND Polls E.S.R**

Sentiment Analysis/Cretan Polls

Registry Number 50

# Survey Pillars

## Personal - demographic data

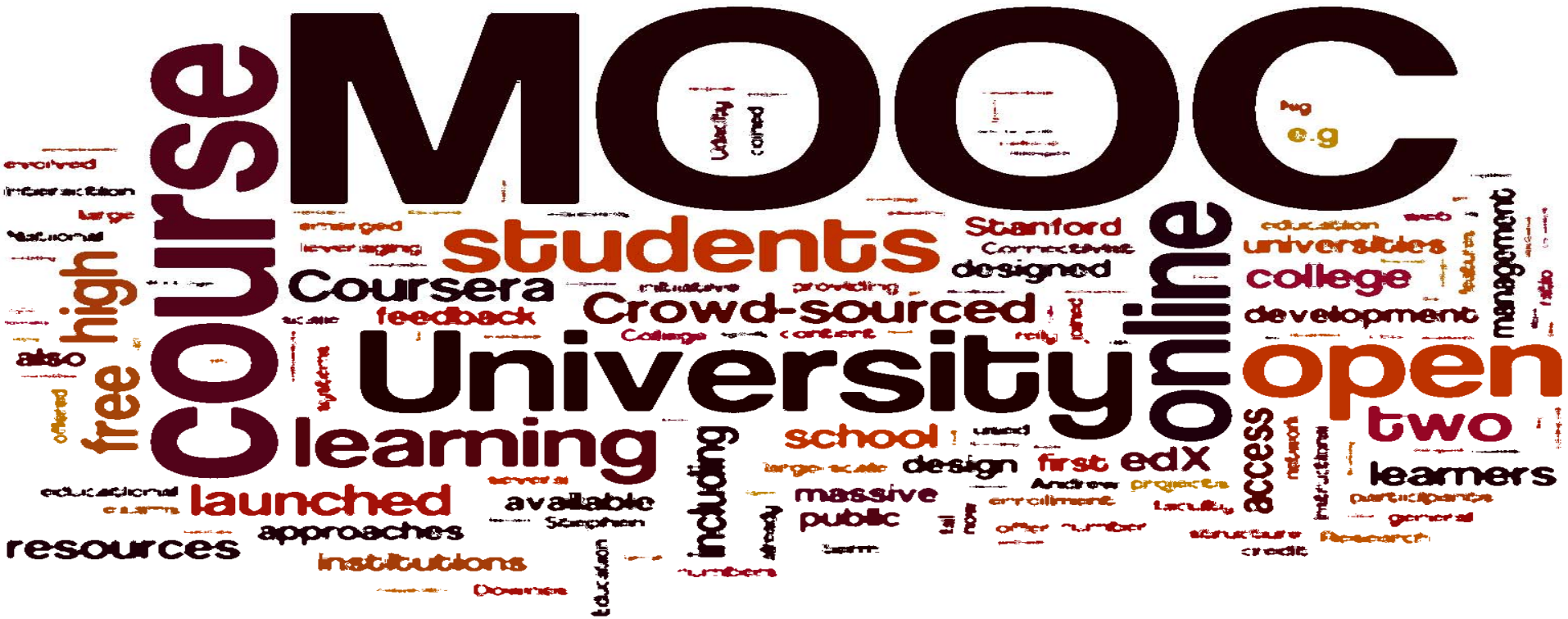
•In this pillar of the survey we asked the students to indicate the school attending, the field of studies and their year of study

## Mooc's Recognition

•In the second pillar we examine the knowledge of students on the Mooc's and the probability of attend Open On Line Internet Courses

## The future dynamics of Mooc's

•In the third pillar we studied the dynamics of massive open online courses and the possibility of integration in student priorities




## *Personal* - Demographic data

# Universities

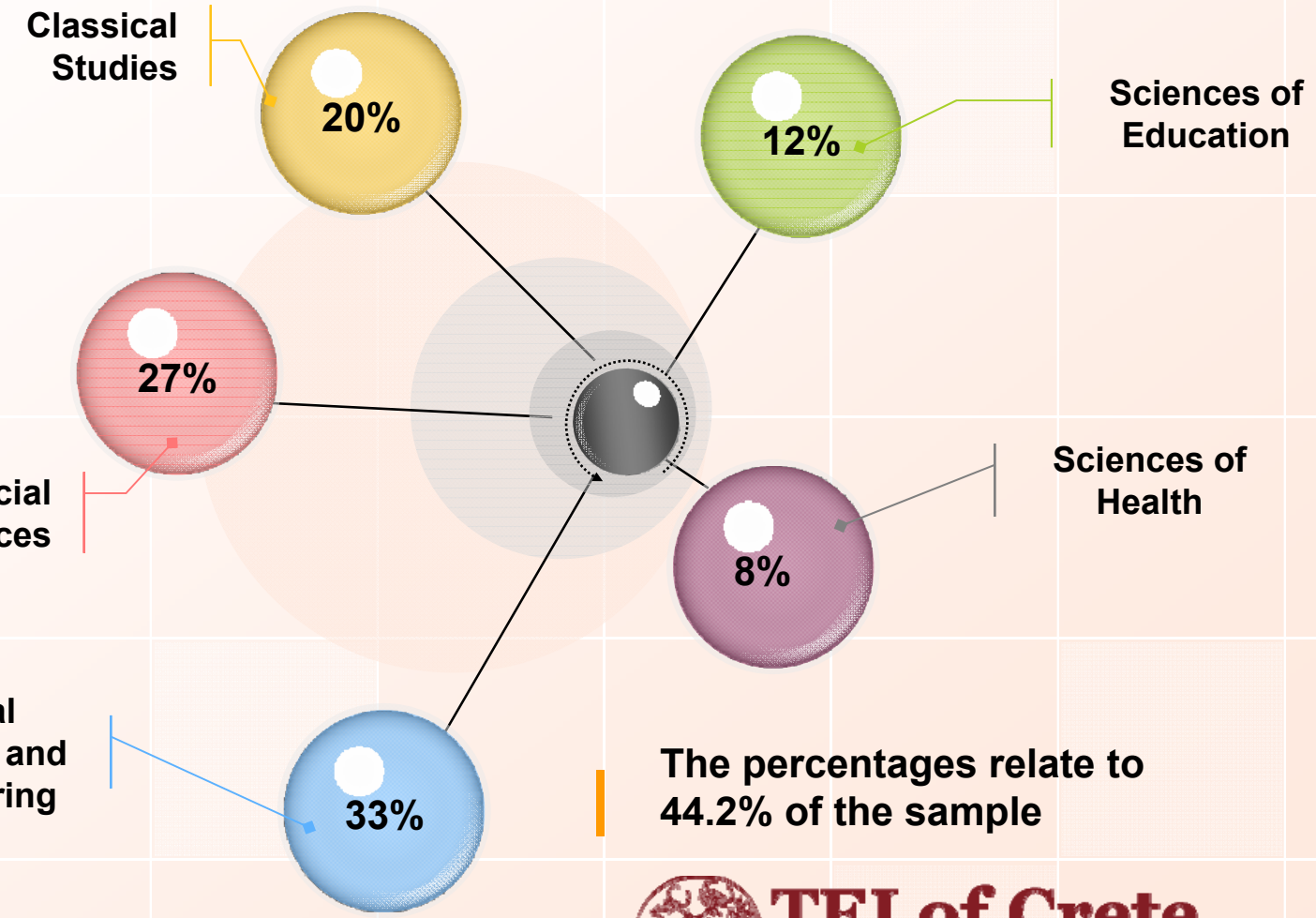
- TEI CRETE
- Crete University
- Technical University of Crete

## Total Sample

**1033 undergraduates students**

The 43% percent of the sample derived from Technological Educational Institute of Crete , the 44,2% from University of Crete and the 12,8% from Technical University of Crete

# University of Crete




The percentages relate to 44.2% of the sample

SENTIMENT ANALYSIS

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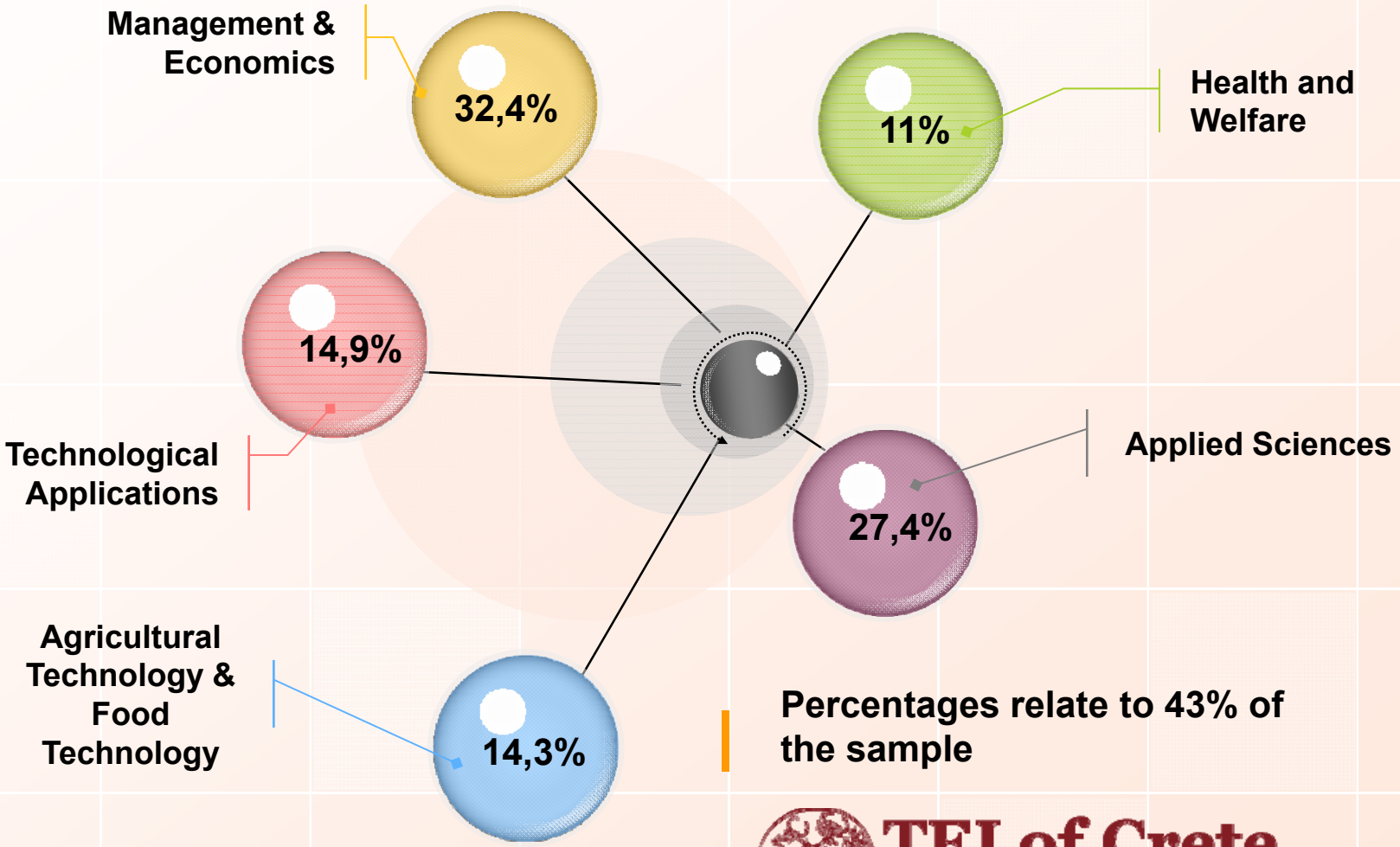
Technological Educational Institute of Crete

# Technological Educational Institute of Crete

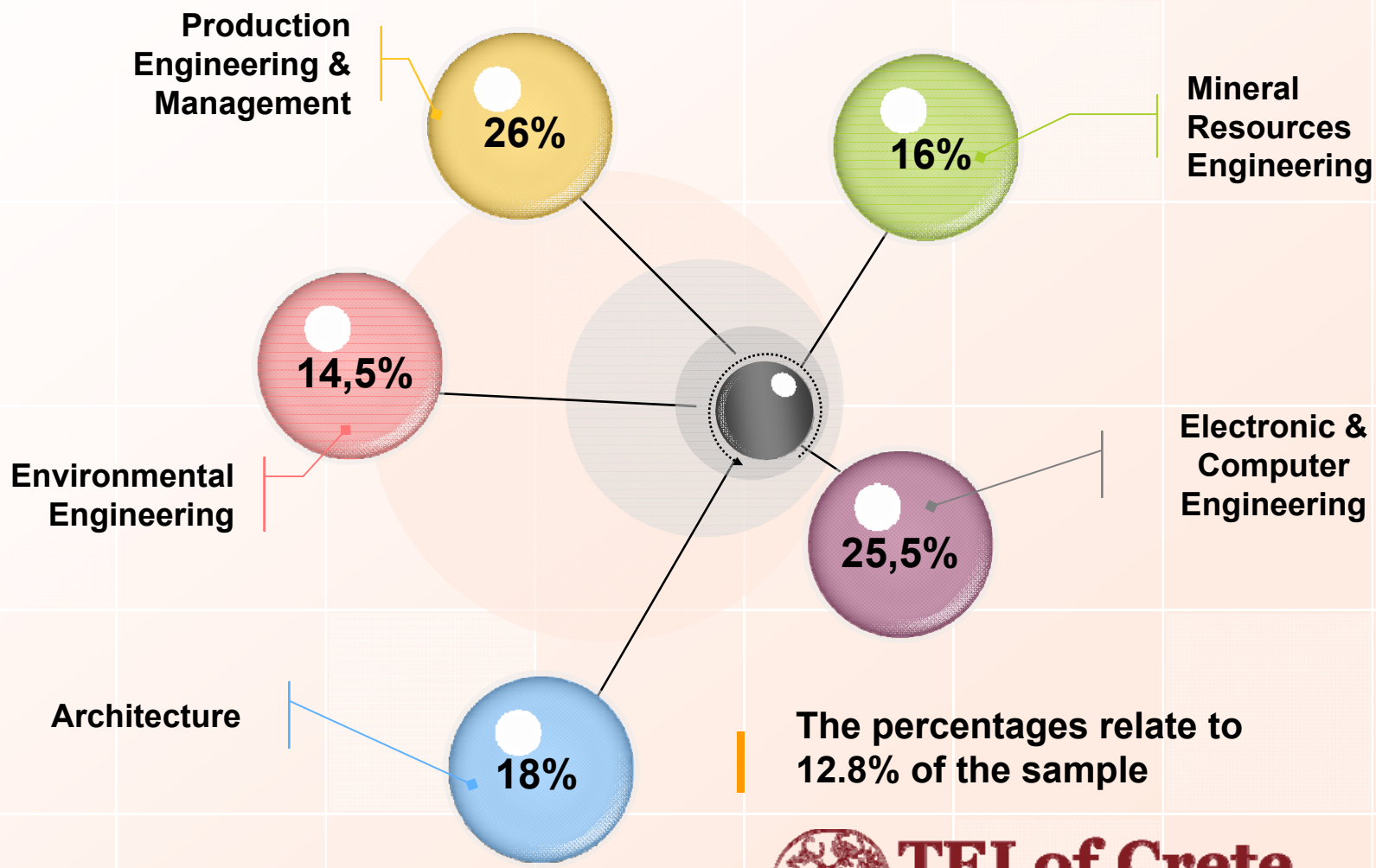



Percentages relate to 43% of the sample

SENTIMENT ANALYSIS

TEI of Crete
Technological Educational Institute of Crete

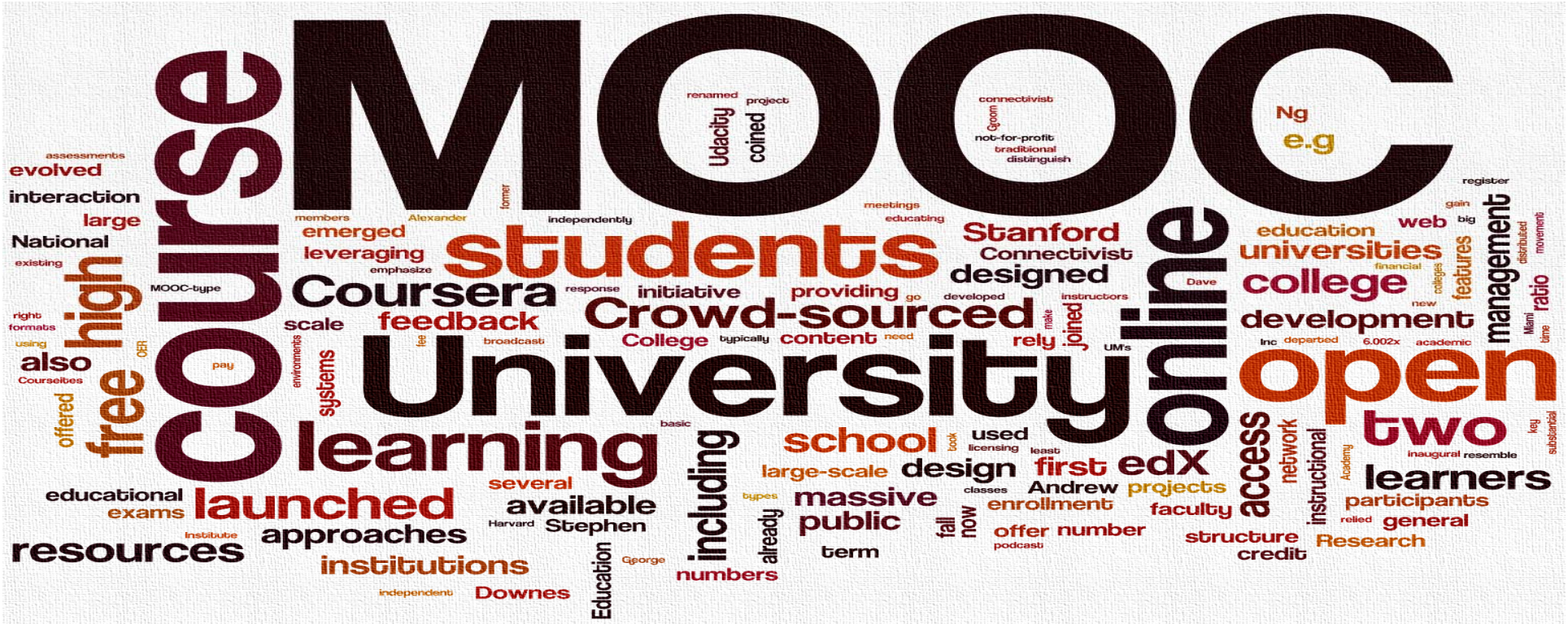
# Technical University of Crete




The percentages relate to 12.8% of the sample

SENTIMENT ANALYSIS

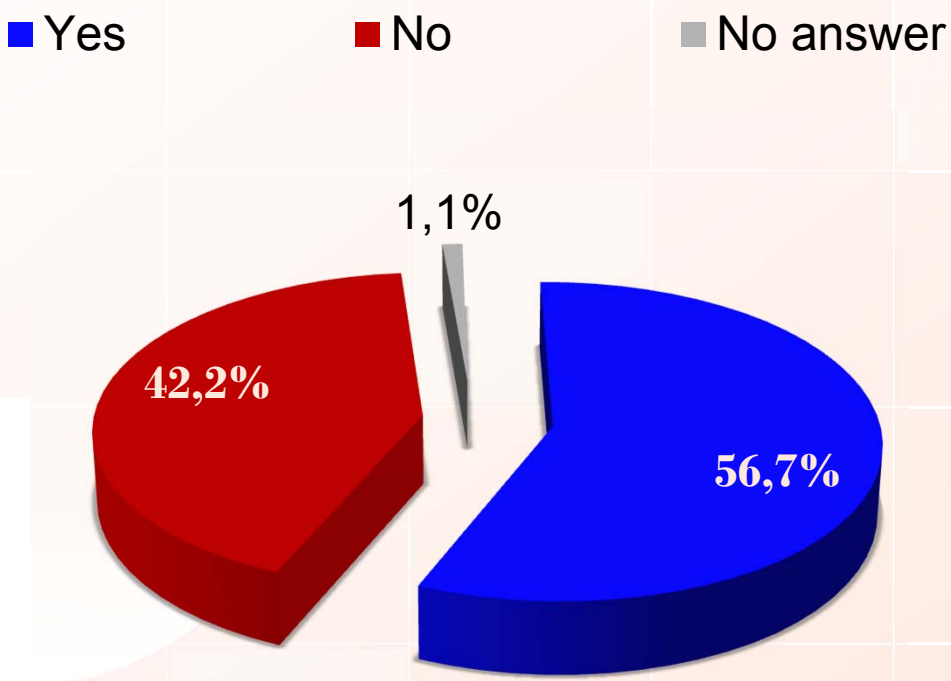
TEI of Crete
Technological Educational Institute of Crete




# Mooc's Impact

# Are you aware of the MOOC's ?

**" Massive On Line Open Courses "**
**N=1033**

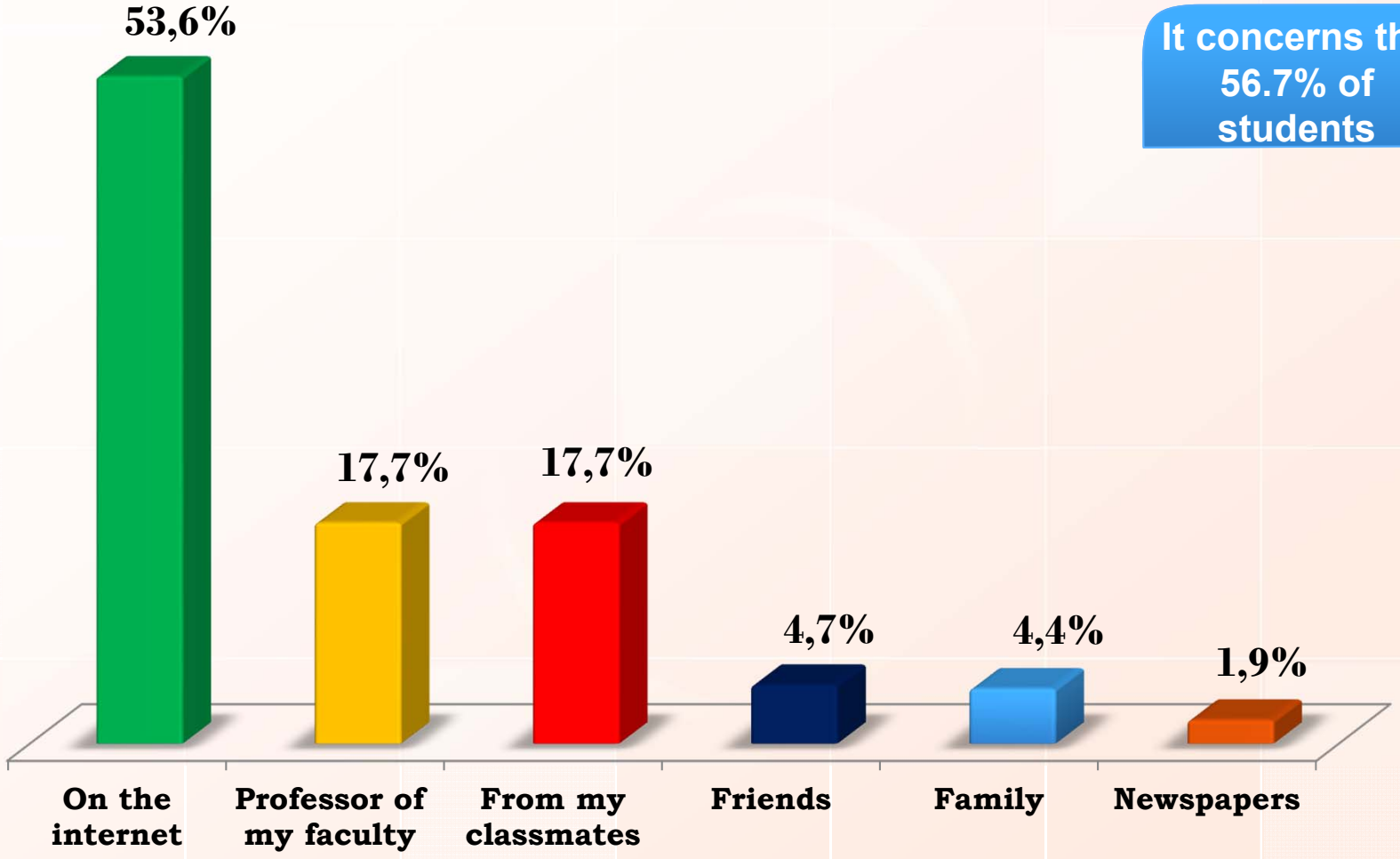


# If yes, where did you learn about the existence of MOOCs ?

"Massive On Line Open Courses "

N=586

It concerns the 56.7% of students

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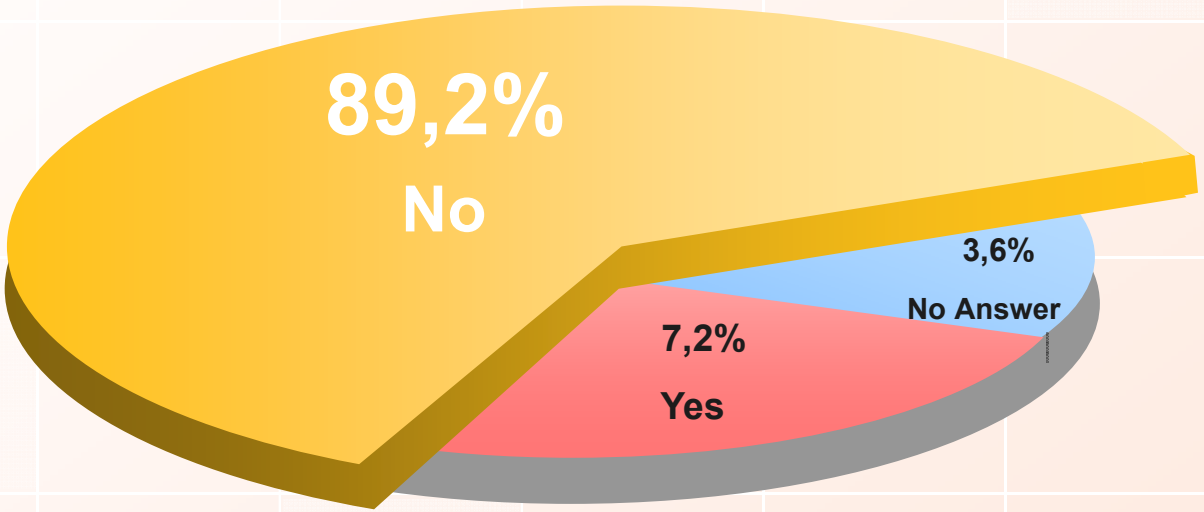
## Have you attended courses through MOOCs ?

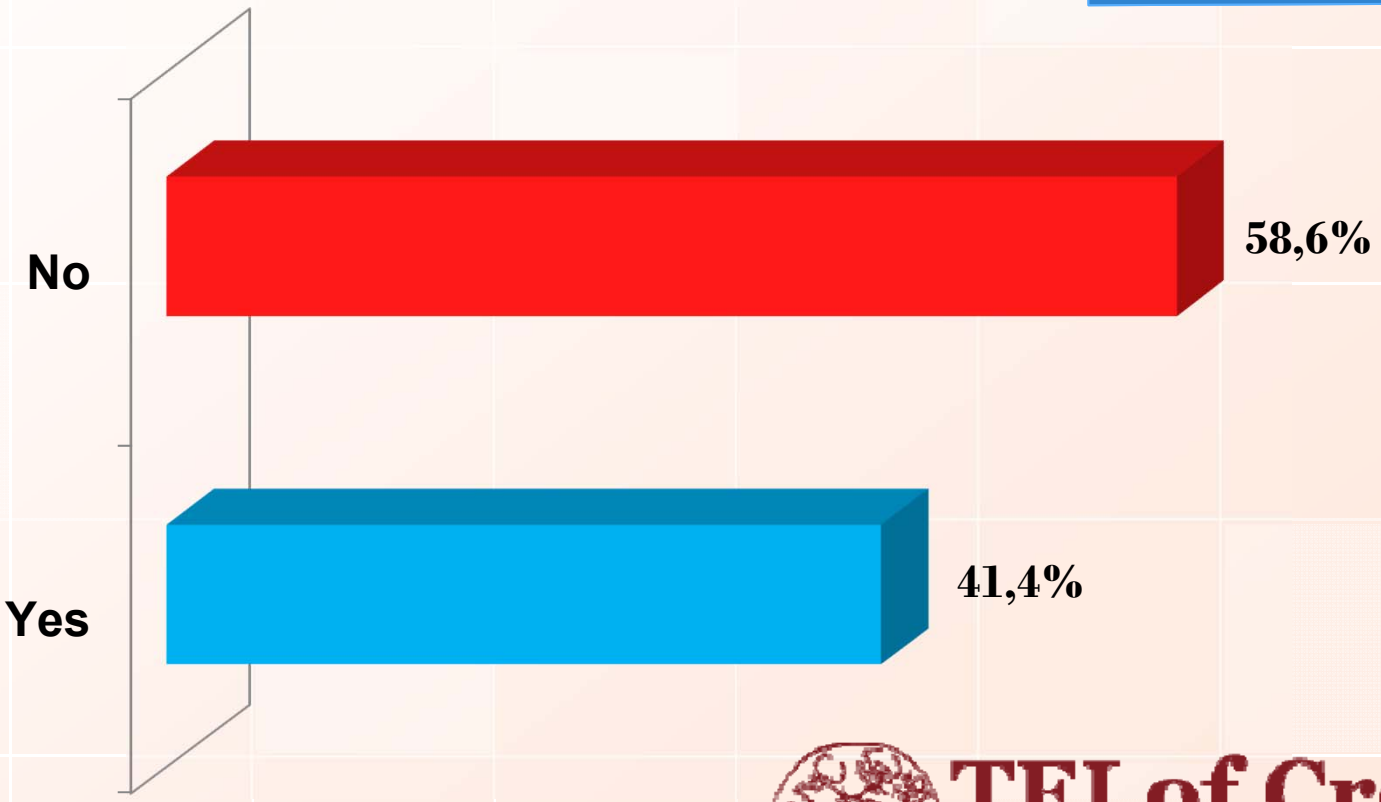
## “ Massive On Line Open Courses “

N=1033



## If so, have you successfully completed the program of MOOC's courses?
## " Massive On Line Open Courses "
## N=74

Concerns the 7,2% of the students




SENTIMENT ANALYSIS

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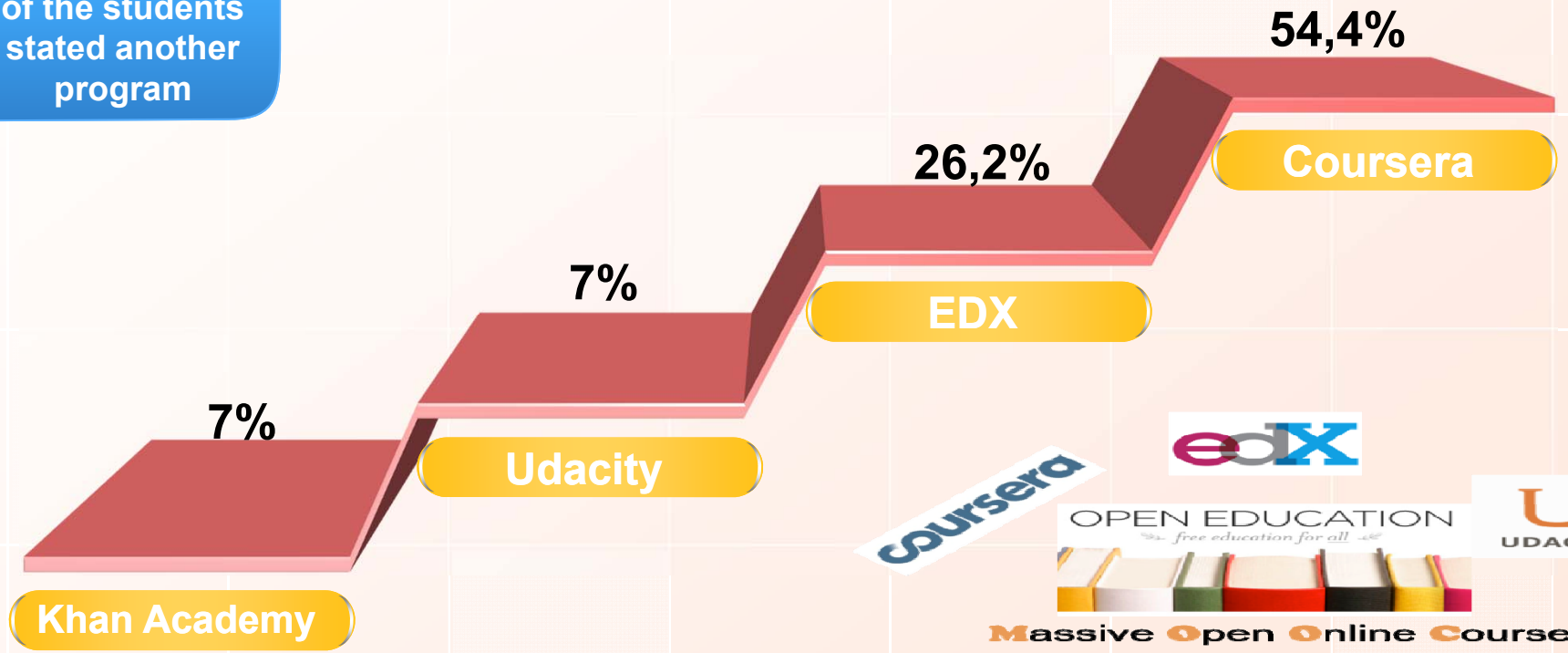
## If yes, note the MOOCs platform that you attended ?

**“ Massive On Line Open Courses “**

**N=74**

The 5,4% percent of the students stated another program




Massive Open Online Course

SENTIMENT ANALYSIS

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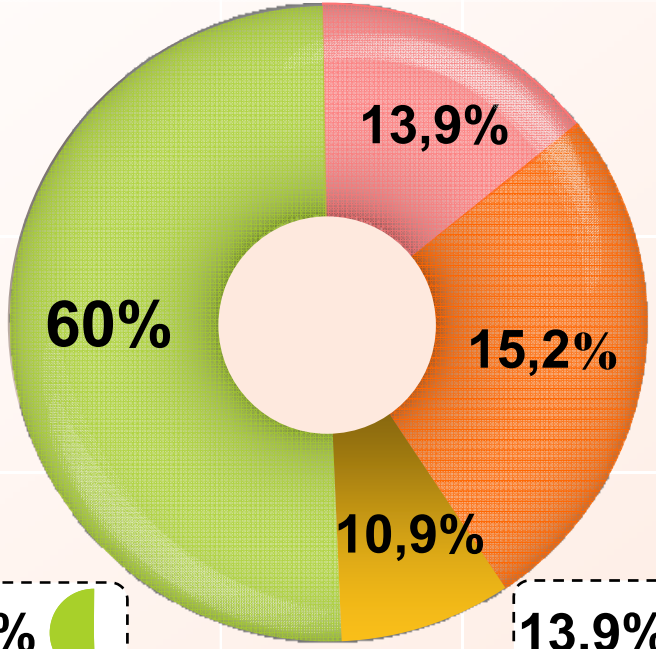
# If not, why did you not complete the program?
## “ Massive On Line Open Courses “
N= 43




I had not time to become involved — 60%

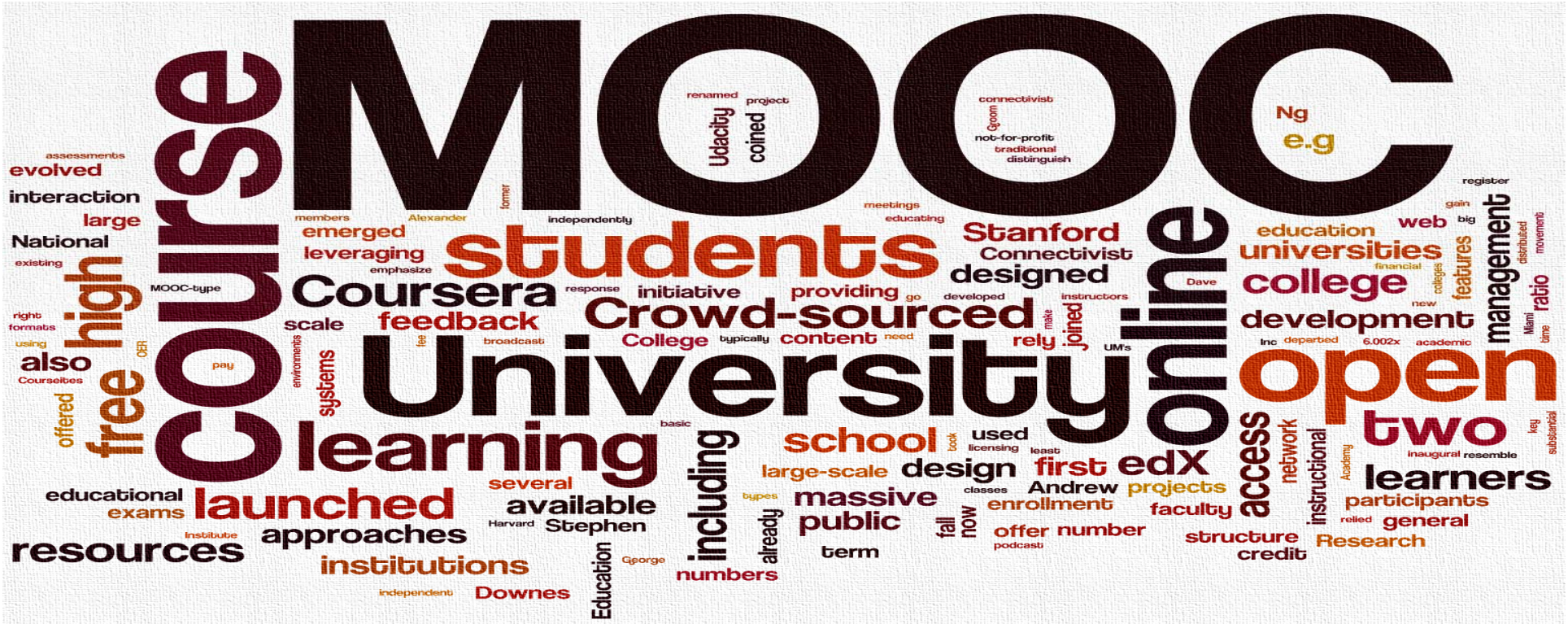
Did not provide certification — 13,9%

Other reason — 10,9%

Fees was quite high — 15,2%

SENTIMENT ANALYSIS

TEI of Crete
Technological Educational Institute of Crete

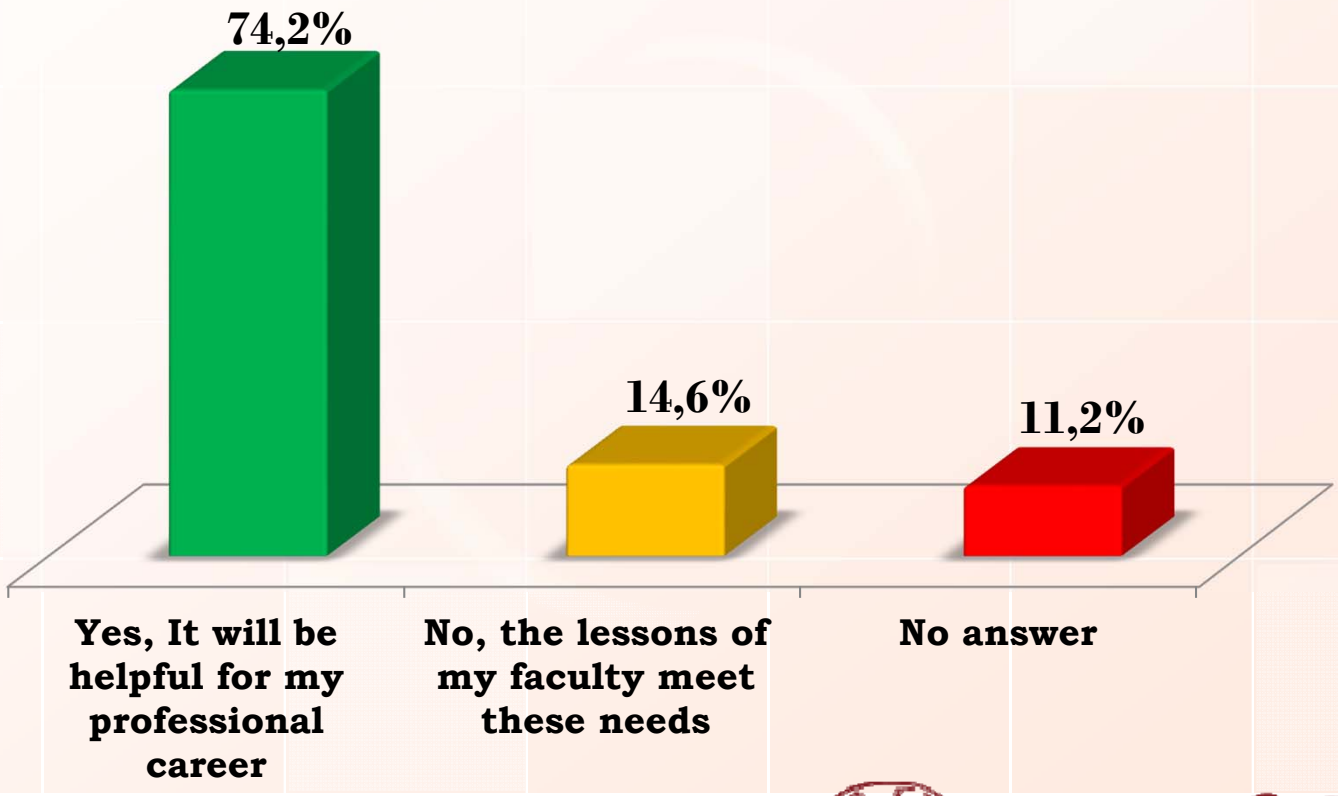



# *The potential of Mooc's*

## Would you be willing to attend courses which would be designed according to the market needs?

### “ Massive On Line Open Courses “

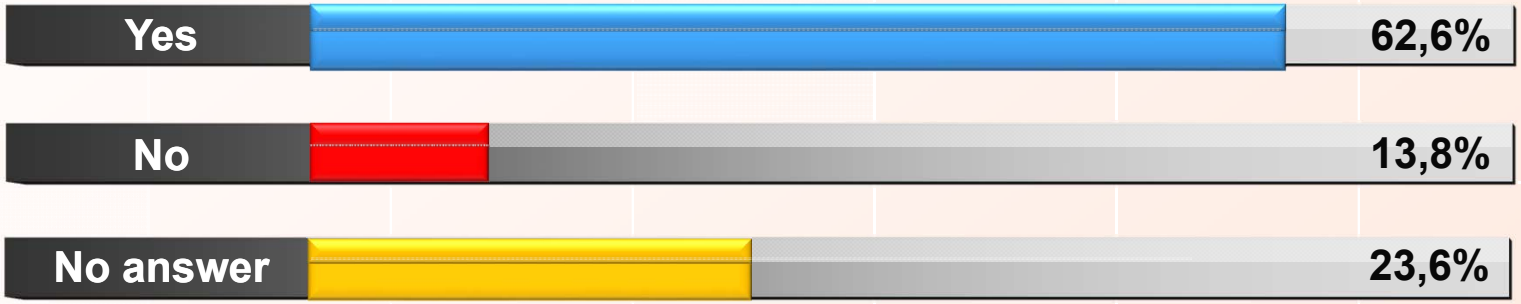
N=1033



## Do you believe that the successful completion of a MOOC course will help you in finding a job relevant to the subject of your studies ?

" Massive On Line Open Courses "
N= 586

**The following percentages refer to the 56.7% of the sample replied that knows Mooc's**



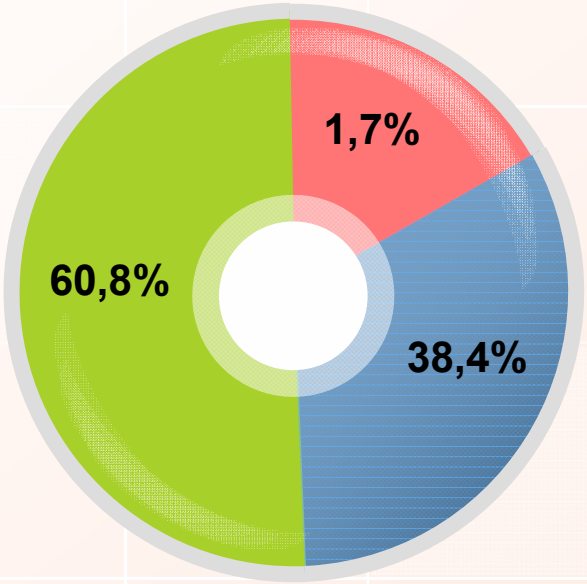
# Are you aware of the MOOC's ?

## " Massive On Line Open Courses "

Technical University of Crete

UNIVERSITY OF CRETE

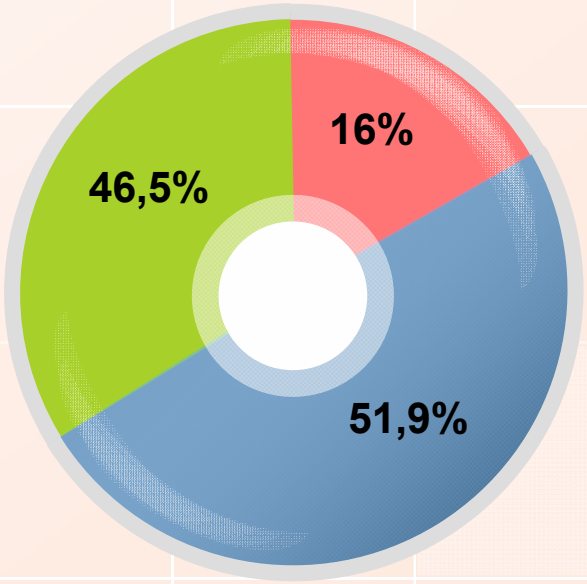
TEI of Crete
Technological Educational Institute of Crete




Yes

No

No answer



# Have you attended courses through MOOCs ?
# " Massive On Line Open Courses "

**Percentages relate to students who answered "Yes"**

## TU of Crete

| | |
|---|---|
| 5,1% | Environmental Engineering |
| 10% | Mineral Resources Engineering |
| 25,7% | Electronic & Computer Engineering |
| 6,6% | Production Engineering & Management |
| --- | Architecture |

## University of Crete

| | |
|---|---|
| 2% | **Primary Education** |
| --- | **Preschool** |
| 9,5% | **Philosophical Studies** |
| --- | **History and archeology** |
| --- | **Literature** |
| 9,5% | **Political sciences** |
| 5,3% | **Economics** |
| 8,7% | **Sociology** |
| 6,2% | **Psychology** |
| 11,1% | **Mathematics** |
| 5,3% | **Chemistry** |
| 20% | **Physical** |
| 9,5% | **Computer Science** |
| ---- | **Materials Technology** |
| ---- | **Biology** |
| 44,4% | **Medical** |

## Technological Institute of Crete

| | |
|---|---|
| 3% | Electronic Engineers |
| --- | Technologist Agronomist |
| 3% | Mechanical Engineering |
| ---- | Electrical Engineering |
| 46,2% | IT engineers |
| 6,7% | Civil Engineering |
| 15,4% | Social Work |
| ---- | Nursing |
| ---- | Accounting |
| 5,9% | Business Administration |

SENTIMENT ANALYSIS

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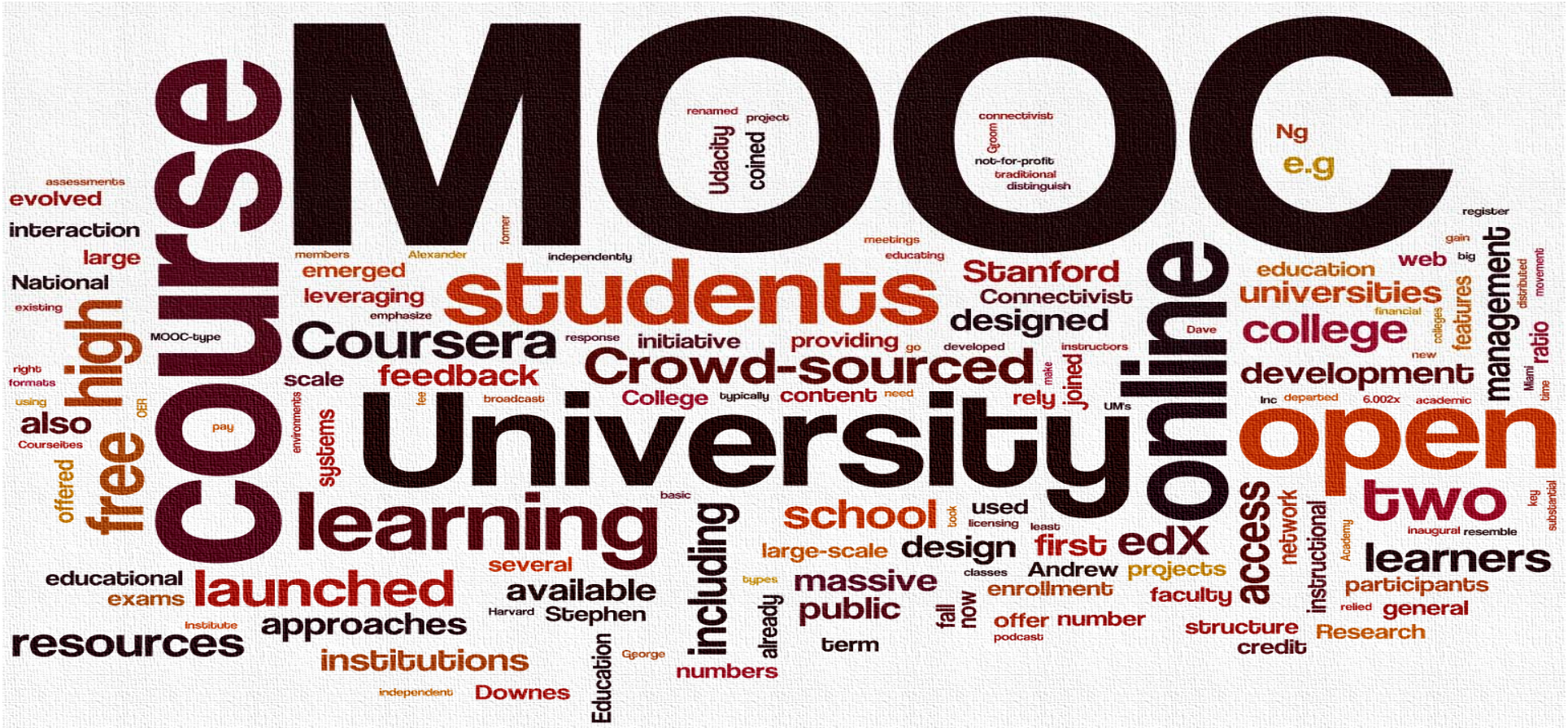
Technological Educational Institute of Crete




# *Massive Open Online Course*
# (Mooc's)
# *& Higher Education (Teacher's Perspective)*

SENTIMENT ANALYSIS

TEI of Crete
Technological Educational Institute of Crete

# Research Identity

**Type of research**

Quantitative research with structured questionnaires

**Data Collection**

Thursday March 19 – Thursday April 30, 2015

**Sample**

The sample size is at 30 professors from Technological Institutes and Universities of Crete

**Methodology**

Personal interviews through internet and face to face to professors of higher education

## Educational Level

" Massive On Line Open Courses "
N=30

University of Crete

Technological Institution

## Total Sample

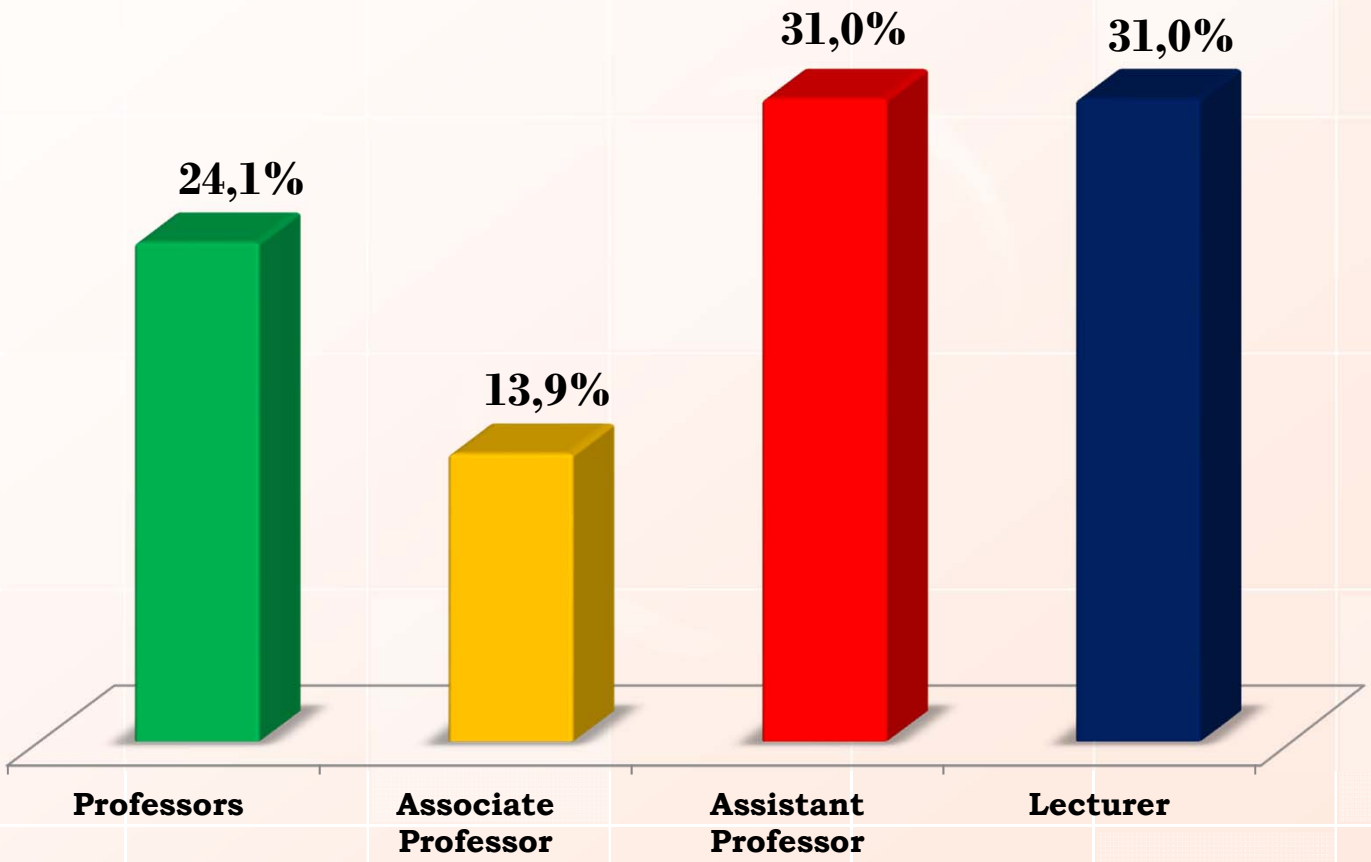
**30 Professors**

**70% Technological Institution**

**30% University of Crete**

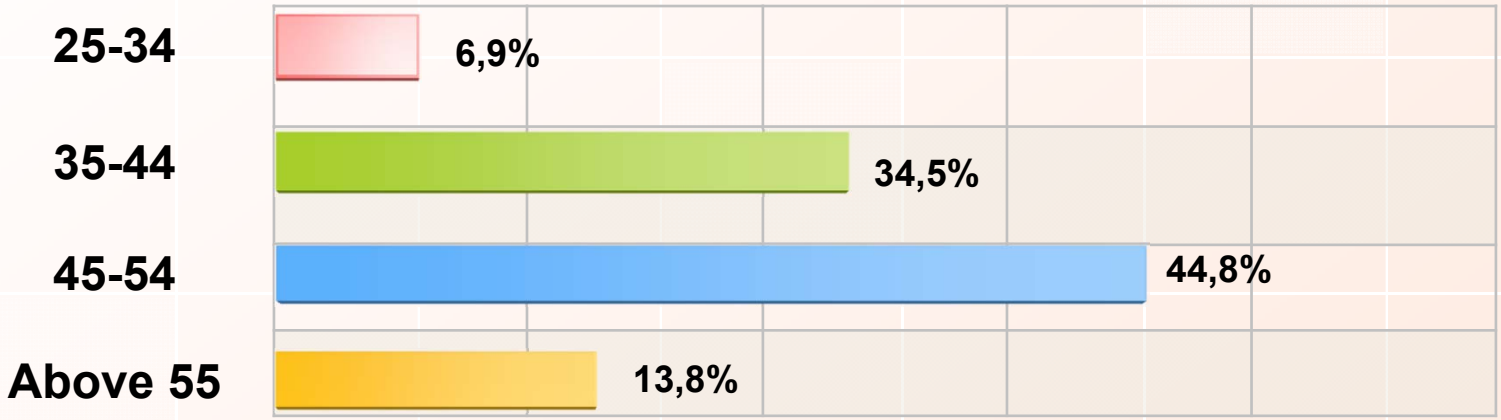
# Administrative Ranks

## “ Massive On Line Open Courses “
## N=30



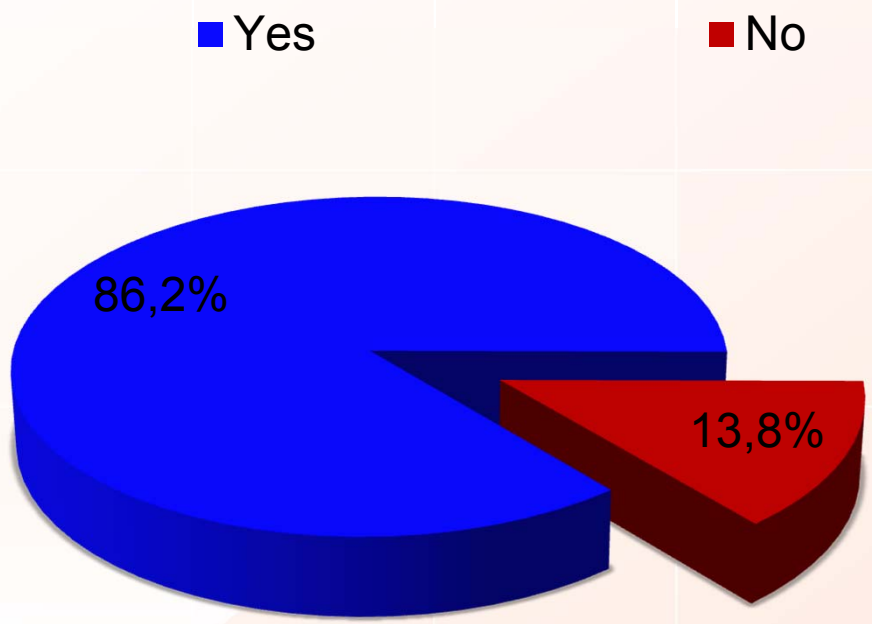
# Age

N=30



# Are you aware of the MOOC's ?

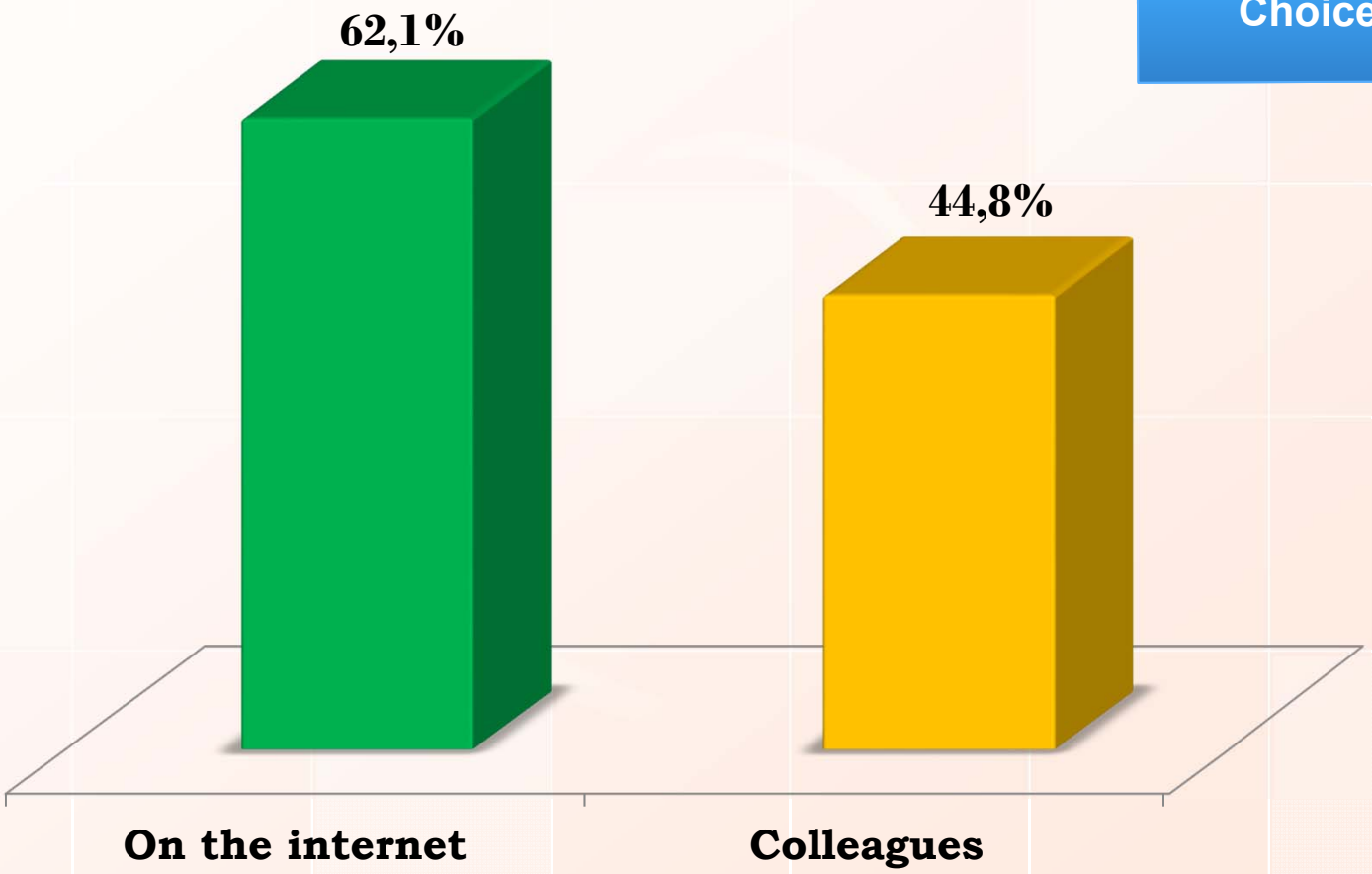
**" Massive On Line Open Courses "**
**N=30**



# If yes, where did you learn about the existence of MOOCs ?

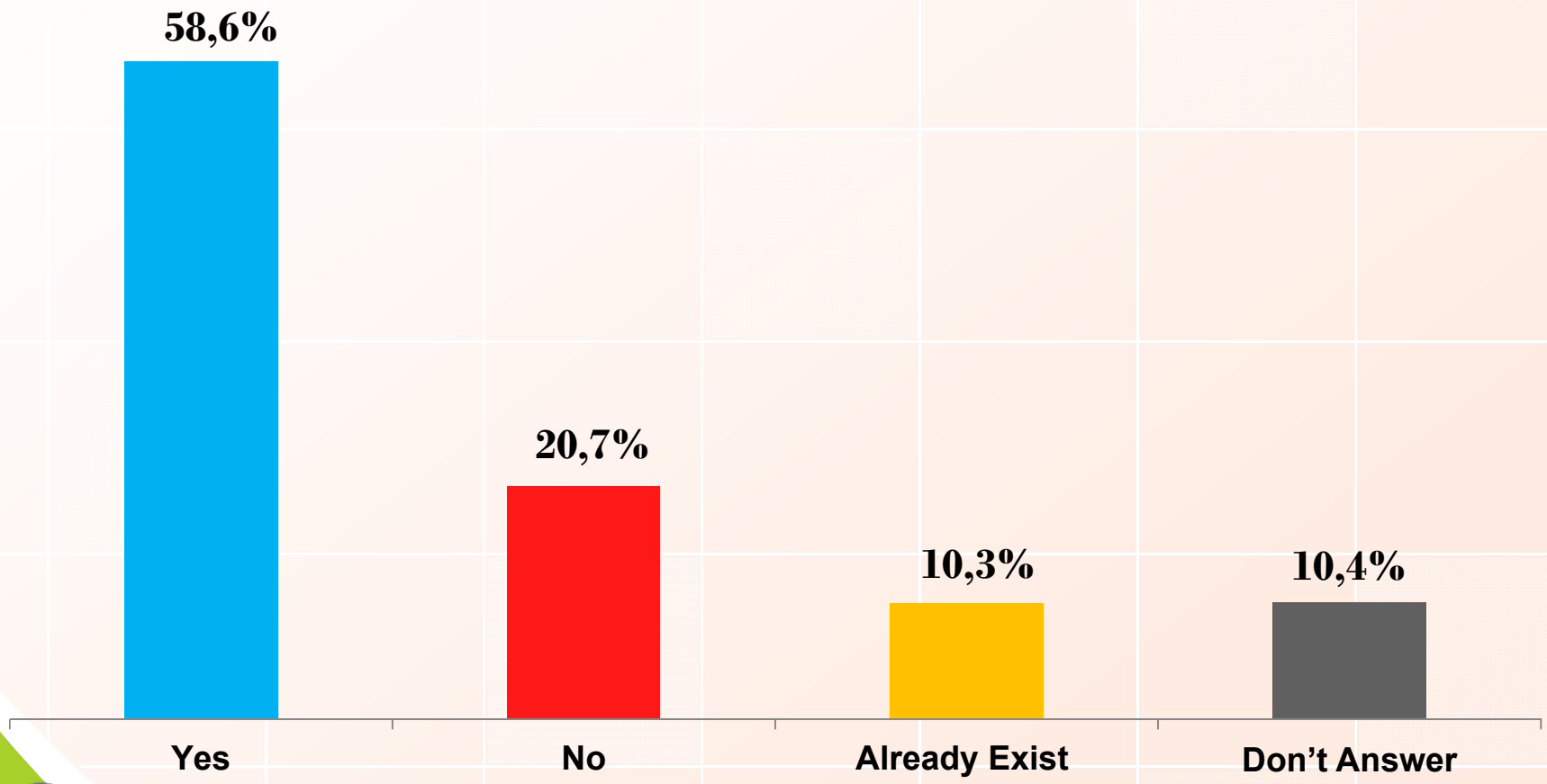
"Massive On Line Open Courses "
N=30

Multiple Choice



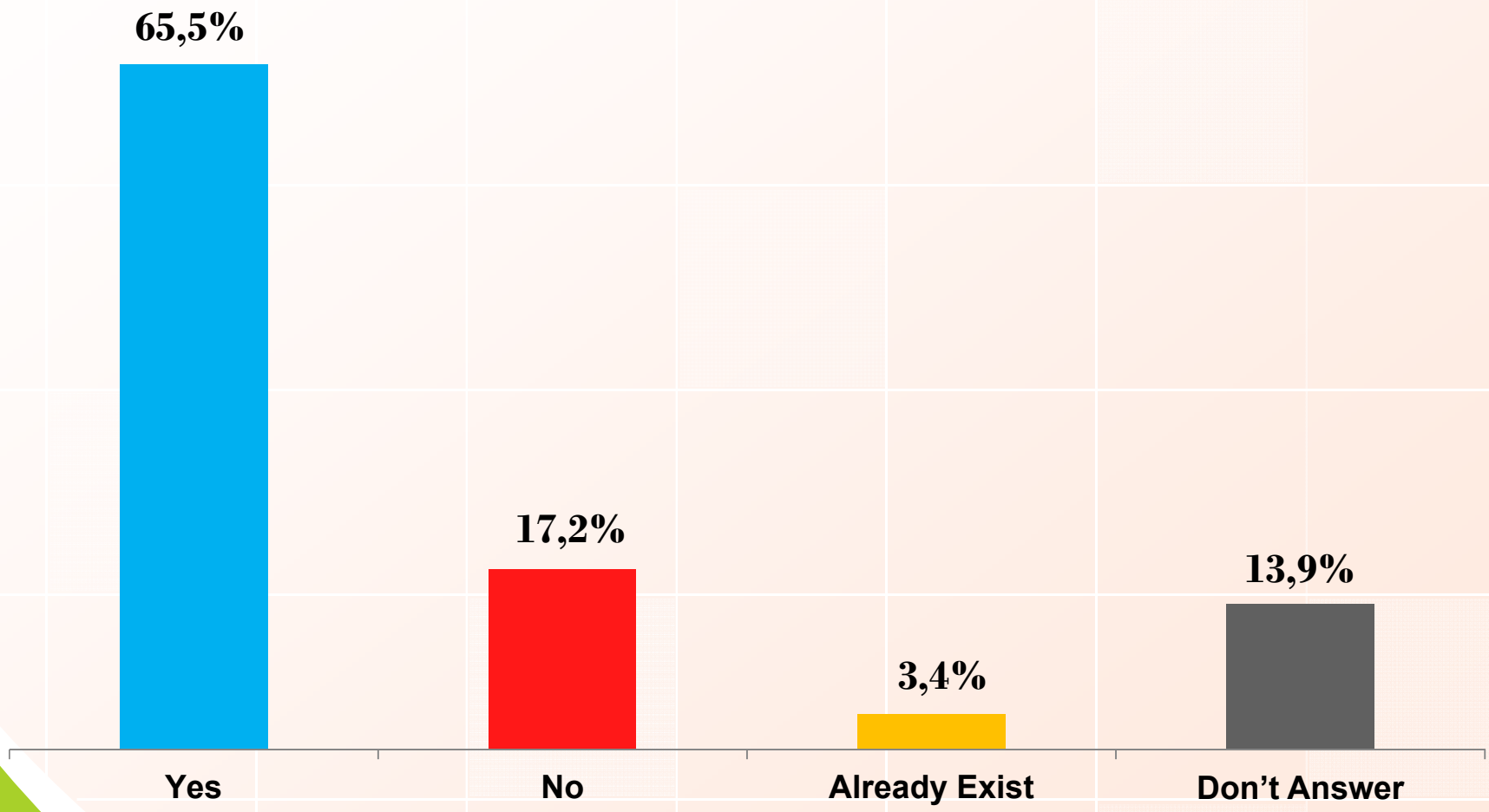
## Would you be interested Massive On Line Open Courses to join the basic curriculum of your University?

" Massive On Line Open Courses "
N=30



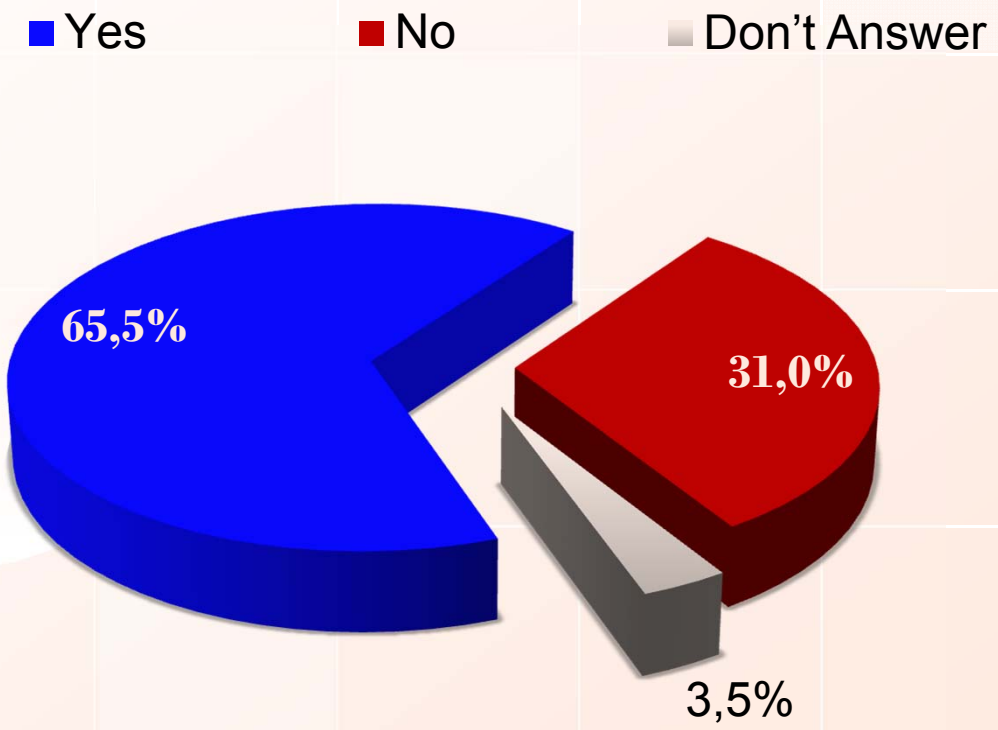
## Would you be interested Massive On Line Open Courses to join the postgraduate curriculum of your University?

" Massive On Line Open Courses "
N=30



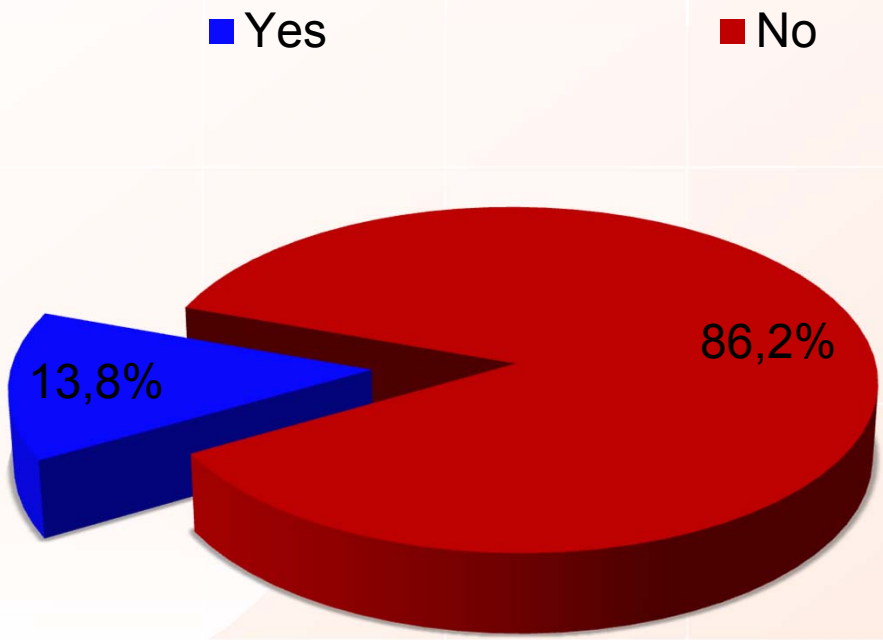
**Do you believe that Massive Open Online Courses should be designed according to the needs of companies, providing certified knowledge and professional rights reserved to the students?**

**“ Massive On Line Open Courses “**
**N=30**



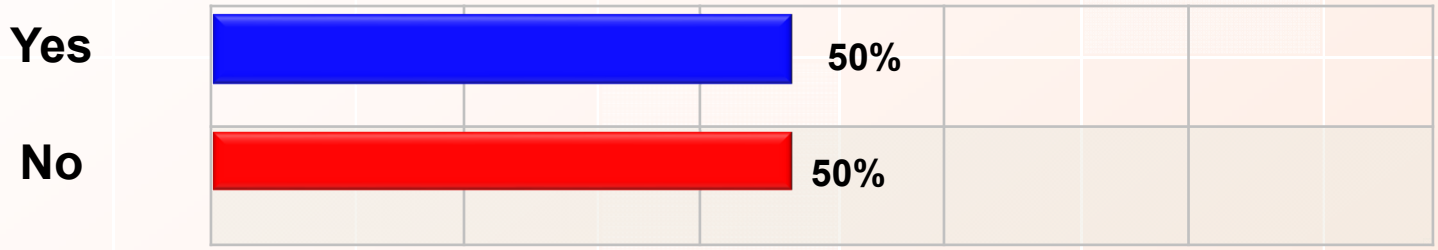
## Do you teach or taught Open Massive Online Courses

**“ Massive On Line Open Courses “**
**N=30**



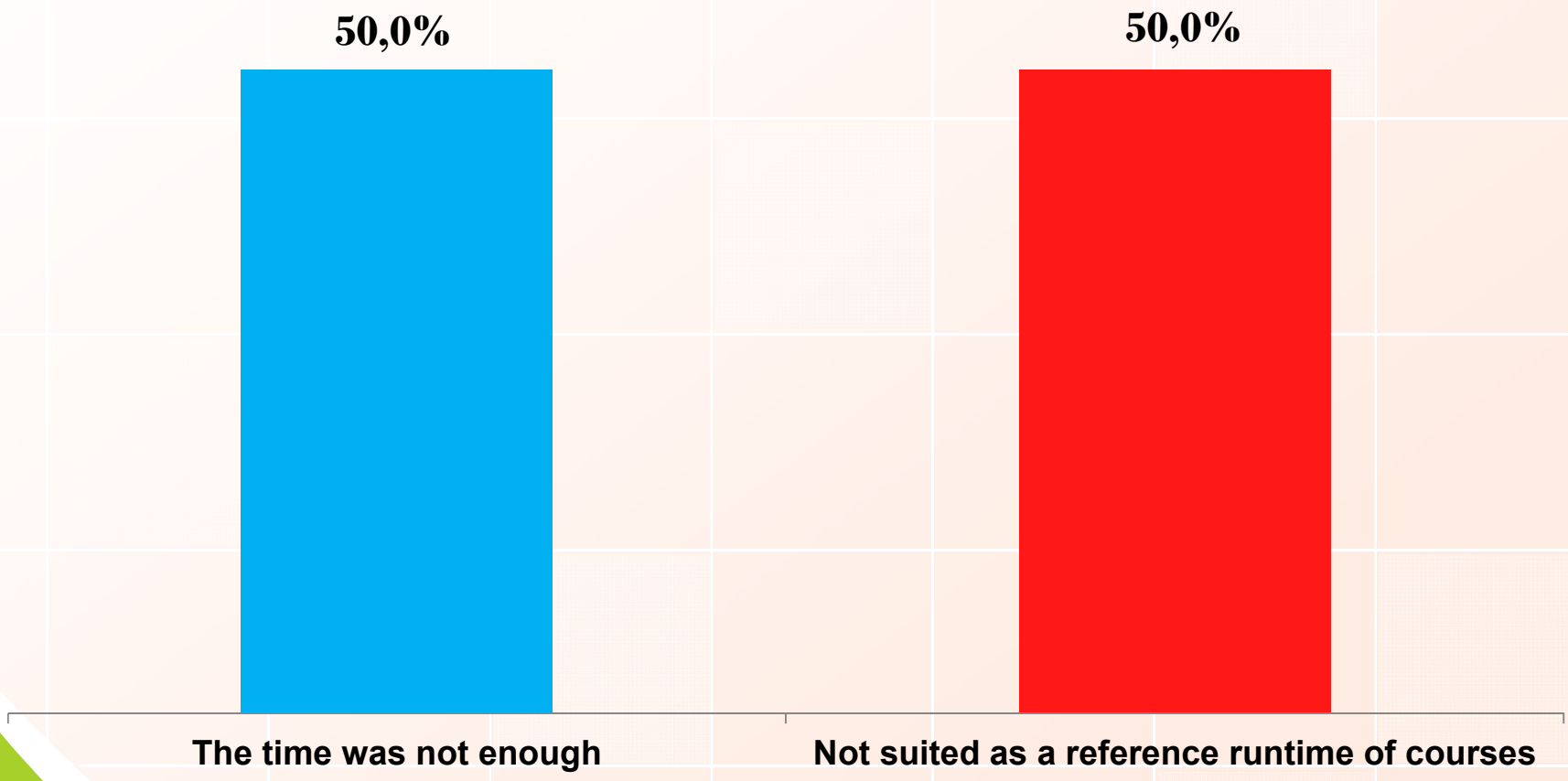
## If yes, have you successfully completed the program of MOOC's courses ?

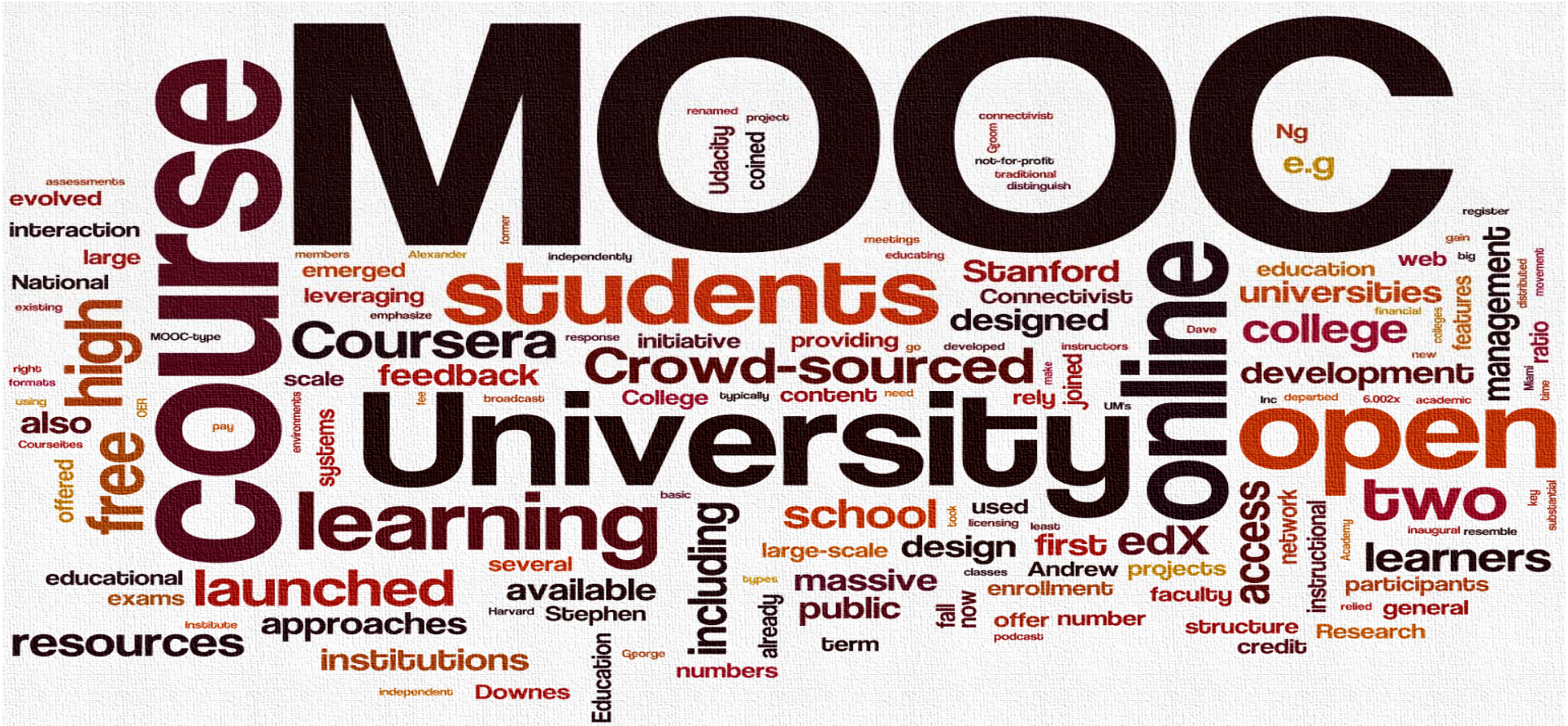
" Massive On Line Open Courses "



## If not, why did you not complete the program?

**“ Massive On Line Open Courses “**






# *The Labor Market* Needs in Crete (electronic engineering sector)

SENTIMENT ANALYSIS

TEI of Crete

Technological Educational Institute of Crete

# Survey ID

**Type of research**

Quantitative survey using a semi - structured questionnaire

**Duration - data collection**

Tuesday 18 of June – Wednesday 15 of July 2015

**Sample**

The sample size is at 48 Companies from Crete (the research is still on action all over Greece and Europe)

**Methodology**

Personal interviews to companies employees. All the companies participating in the survey have employees working in the field of engineering.

**Personnel field/ check**

Four (2) researchers and one (1) supervisor

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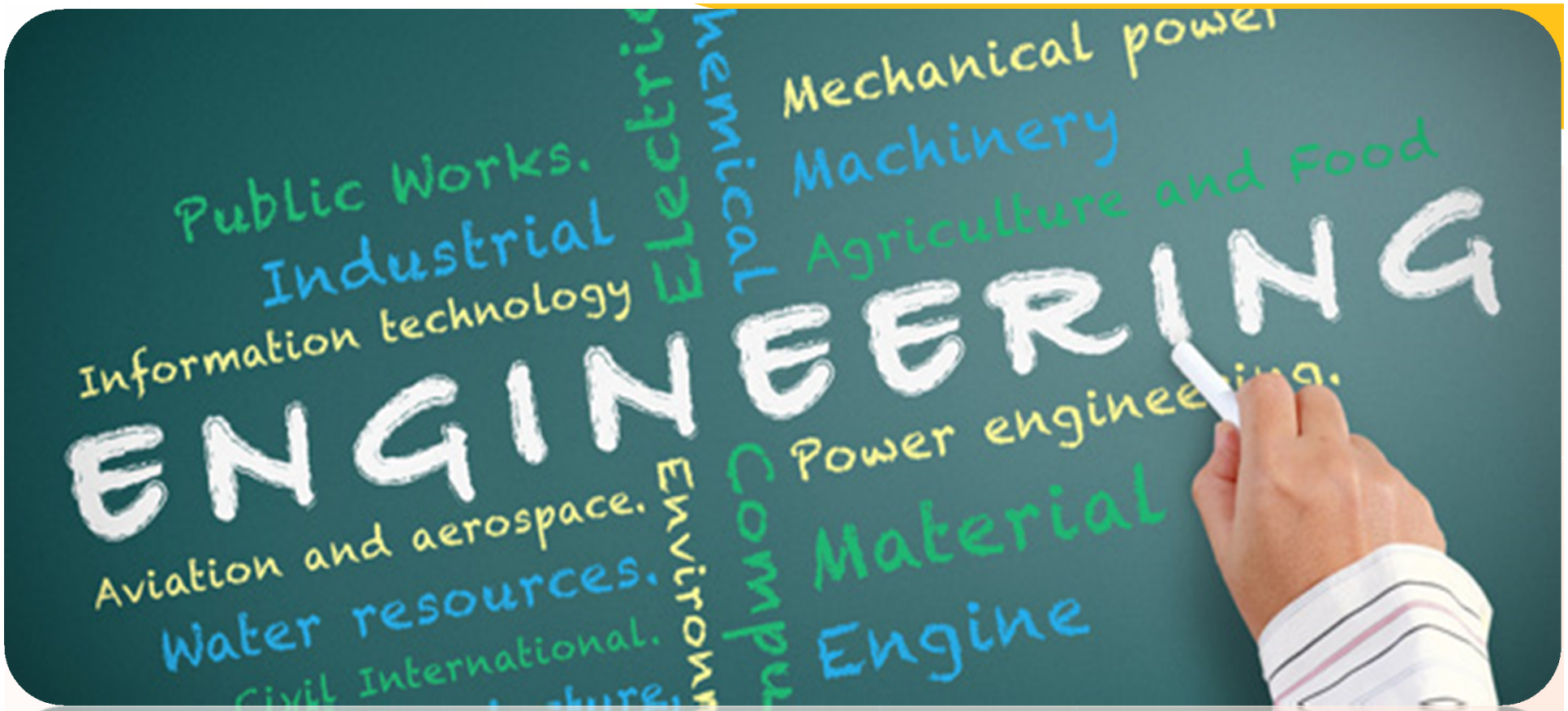
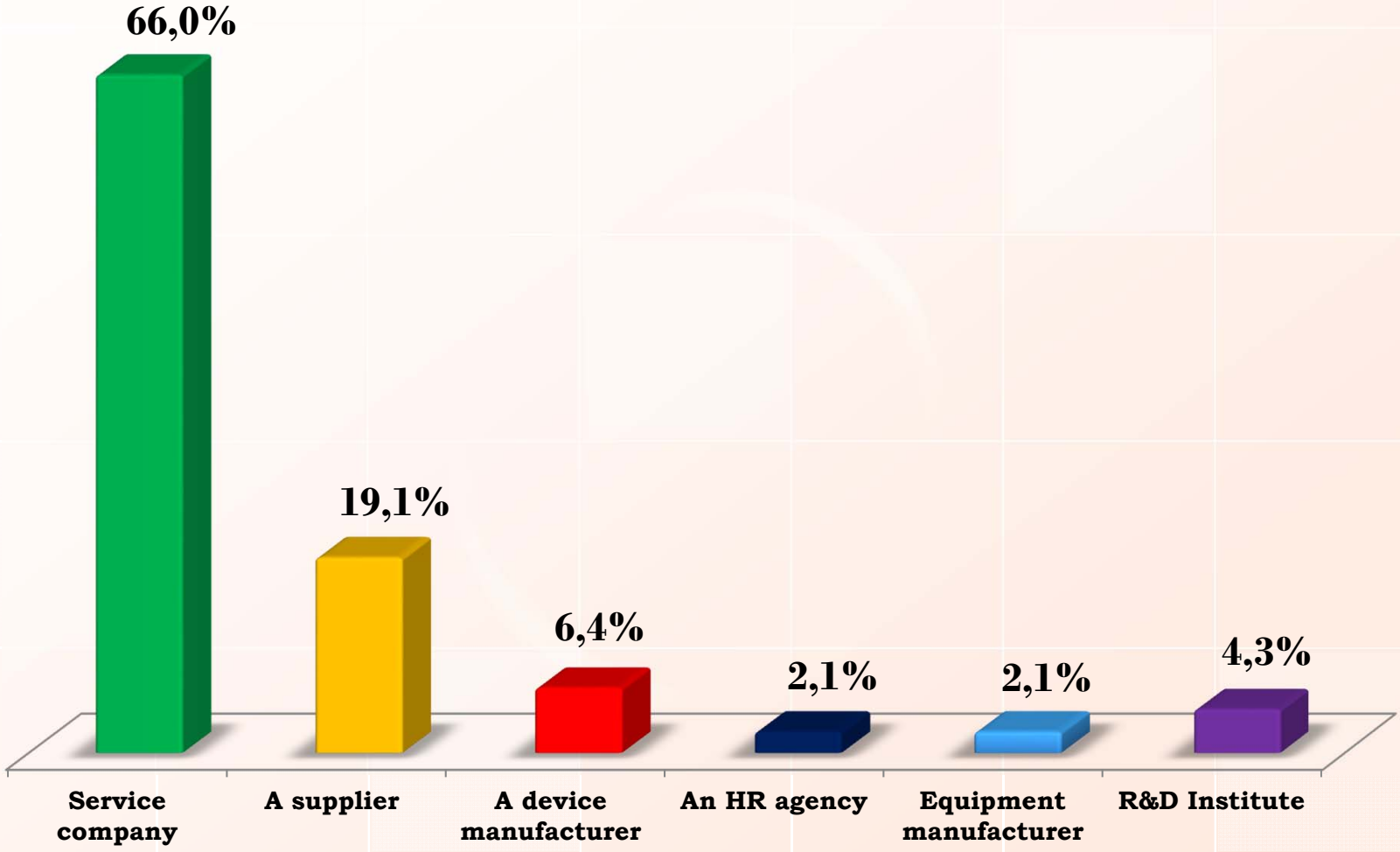



# Company Demographic Data

# What type of company are you?
## "Massive On Line Open Courses "
## N=47

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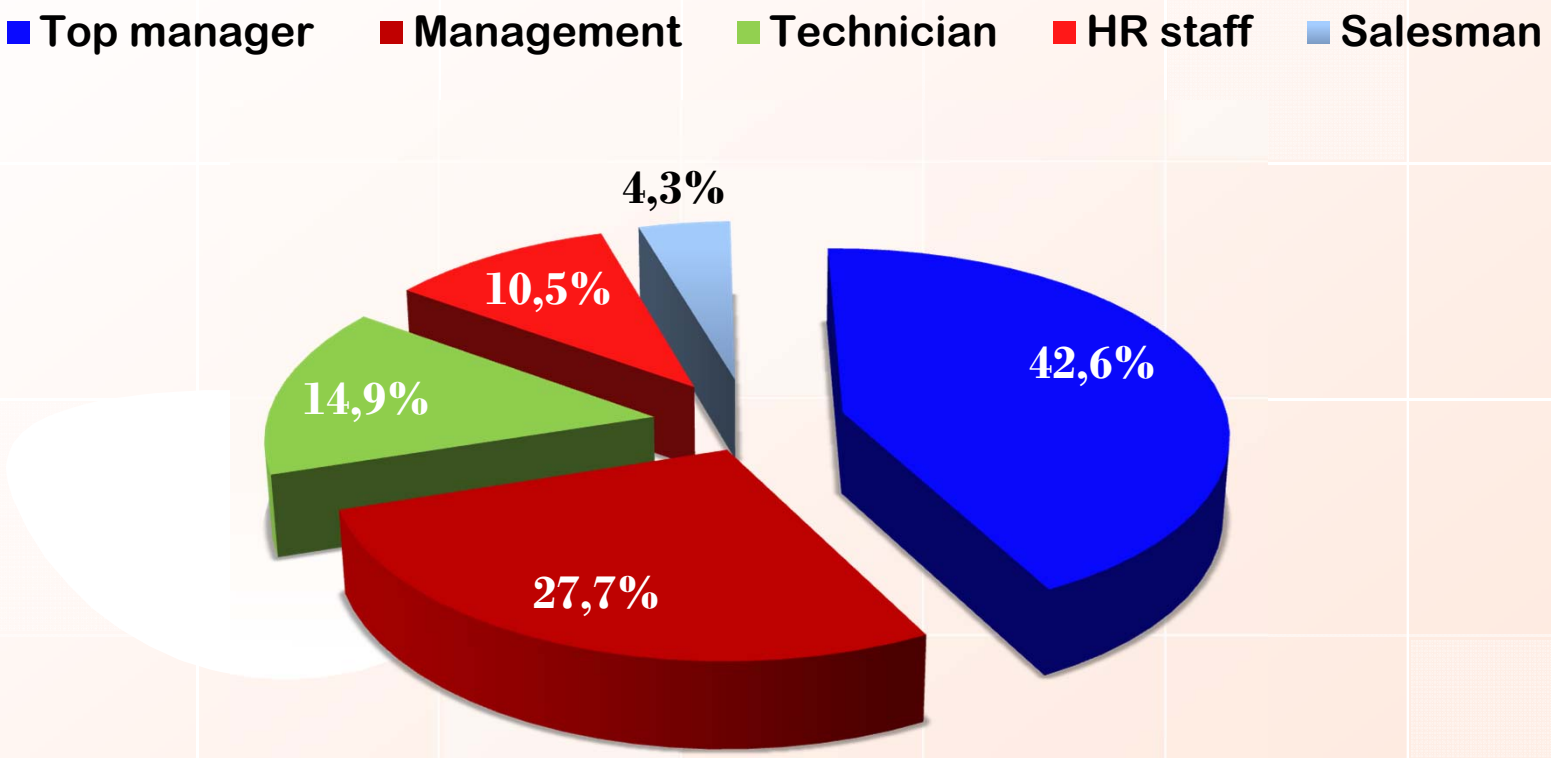
# What is your position in the company?

" Massive On Line Open Courses "
N=47

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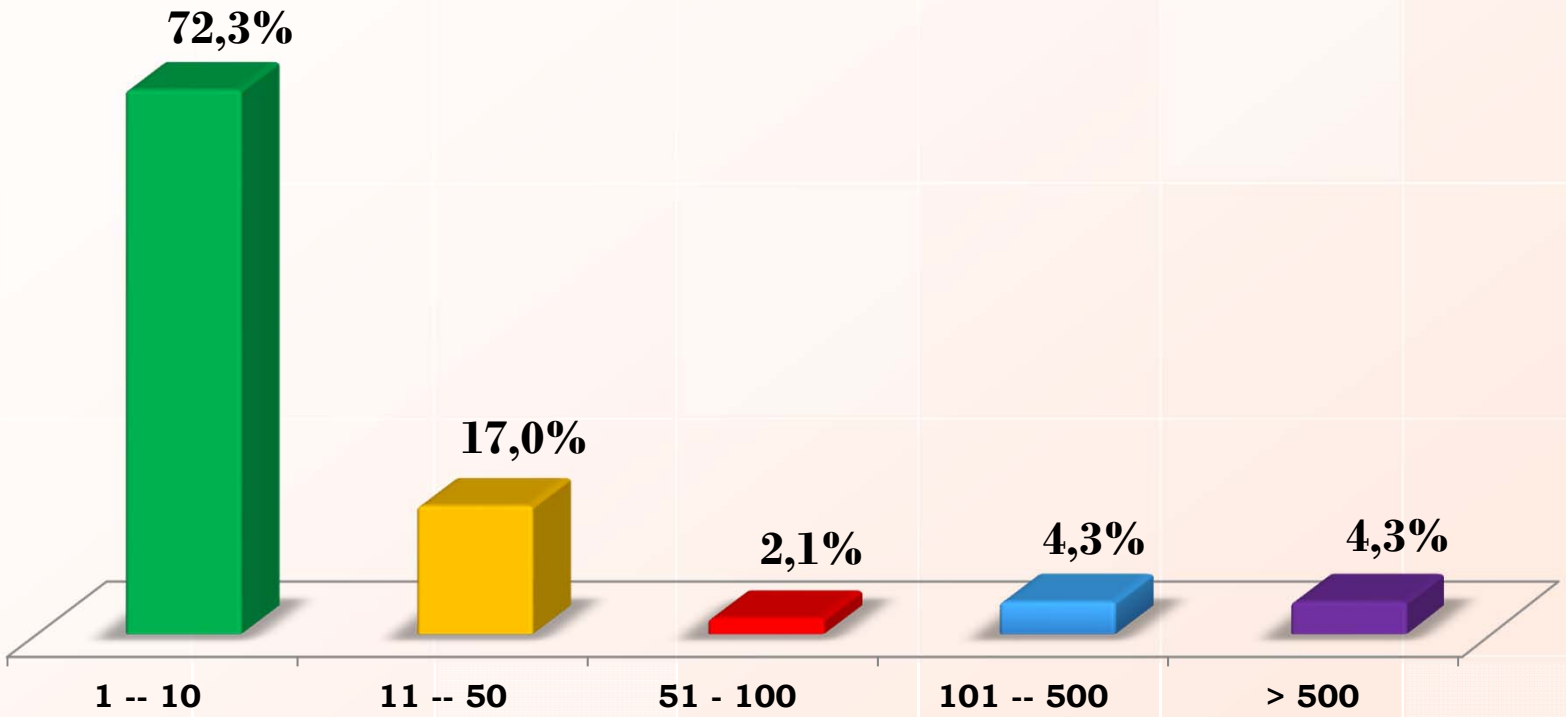
# How many people does your company employ?

" Massive On Line Open Courses "
N=47

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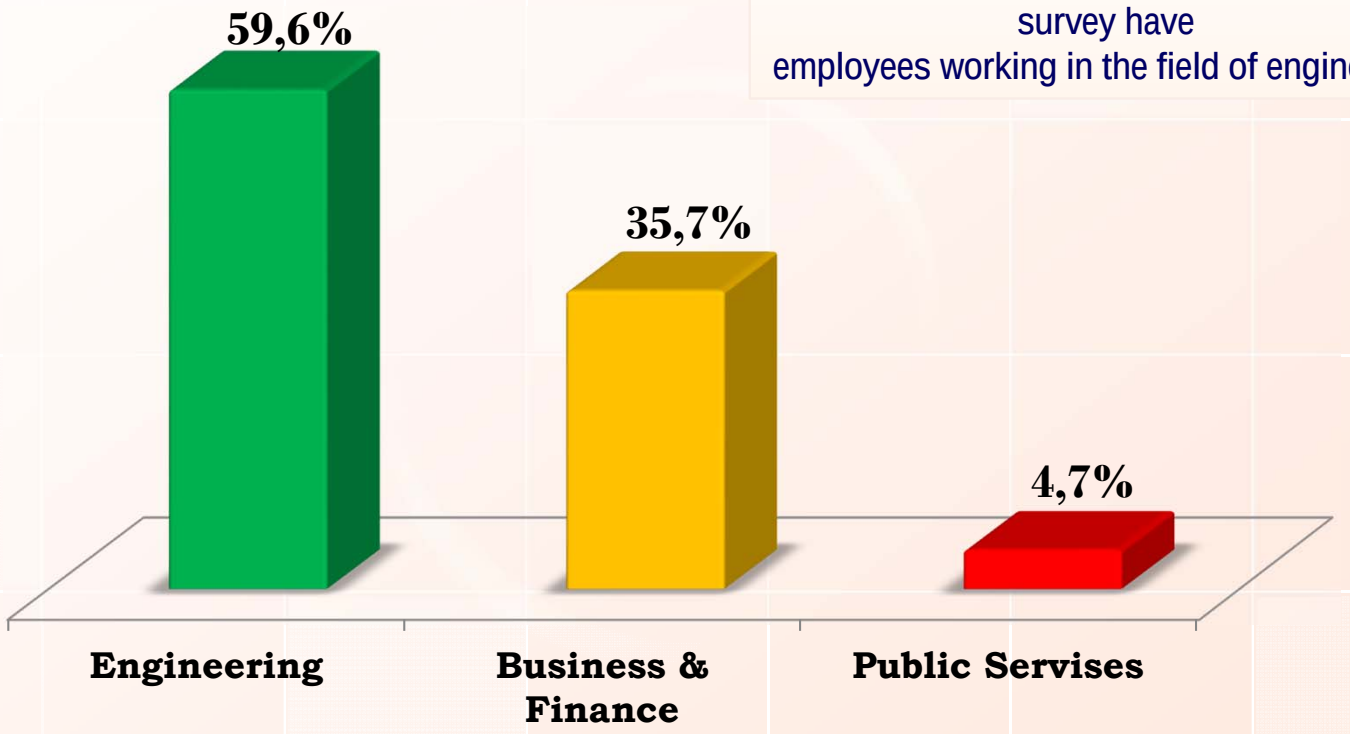
# Please specify the sector of your company

## “ Massive On Line Open Courses “
## N=47

All the companies participating in the survey have employees working in the field of engineering.

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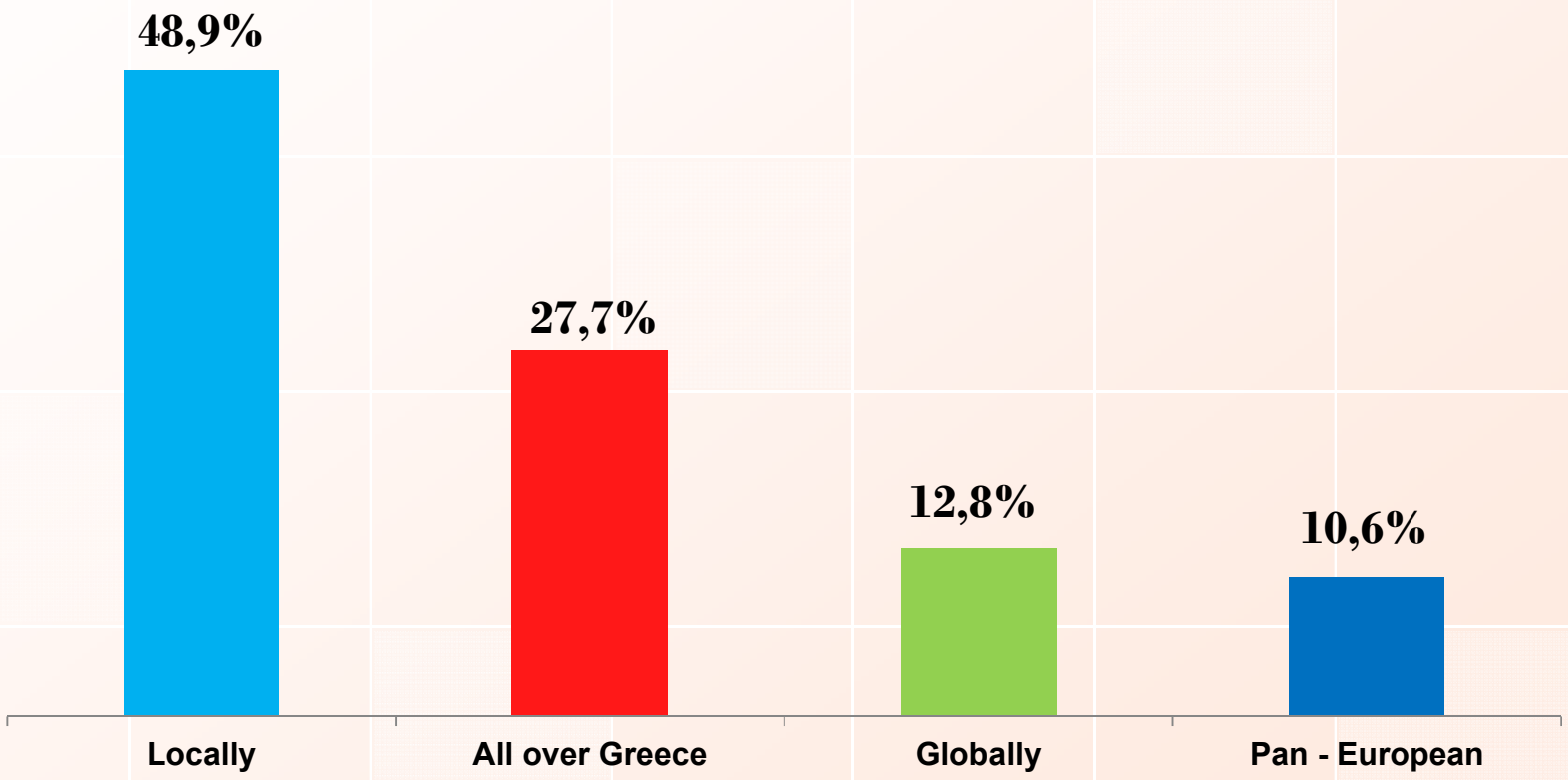
# Your company/organization works?

## “ Massive On Line Open Courses “
## N=47

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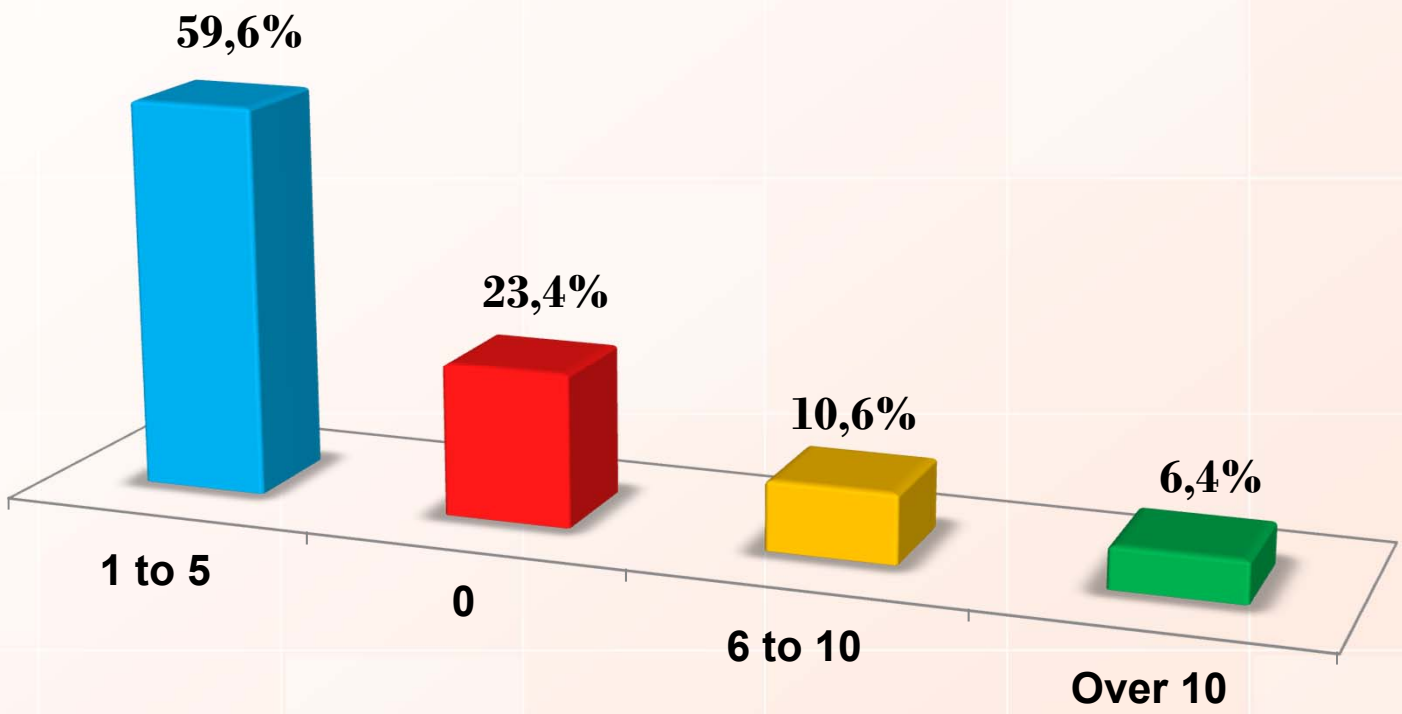
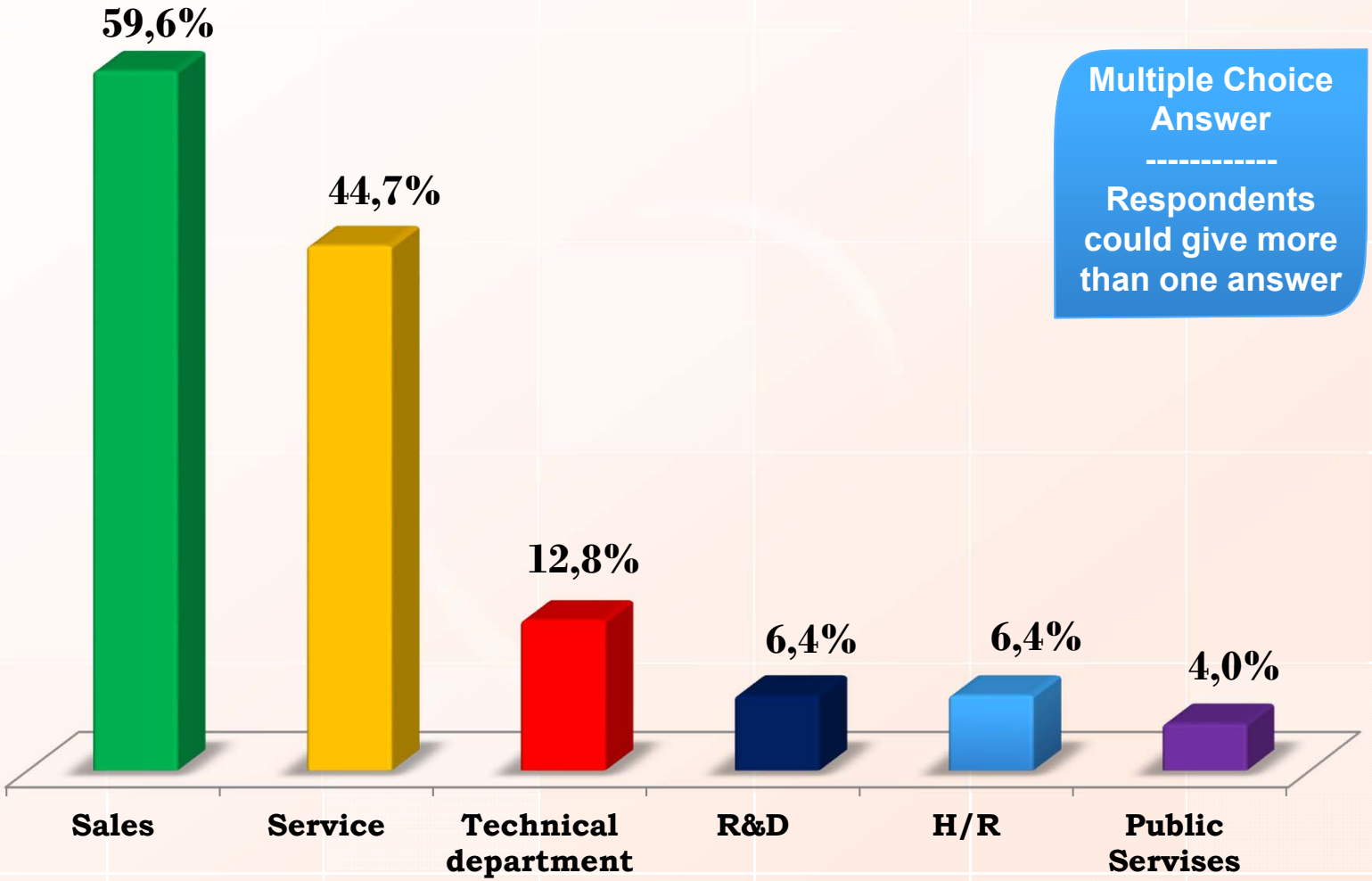
# How many people joined your company in the last 3 years?

**“ Massive On Line Open Courses “**
**N=47**



# Please provide the most common vacancies within your company?

## "Massive On Line Open Courses "
## N=47




Multiple Choice Answer

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Respondents could give more than one answer

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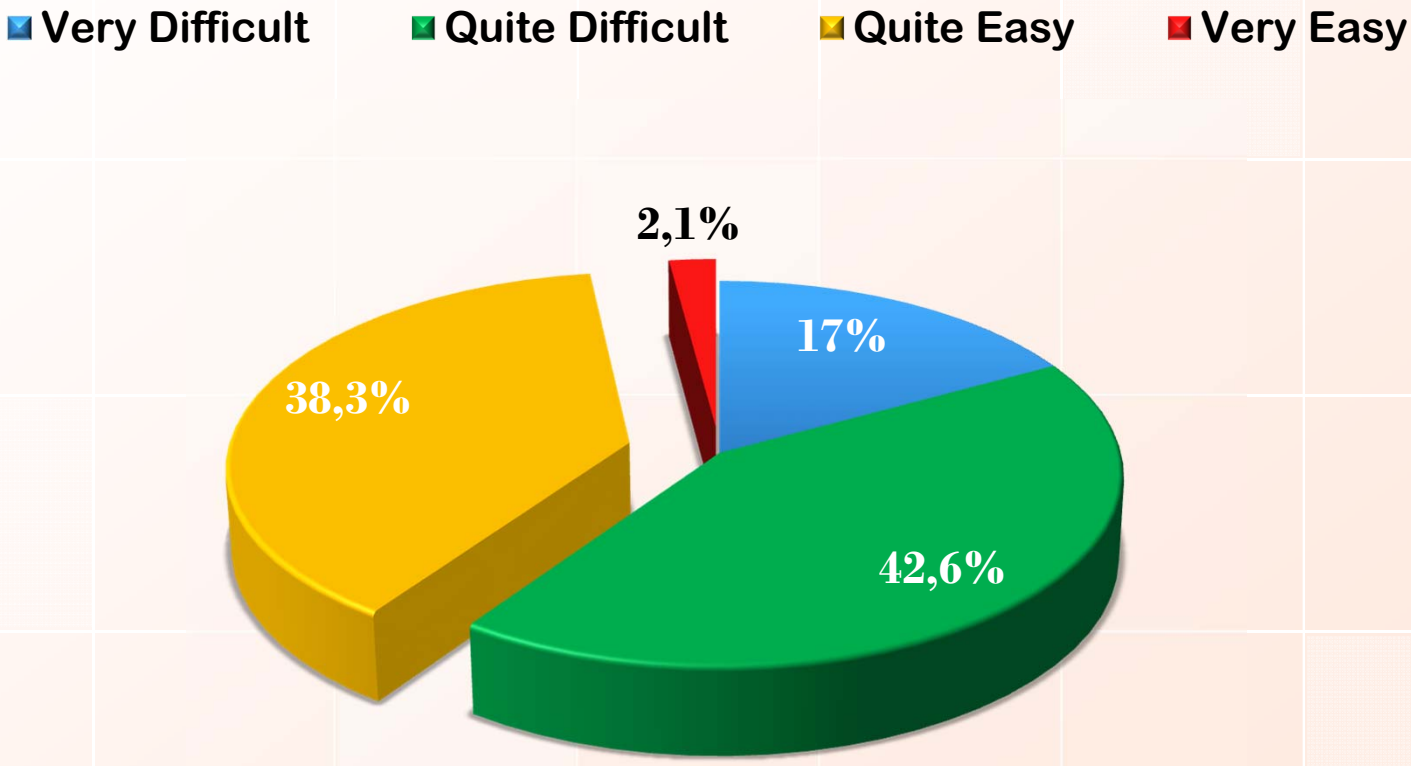
# How easy is to fill these vacancies?

## “ Massive On Line Open Courses “

## N=47

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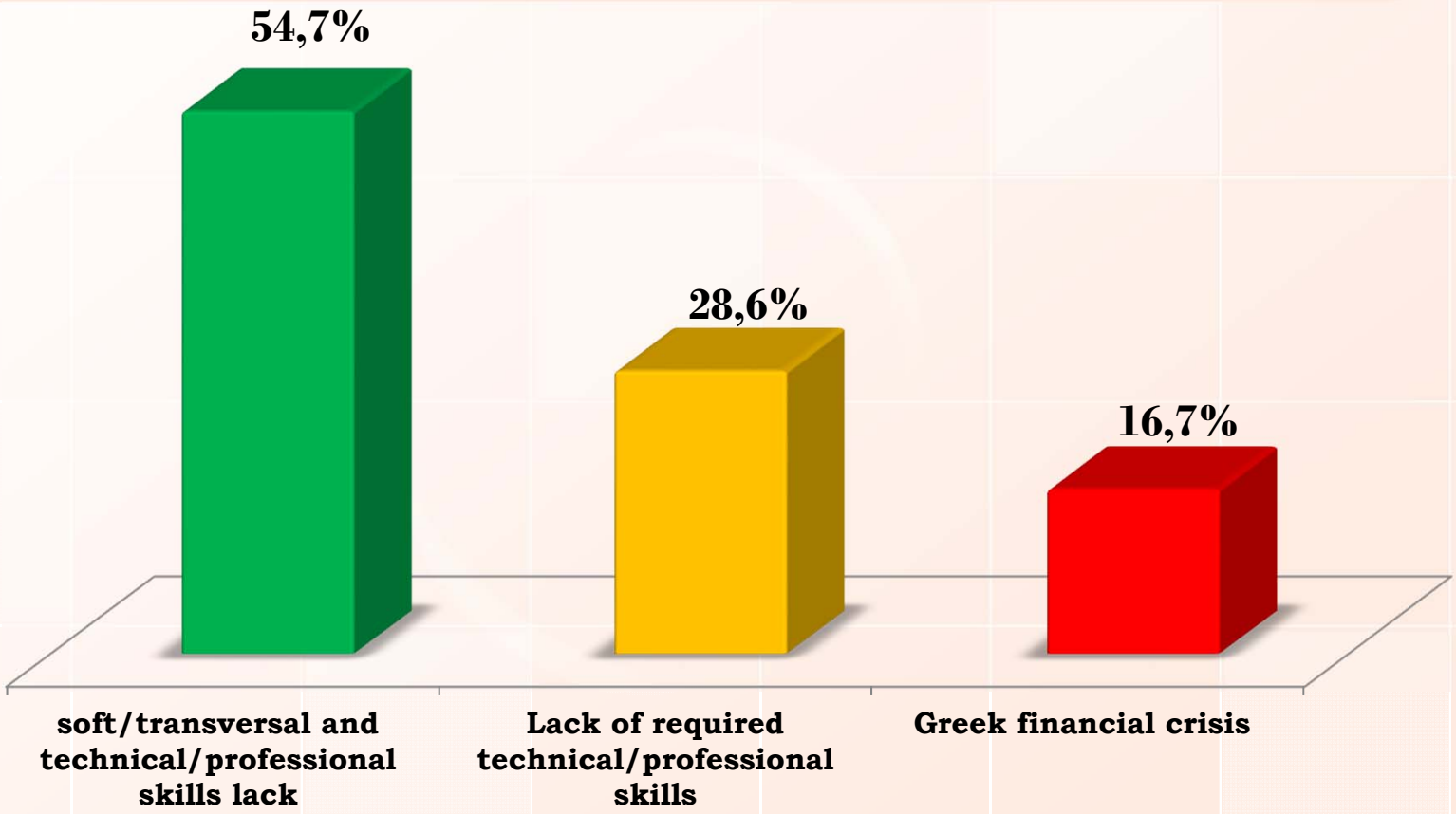
# In your opinion what are the difficulties to fill the most recent vacancies within your company?

" Massive On Line Open Courses "
N=47

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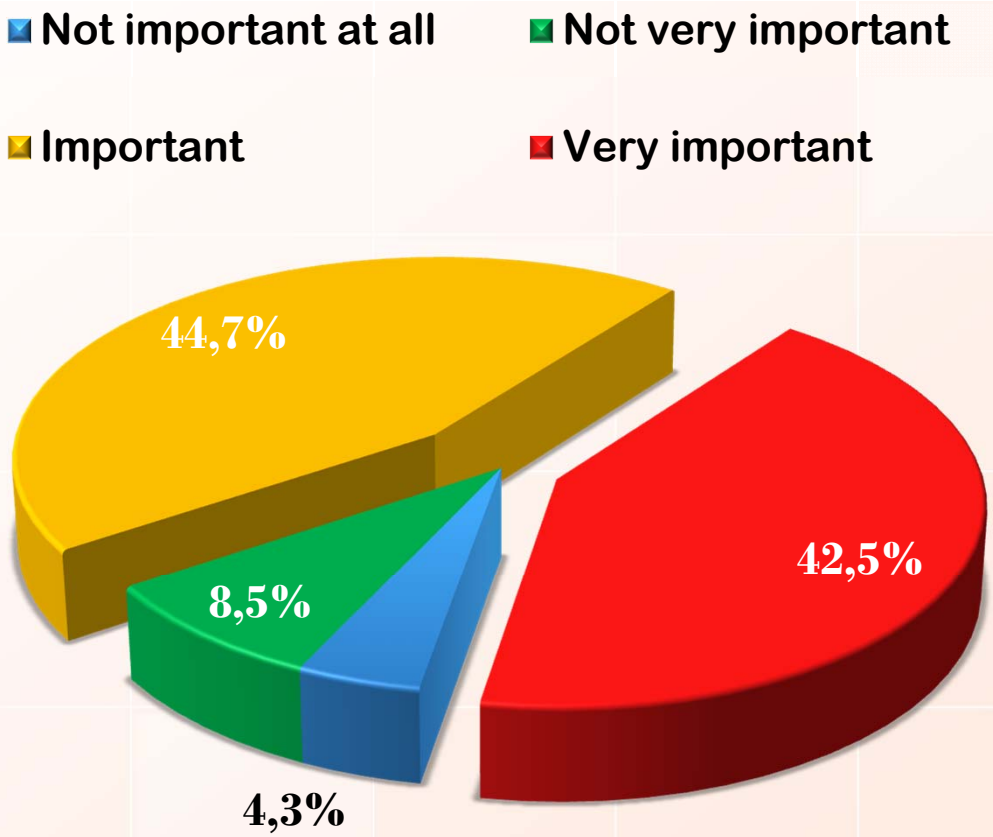
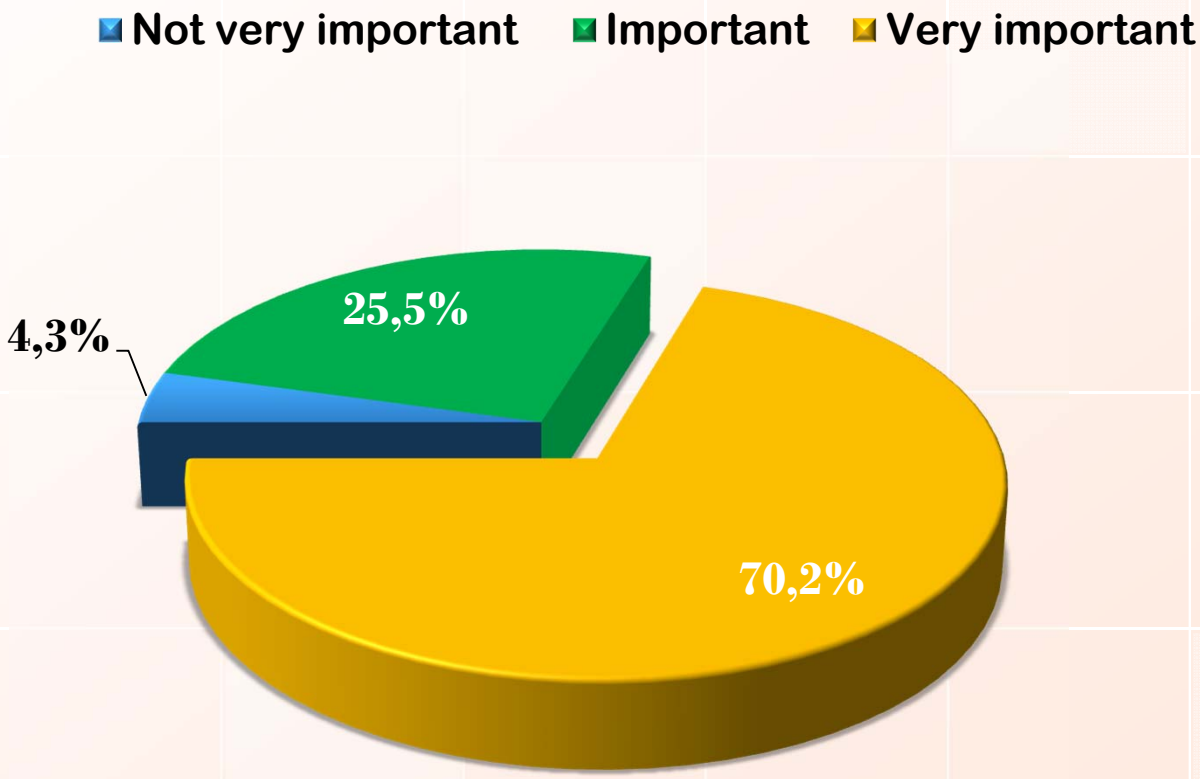
# How important are the soft/transversal skills to fill these vacancies?

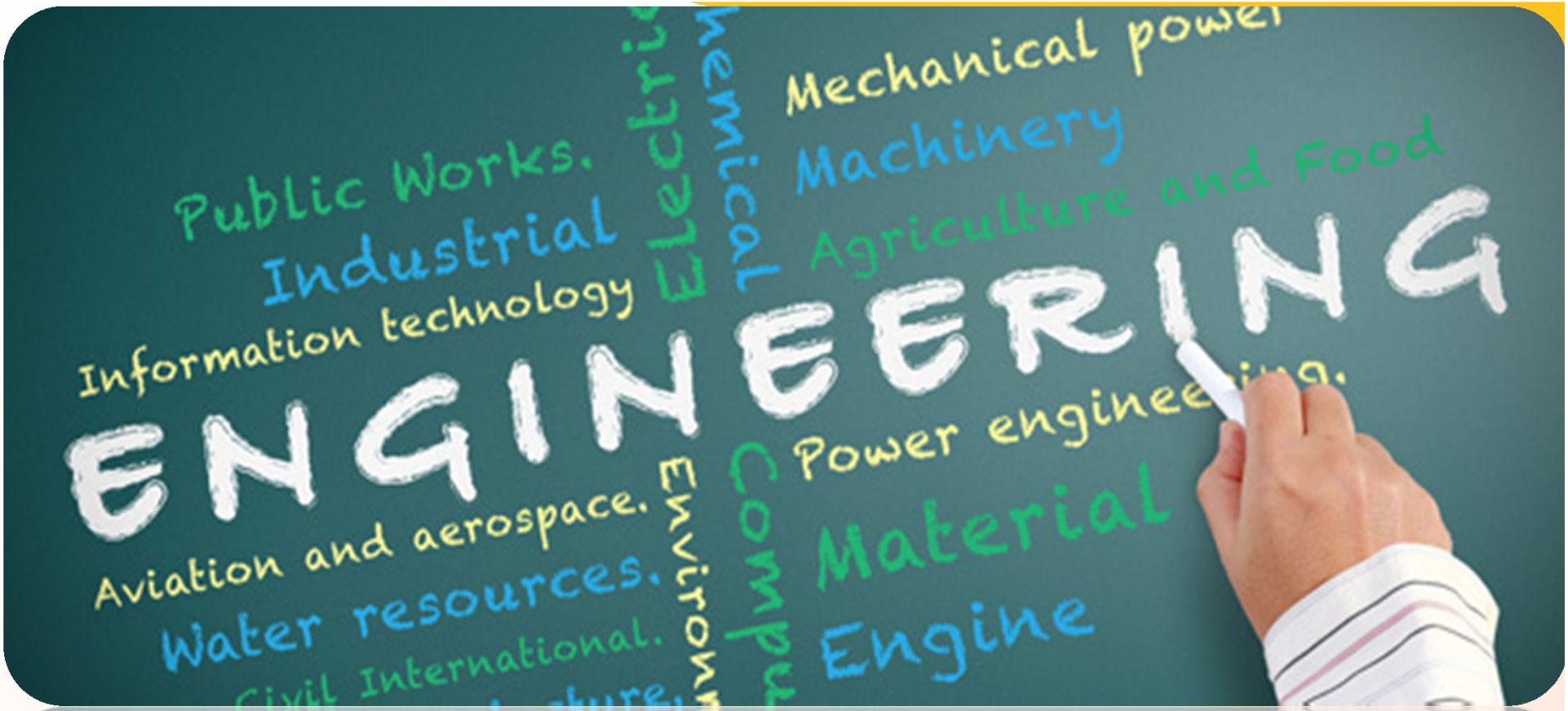
## “ Massive On Line Open Courses “
## N=47



# How important are the technical/professional skills to fill these vacancies?

## “ Massive On Line Open Courses “
## N=47






# Soft / Transversal Skills

## If you were recruiting for your company which of the following Soft / Transversal Skills are important regarding your most common vacancies?

" Massive On Line Open Courses "
N=47

### Learning and Innovation Skills

| | Not so important | Nice to have | Important | Very important |
|---|---|---|---|---|
| Creativity and Innovation | 2,2% | 8,7% | 47,8% | 41,3% |
| Critical Thinking and Problem Solving | - | 8,7% | 39,1% | 52,2% |
| Communication and Collaboration | - | 4,3% | 38,3% | 57,4% |
| Networking | 4,3% | 19,6% | 37% | 39,1% |
| Self Management / Time Management | - | 10,9% | 32,6% | 56,5% |

## If you were recruiting for your company which of the following Soft / Transversal Skills are important regarding your most common vacancies?

" Massive On Line Open Courses "
N=47

### Information, Media and Technology Skills

| | Not so important | Nice to have | Important | Very important |
|---|---|---|---|---|
| Information Literacy | - | 6,4% | 34% | 59,6% |
| Media Literacy | 2,2% | 13% | 30,4% | 54,4% |
| ICT (Information, Communication and Technology) Literacy | - | 17,8% | 28,9% | 53,3% |

## If you were recruiting for your company which of the following Soft / Transversal Skills are important regarding your most common vacancies?

" Massive On Line Open Courses "
N=47

### Life and Career Skills

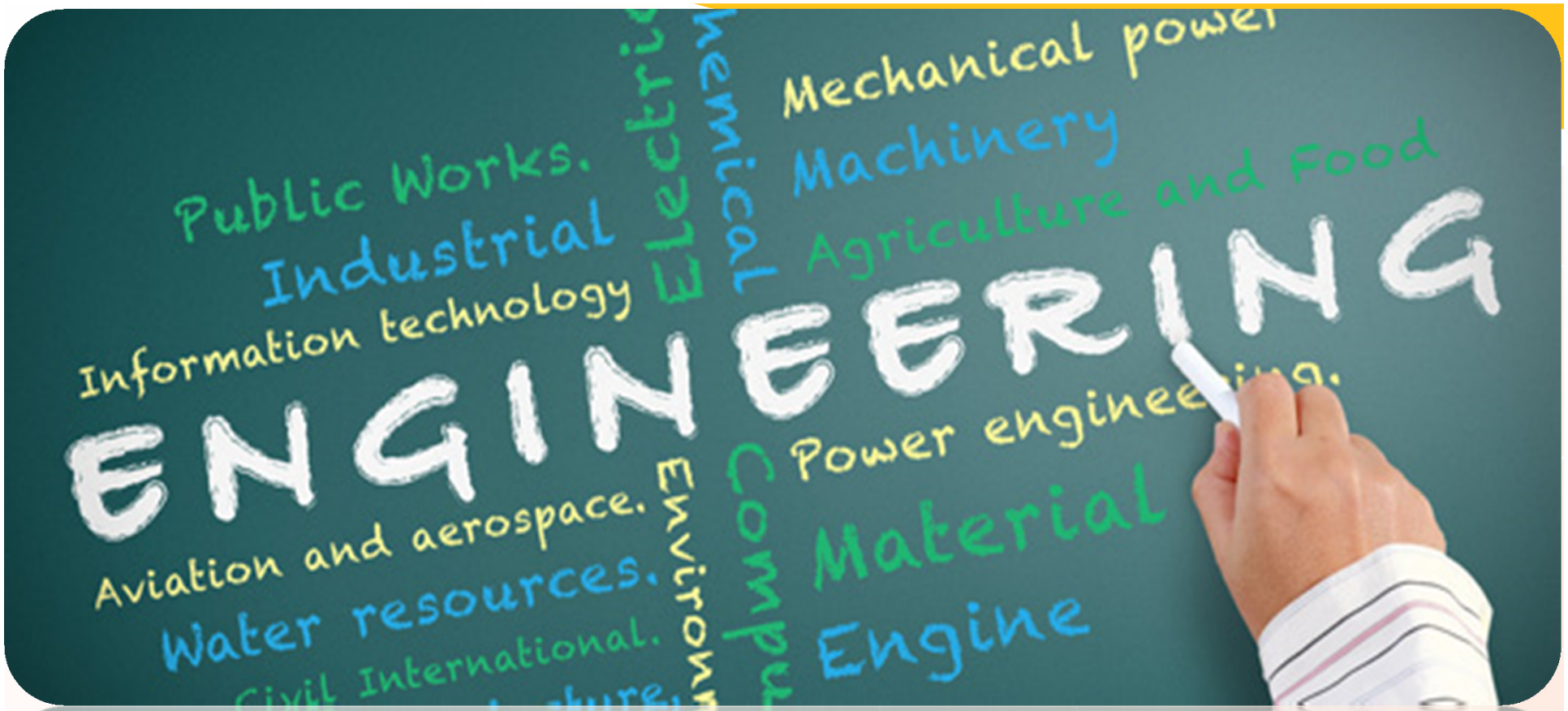
| | Not so important | Nice to have | Important | Very important |
|---|---|---|---|---|
| Flexibility and Adaptability | - | 13% | 43,5% | 43,5% |
| Initiative and Self-Direction | 2,1% | 6,4% | 57,4% | 34,1% |
| Social and Cross-Cultural Skills | - | 6,8% | 59,1% | 34,1% |
| Productivity and Accountability | - | 4,3% | 52,2% | 43,5% |
| Leadership and Responsibility | 6,7% | 6,7% | 46,6% | 40% |
| Enthusiasm | 4,3% | 23,9% | 34,8% | 37% |
| Ethics | 2,2% | 6,7% | 64,4% | 26,7% |

## If you were recruiting for your company which of the following Soft / Transversal Skills are important regarding your most common vacancies?

" Massive On Line Open Courses "
N=47

### Interdisciplinary

| | Not so important | Nice to have | Important | Very important |
|---|---|---|---|---|
| Global awareness | 15,2% | 45,7% | 37% | 2,1% |
| Financial, Economic, Business and Entrepreneurial Literacy | 13% | 63% | 19,6% | 4,3% |
| Civic Literacy | 34,1% | 50% | 15,9% | - |
| Health Literacy | 37,2% | 32,6% | 27,9% | 2,3% |
| Environmental Literacy | 31% | 28,6% | 38% | 2,4% |
| Language Skills | 4,3% | 4,3% | 37% | 54,4% |
| Research Experience | 8,9% | 44,4% | 35,6% | 11,1% |
| Scientific Writing | 17,8% | 53,3% | 22,2% | 6,7% |
| Hands on know-how | 6,4% | 12,8% | 51% | 29,8% |




# Technical / Professional Skills

## If you were recruited for your company which of the following Technical / Professional Skills are important for your most common vacancies?

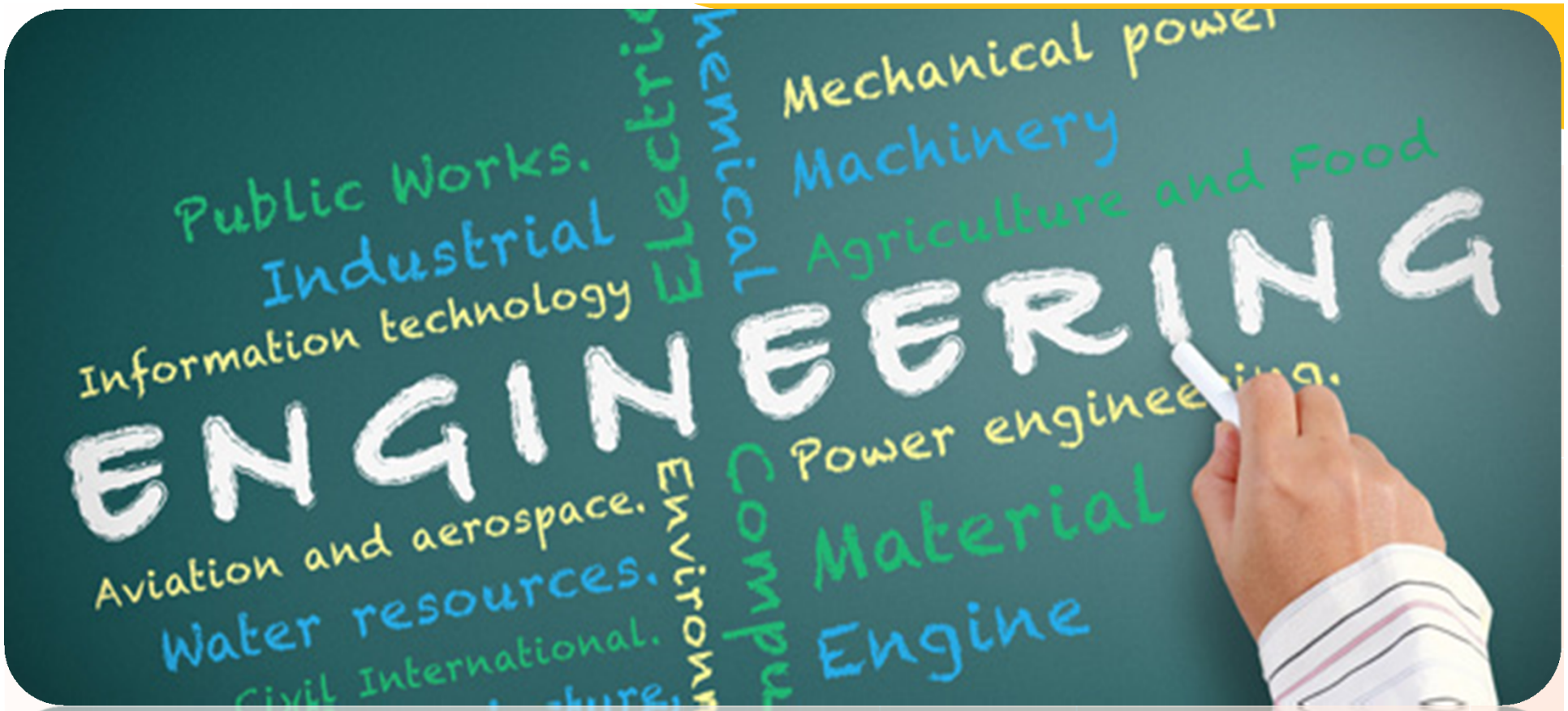
" Massive On Line Open Courses "
N=47

| | Not so important | Nice to have | Important | Very important |
|---|---|---|---|---|
| Digital Electronics | 6,4% | 23,4% | 27,6% | 42,6% |
| Analog Electronics | 8,7% | 23,9% | 32,6% | 34,8% |
| Telecommunications | 4,3% | 2,2% | 32,6% | 60,9% |
| Automations | 4,3% | 36,2% | 25,5% | 34% |
| Power Electronics | 13% | 41,3% | 21,7% | 23,9% |
| Optoelectronics | 22,2% | 42,2% | 24,4% | 11,2% |
| Circuit Analysis | 15,2% | 37% | 34,8% | 13% |

## When your company recruits which academic qualifications are required for the following?

" Massive On Line Open Courses "
N=47

| | GSCE | A – Level | TECHNICAL EDUCATION | UNIVERSITY DIPLOMA | PhD |
|---|---|---|---|---|---|
| Digital Electronics | - | 8,9% | 66,7% | 22,2% | 2,2% |
| Analog Electronics | - | 11,6% | 69,8% | 16,3% | 2,3% |
| Telecommunications | - | 4,5% | 75% | 18,2% | 2,3% |
| Automations | - | 6,8% | 72,7% | 18,2% | 2,3% |
| Power Electronics | 4,5% | 11,4% | 65,9% | 15,9% | 2,3% |
| Optoelectronics | 2,4% | 14,3% | 59,5% | 19% | 4,8% |
| Circuit Analysis | 2,4% | 16,7% | 57,1% | 21,4% | 2,4% |




# Company employees

## Regarding the employees of your company how satisfied are you with their existing Technical/Professional Skills and knowledge in the following fields?

" Massive On Line Open Courses "
N=47

| | Not satisfied at all | Not very satisfied | Quite satisfied | Very satisfied |
|---|---|---|---|---|
| Digital Electronics | 2,6% | 23,1% | 56,4% | 17,9% |
| Analog Electronics | - | 22,5% | 55% | 22,5% |
| Telecommunications | - | 19,5% | 51,2% | 29,3% |
| Automations | 2,6% | 33,3% | 48,7% | 15,4% |
| Power Electronics | 2,5% | 37,5% | 45% | 15% |
| Optoelectronics | 10% | 32,5% | 37,5% | 20% |
| Circuit Analysis | 7,3% | 31,7% | 39% | 22% |

## Regarding your employees in general, how satisfied are you regarding their Soft/Transversal Skills and knowledge in the following fields?

" Massive On Line Open Courses "
N=47

### Learning and Innovation Skills

| | Not satisfied at all | Not very satisfied | Quite satisfied | Very satisfied |
|---|---|---|---|---|
| Creativity and Innovation | - | 13,3% | 60% | 26,7% |
| Critical Thinking and Problem Solving | - | 15,6% | 51,1% | 33,3% |
| Communication and Collaboration | - | 4,4% | 53,3% | 42,2% |
| Networking | - | 6,8% | 70,5% | 22,7% |
| Self Management / Time Management | 2,2% | 6,7% | 66,7% | 24,4% |

## Regarding your employees in general, how satisfied are you regarding their Soft/Transversal Skills and knowledge in the following fields?

" Massive On Line Open Courses "
N=47

### Information, Media and Technology Skills

| | Not satisfied at all | Not very satisfied | Quite satisfied | Very satisfied |
|---|---|---|---|---|
| Information Literacy | - | 4,4% | 51,1% | 44,5% |
| Media Literacy | - | 4,4% | 57,8% | 37,8% |
| ICT (Information, Communication and Technology) Literacy | - | 8,9% | 60% | 31,1% |

## Regarding your employees in general, how satisfied are you regarding their Soft/Transversal Skills and knowledge in the following fields?

" Massive On Line Open Courses "
N=47

### Life and Career Skills

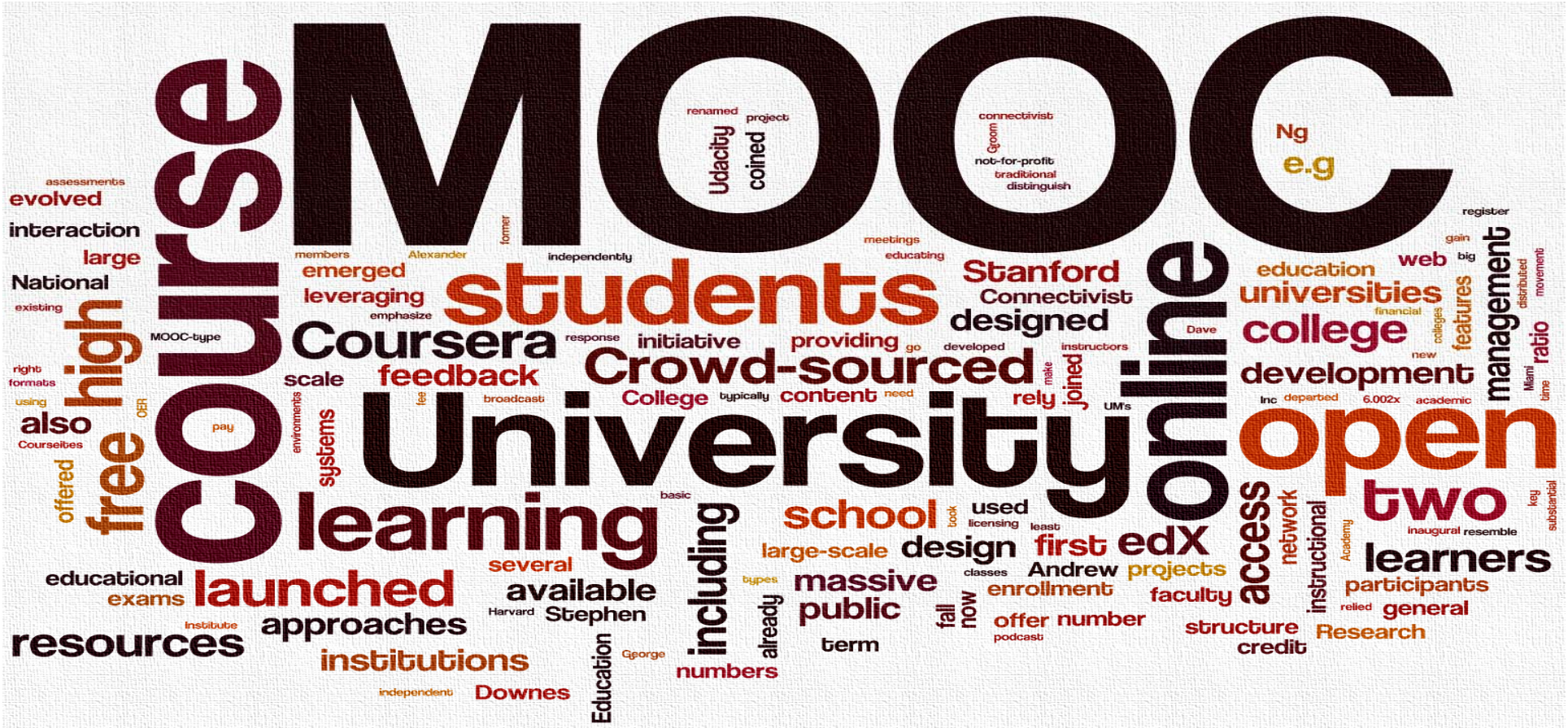
| | Not satisfied at all | Not very satisfied | Quite satisfied | Very satisfied |
|---|---|---|---|---|
| Flexibility and Adaptability | - | 11,1% | 57,8% | 31,1% |
| Initiative and Self-Direction | - | 15,9% | 61,4% | 22,7% |
| Social and Cross-Cultural Skills | 2,3% | 9,1% | 77,3% | 11,4% |
| Productivity and Accountability | - | 6,8% | 70,5% | 22,7% |
| Leadership and Responsibility | 2,3% | 9,1% | 68,2% | 20,5% |
| Enthusiasm | 2,3% | 15,9% | 59,1% | 22,7% |
| Ethics | 2,3% | 11,4% | 65,9% | 20,4% |

## Regarding your employees in general, how satisfied are you regarding their Soft/Transversal Skills and knowledge in the following fields?

### " Massive On Line Open Courses "
### N=47

Interdisciplinary

| | Not s... at all | ...y satisfied | Quite satisfied | Very satisfied |
|---|---|---|---|---|
| Global awareness | 17,1% | 39% | 43,9% | - |
| Financial, Economic, Business and Entrepreneurial Literacy | 15% | 52,5% | 32,5% | - |
| Civic Literacy | 20,6% | 35,3% | 44,1% | - |
| Health Literacy | 8,6% | 28,6% | 54,2% | 8,6% |
| Environmental Literacy | 5,6% | 36,1% | 50% | 8,3% |
| Language Skills | 4,8% | 9,4% | 54,8% | 31% |
| Research Experience | 12,5% | 47,5% | 30% | 10% |
| Scientific Writing | 25% | 45% | 22,5% | 7,5% |
| Hands on know-how | 2,4% | 19% | 54,8% | 23,8% |




# MOOCs & AmIES 2015

SENTIMENT ANALYSIS

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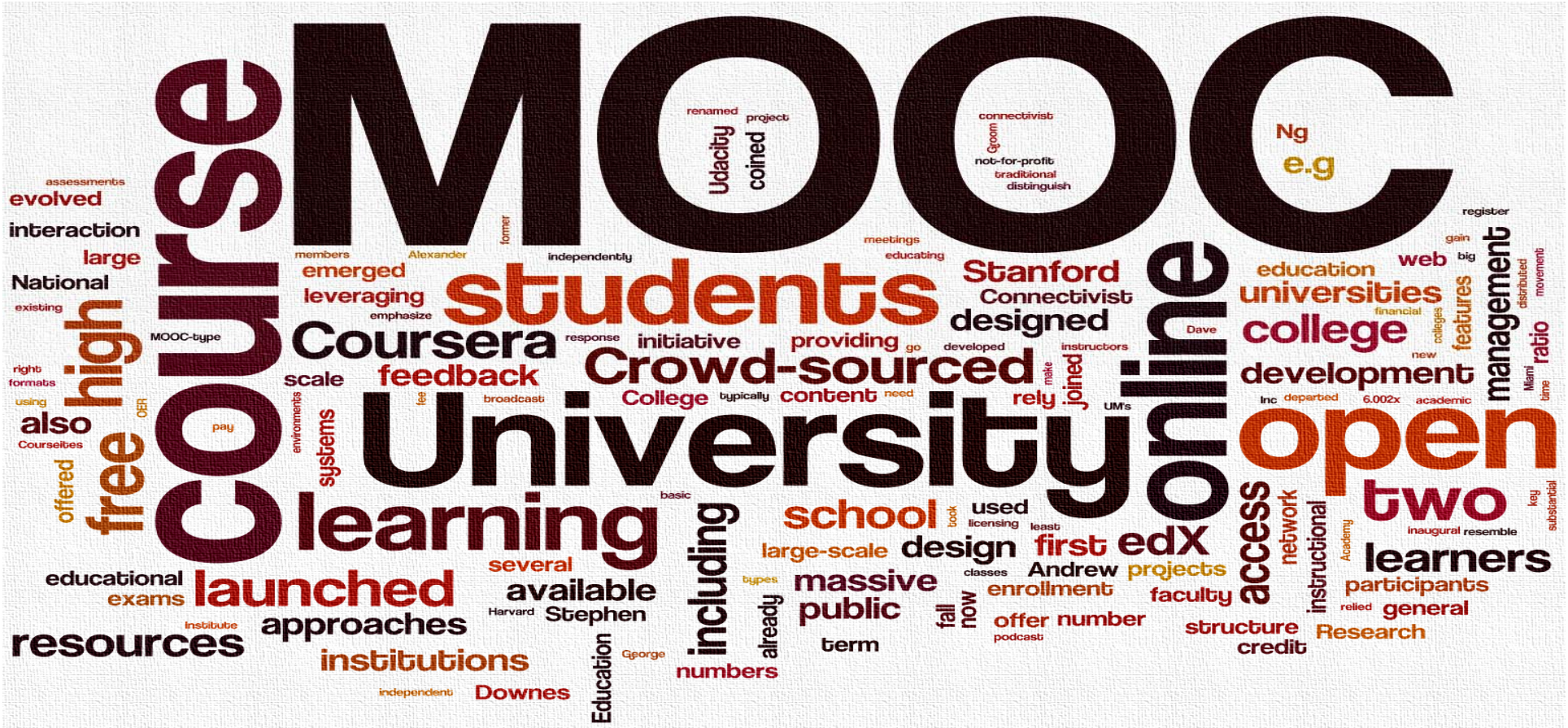
# MOOCs and AMiES 2015

- ***MOOCs in Ambient Intelligence*** *(few examples)*
  - *Ambient Intelligence by MITOPENCOURSEWARE (Link)*
  - *Artificial Intelligence for Robotics (operated by Udacity – link)*
  - *Artificial Intelligence (operated by edX – link)*
  - *Machine Learning (operated by Coursera – link)*
  - *Neural Networks for Machine Learning (operated by Coursera – link)*
  - *Introduction of OptoBotics; series of courses that lead to a specialization (operated by Coursera – link)*
  - *ICT in Primary Education (operated by Coursera – link)*

- ***MOOCs in Embedded Systems*** *(few examples)*

***Embedded Systems Course On List of 10 Most Popular MOOCs***

- *Embedded Systems in edX – link*
- *The Harware/Sofware Interface by Coursera – link*
- *Mechatronics by saylor.org - link*




## Future Actions

SENTIMENT ANALYSIS

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# Future Actions

- **Identify** the missing skills from our graduates according to the LLMN in local, national and European level in the following sectors: Engineering, Tourism & Leisure, Health Sciences and Business & Management in European Level
- **Identify** the missing skills according to the Work Seekers in national & European Level
- **Identifying the HEI policy towards MOOCs**
- **Identify the gap between the WS and LLMN**
- Method: Personal Interviews & on line Questionnaires
- Develop MOOCs that cultivate the identified missing skills
- **Launching four MOOC cafes** according to the above surveys results

*Thank you for your attention*

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