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## 1 Introduction

This deliverable **“D4.3 Implementation of internships and co-supervised theses in industry”** reports the results of the activities carried out in:

WP4 Training and internship implementation (work package leader: UB), T4.4 Implement framework for support of student internships in companies (task leader: ENT).

The rest of the document describes development of the frameworks for both internships and co-supervised theses in industry, followed by description of project results regarding implementation of stated frameworks and conclusion.

## 2 Implementation of the framework for internships and co-supervised theses in industry

One of the Project objectives is to enable internships for many students who want to experience the work in an industry environment but are currently not provided with opportunities to do so. As the authors of [1] state – “all students deserve opportunity to gain an understanding of world of work, learn skills that can be transferred between jobs and industries, apply their school knowledge in the real world, test out a career to see it is right for them, and build their self-belief so that they can achieve success in this changing world of work.” [1]

An internship is a valuable tool for preparing students for the real life, from the view of education institution, and testing real working life approach to better choose potential further career and employer. The other partner in the process of internship realisation is the industrial side that sees great opportunity to present themselves to the young people, potential future employees, and build interest for their working environment while also testing potential candidate for future cooperation. To establish a successful internship, it is crucial to define the right environment in which each party will fully understand its own role, properly create the right expectations so that all parties involved in an internship will be satisfied in the end. The most important part in achieving such results will be continuous process of executing such activities, not a sporadic success.

The successful internship can also result in other kind of relationship with an industry such as a topic for student final thesis. Another option for students are company announcements about topics of interest and application for one topic to have co-supervised thesis in the industry. Working on the student thesis is demanding process for all parties involved and requires very good preparation and tracking process to enable final success and acceptance of provided result for everyone involved in the process.

For the internship and co-supervised thesis, the same parties are involved (education institution, industrial partner and student) but activities, expectations, time-frame, and results are different. This is the reason why in the following text, the implementation of the internships and co-supervised thesis frameworks are described as the separate processes.

### 2.1 Framework for implementation of internships

It is recommendable to define initial points and common view when we start to implement a certain activity. This is the reason why we would provide some definitions. One of the definitions for the internship is: “A form of experimental learning that integrates knowledge and theory learned in the classroom with practical application and skills development in a professional setting. Internships give the students the opportunity to gain valuable, applied experience and to make continuous progress in professional fields they are considering as their career paths. They also give employers the

opportunity to guide and evaluate talents, and enable educational institutions to enrich their study programmes, as well as connect with the industry.”

The stated definition of internship leads us to a simple conclusion that there are three essential actors (students, industry partners, and educational institutions) that must be well connected all the time and coordinated through an appropriate process to make internship happen and in the end to fulfil all expectations and enable every involved party to be content with the results. The simplest way is to define framework that all parties should follow in creating successful internship journey. An idea of framework is to coordinate processes that each involved party should run for themselves and to make common coordinated entrance and exit points for each individual process. Students, or as we should define them later as interns, are key entities for existence and execution of framework – to start with, they must have an interest in an internship.

As mentioned in the previous definition of internship, every additional experience during the education creates an additional value in the life of the person that gains new experience. Having that in mind, there are a couple of time periods when the internship can be executed, considering the student’s obligations at the educational institutions:

- During the summer period (free from formal education obligations – out of teaching or exams time),
- During the regular teaching time but in student free time,
- During the regular teaching time as a part of study programme (student practical work as part of curricula).

It is important that every party of the internship framework is well informed about their duties before student start carrying out the internship. Another important element is establishing good quality control mechanisms, to ensure that each of the involved parties is performing activities according to the agreed and defined process. The educational institution has to provide their education programme (curricula) for the companies to ensure better matching of needs and background knowledge provided to the students. The educational institution knows their students and has to check the validity of the companies that offer a work environment for the students. Students must have an opportunity to make a quality check during the selection process, taking into account the company needs and their overall worksite conditions and payment possibilities. The quality of provided data is key for the selection and the final result.

The first part of the process must be developed at the educational institution side. There should be a formal place where students make the first contact about internships possibilities and can have relevant support in reviewing potential companies as well as continuous support for execution. The educational institution is very important for the students at that moment of their life and they have trust and expectation from institution for their support during academic life. Academic institutions can organize different forms of internship programme execution, because it can be done based on a technology support by portals and other tools that help the implementation of the process, or on old fashion way through papers. The presentation of the key steps and relevant supporting actions is listed in the following text for each of the parties involved in the internship.

- A) At the **educational institution side**, the key steps are:
- Make a formal decision about the support of student internships,
  - Define internal procedures about institutional contact for the students and formal way for internships announcement (web page, other digital or paper format ...),
  - Prepare materials with key steps for student application and activities after internship completion,
  - Define internal policy and procedure for potential ECTS points recognition based on the executed internship,

- Define the internal procedure to evaluate companies that want to be listed as candidates for student internships support through educational institution,
  - Define the internal institutional procedure to conduct and evaluate student's satisfaction questionnaire related to the executed internship,
  - Yearly meetings with local companies that provides internships to students for exchange experience and potentially improve process.
- B) The second and the most important party in the internship programme are students. It is important for student applicants to have clear view of what they want to achieve through their internship programme and in which way. The key elements for **students** are:
- Self-evaluation of interests and capabilities to find own goals/challenges for her/himself,
  - Overview of offered, or creation of new, possibilities for internships (e.g., send question to a company of interest that was not listed through already implemented internship collaborations at the educational institution),
  - Discuss and set up the internship expectations and goals with the educational institution responsible/representative,
  - Match opportunities and own goals – select couple of opportunities ranked on priority list,
  - Prepare themselves for interview in the company,
  - Define own acceptance criteria:
    - o Time-frame,
    - o Type of work,
    - o Amount of work,
    - o Payed/not-payd internship,
    - o Preconditions for work,
    - o Learning/experience outcome after internship.
  - After passing the internship interview at the company, execute internship
    - o Regular communication with company mentor and representative from the education institution (be polite and open in communication).
  - Evaluate internship (be realistic and help your colleagues at educational institution)
    - o At the company,
    - o At the education institution.
  - If requested, prepare a report about the internship.
- C) The third party that provide internship execution is **a company** and here is a short toolkit on how to prepare and execute a successful internship for the parties from industry involved in the process:
- Identify your business needs
    - o Define the purpose of student work, e.g.:
      - Lack of workforce in some project execution,
      - Special student project.
    - o Define the expected student skills,
      - Software or hardware skills,
      - Research or some specific process skills,
      - Client or customer interaction.
    - o Investigate required equipment for student work (capabilities of existing equipment to enable students planned job done),
    - o Existence/availability of required person to work with intern.
  - Develop the intern job description,
    - o Make initial specification of daily duties for intern,
    - o Depending on the expected project type (existing or new) position the intern in the project execution plan,

- Define the expected skills for intern according to project tasks execution,
- Define the expected supervisor/mentor for constant contact with intern,
- Define the interaction and means of communication with other project members,
- Define the intern performance evaluation,
- Define expected work effort per week for intern, taking into account when the internship is being executed (i.e., is the work meant to be performed in parallel with the classes or exams at the educational institution or not?)
- Define the work environment and rules that intern must fulfil to work in the company.
- Recruit the interns,
  - Define who will be responsible for intern recruiting process,
    - Career service,
    - Career fairs,
    - Social media,
    - Student organizations,
    - Education institution special portal,
    - Some other special portal.
- Selection process,
  - Match the student skills and expected project requirements,
  - Student background knowledge assessment – knowledge gained at the university – finished topics against the project requirements,
  - Student previous work experience,
    - Any type of additional activities where a student was or is active on top of regular education obligations.
  - Any listed honours or awards from student,
  - List of executed projects during study or projects related to the internship position that the applicant has been working on in spare time
  - Motivation for selection of this internship – student motivation.
- Managing interns,
  - Ensure a proper communication channel between student and company, as well as mentor and education institution mentor (if defined at the education institution),
  - Involve the student intern in all company required working standards for job execution and stay in company –provide standard newcomer introductory overview for intern, if it exists in the company, including topics such as:
    - Security policy,
    - Dress code,
    - Working time,
    - Other requirements and conditions to live and work in the company space.
  - If needed, review and adjust a job description for the intern to establish right expectations both for company and student,
  - Define the problem-solving procedure for the intern in the period of working in the company,
  - Continuously supervise process of intern progress and achievements,
  - Have a dedicated mentor that can serve as teacher, supporter and evaluator to the intern, and to give the intern safe and proper working experience feeling.
- Evaluate performance,
  - Make an initial check-in evaluation with intern to be possible to track progress,
  - Regular discussion or evaluation of intern's opinion to track the progress and take possible corrective actions (at least on weekly basis),
  - Final evaluation – collect a complete overview of intern behaviour and progress at the assigned project or job role,



- Exit interview – for an intern where the company is satisfied with intern personality, achieved results and want to make further cooperation or plan to employ intern; it is a good practice to transfer a message through personal discussion during the interview.
- Compensation policy,
  - The intern does not replace regular employees and the same level of maturity and work attitude can't be expected from the intern, but on the other hand willingness and included effort for executed work can be rewarded – a related initial and consistent policy of the company dealing with internships should be established,
  - It is a good practice to have an internal policy regarding the payment of the intern work that can be consistently applied on the all internships –for similar type of the project paying internships per hour of work should be same (e.g., working on the research project is always paid based on the same hourly price, administrative jobs have another price of man-hour, i.e. a consistent price level for different job categories should be defined and applied in a consistent manner),
  - If the company policy is to not make a compensation for internships work, it must be valid for all interns in the company.
- For international students define internal procedures for student visa support,
  - Be prepared to have an available person which know the legal procedure and want to guide student with visa application.
- Prepare procedure for dismissal of intern,
  - for rare situations and under special conditions – only if some significant violation of some well-defined process is misconducted and creates very bad working situation – e.g., cause damage,
  - in such cases, high level of management should be involved and all parties in the process should be properly informed.

An initial intention of the internship framework is to create a safe and structured environment through which the intern can gain real life experience during the study. Two well established parties – worksite mentor and education institution internship coordinator - play the key roles in this process. The main expectations from them are as follows:

- a) Worksite coordinator:
  - a. provides the training the intern,
  - b. Advises him or her,
  - c. Navigates worksite culture,
  - d. Enables the interaction of the intern with other workers.
- b) Education institution coordinator
  - a. provides a support to build the relationship between the worksite mentor and student,
  - b. supports the student to learn the expectations related to the internship,
  - c. supports the student to implement successful work habit.

A successful execution of the internship provides benefits for all of the involved parties. Some of the benefits for each involved party are listed in the following text:

- a) Benefits for the student:
  - a. Experiences the real world of working environment,
  - b. Gains the awareness of career and career paths,
  - c. has the opportunity to work on real-life projects,
  - d. Achieves measurable goals and completes activities in the professional industrial environment,
  - e. Learns and practices the skills and behaviour expected in today's workplace,

- f. Gets the feedback from teachers and industrial partner,
- g. Builds a self-confidence.
- b) Benefits for the education institution
  - a. Provides additional skills practice during education,
  - b. Tests the validity of curricula for the future student employment,
  - c. Builds relationships with the companies for potential future collaborations.
- c) Benefits for the company
  - a. Opportunity to extend an interview process and evaluate intern's skills, work ethics and assimilation into the company culture before incurring the expense of bringing them as full-time employee,
  - b. Opportunity to execute some pending ideas or relax some of existing employees,
  - c. Opportunity to learn potential of future newcomers – relevant planning.

This basic framework can be well supported by the tools developed within the BENEFIT project through portals and visible curricula that can play a great role in a complete support of internship process in the region. The results of the BENEFIT project that enable support for publication of the curricula for each education institution and continuous updates, and list of companies with their interests can serve as matching platform for students and companies.

## 2.2 Framework for implementation process of co-supervised theses in the industry

The thesis work is very important for both the education institution and for the student. It is an essential part of the curricula and have many parts well defined, such as: expected time for preparing, expected pre-conditions, expected work to be done, expected way of presenting achieved results, mentor, validation procedure, intellectual property rights, way of defence, publicity and many other more formal or institution-dependent elements. Every high education institution has well-defined rules for student thesis process from selection to archiving. If someone wants be a part of the process, that party must be very formally included in the process steps to fulfil required time-frame, final quality, and potential legal issues check regarding intellectual property rights.

Key steps for establishing this process are:

- According to the education institution regulation, provides the announcement about thesis time selection
- List of educational institution available mentors
- List of topics agreed with industrial partner
  - o Provides a confirmation in the industrial partner about:
    - Topic – or problems that will be included in the thesis topic,
    - Way of working with the student,
    - Industrial mentor for period of thesis work,
    - Available equipment, if needed,
    - Agreement about IPR with industrial partner,
    - Agreement of public presentation of result,
    - Working environment for student (workplace, equipment).

The best practice experience is that everything between education institution mentor and industrial mentor is agreed prior to announcement of possibility to work on co-supervised topic – all formal elements should be solved and agreed between the two institutions. If the topic is part of previously agreed or ongoing common research project (between education institution and company),

everything is much easier because formal elements already exist. If the student decides to continue some of interesting topic from the previous internship, it is her or his obligation to establish the communication with the education institution mentor on time and convince potential mentor to accept communication with the industrial partner and reach the common conclusion about the thesis topic and way of working.

The established portal in the project BENEFIT can be very good platform to serve as a meeting point with provided information and enable international (regional) announcements about possibilities to joint interest and execution of co-supervised theses.

### 3 Results of framework implementation

The framework for the implementation of internships and co-supervised thesis in the industry was developed, integrating the results from WP2 and WP4. The framework is based on the platforms that enable distribution of information about internships and possibilities for working on co-supervised thesis in industry. The information about companies participating in providing such opportunities, and information about open internship and co-supervised thesis positions can be accessed via Industry web catalogue (<https://www.project-benefit.eu/eplatform/?catalogue#4>) and Industry information portal (<https://www.project-benefit.eu/eplatform/?portal>). In addition to the described part of the framework dealing with the distribution of information, another part of the framework is based on legal aspects of the internships and co-supervised thesis implementation which is realized through agreements and memorandum of understanding specifying the collaboration between companies and universities.

So far, Ericsson Nikola Tesla (ENT) has used the implemented framework for attracting 13 students from BENEFIT academic partners to participate in ENT Summer Camp 2019, which provided an opportunity for students to have an internship within the Ericsson Nikola Tesla company. Additionally, in 2019, 14 students participated in Cisco Summer School 2019 held in Belgrade. The internship opportunities provided by ENT and Cisco were planned in the same scope for the year 2020, and the addition of new companies providing internship and co-supervised thesis opportunities is expected. However, the Covid-19 pandemic caused the cancellation of certain activities that required traveling (such as Ericsson Summer Camp 2020 and Cisco Summer School 2020). As a consequence, Cisco Online Winter School 2021 was organized as a fully online event in February 2021. The number of registered participants at the Cisco Online Winter School 2021 was 86 students and by the time of generating these report 29 of them successfully finished all activities. In total, by the end of the project, there were 59 internships and 26 co-supervised theses realized (16 bachelor theses and 10 master theses).

#### 3.1 Ericsson Nikola Tesla Summer Camp 2019 – July and August 2019, Zagreb

Ericsson Nikola Tesla Summer Camp 2019, organized by the Ericsson Nikola Tesla (ENT), was held in Zagreb during five weeks of the academic summer break (July 15<sup>th</sup> – July 26<sup>th</sup> and August 19<sup>th</sup> – September 6<sup>th</sup>, 2019). The main goal of the Summer Camp workshop was for students to work on projects in teams, by solving real industrial problems in an industrial environment. With the help of 26 mentors, they worked on 18 projects in areas such as Internet of Things, machine learning, and radio networks. Thirteen participants of ENT Summer Camp 2019 were included via BENEFIT project, from six partner universities (2 students from UB, 2 students from UNS, 2 students from UNI, 2 students from UBL, 2 students from UNTZ and 3 students from UNSA).



Figure 1 – Ericsson Nikola Tesla Summer Camp 2019

### 3.2 Cisco Summer School 2019 – September 2019, Belgrade

Cisco Summer School 2019, organized by the Cisco Srbija and Cisco Networking Academy, School of Electrical Engineering, University of Belgrade, was held in Belgrade during two weeks (September 9<sup>th</sup> – September 20<sup>th</sup>, 2019). The main topic of the Summer School was “Internet of Things” and it was consisted of Cisco Networking Academy course “IoT Fundamentals: Connecting Things” and technical sessions on “Cisco IoT solutions”, “Security in IoT”, “Cisco solution for LoRaWAN” and “Cisco collaboration tools”. Students worked on practical labs and projects at the Laboratory of the Cisco Networking Academy. The total number of participants at the Cisco Summer School 2019 was 14 students from the five universities that participate in the project BENEFIT (2 students from UBL, 2 students from UNTZ, 2 students from UNI, 1 student from UNS and 7 students from UB).



Figure 2 – Cisco Summer School 2019

### 3.3 Cisco Online Winter School 2021 – February 2021, Belgrade

Cisco Online Winter School 2021, organized by the Cisco Srbija and Cisco Networking Academy, School of Electrical Engineering, University of Belgrade, was held online in Belgrade during two weeks (February 3<sup>rd</sup> – February 14<sup>th</sup>, 2021). The main topic of the Summer School was “Data and Analytics” which consisted of Cisco Networking Academy course “IoT Fundamentals: Big data and Analytics” and technical sessions on “Data processing in Webex”, “Key Trends in Cybersecurity” and “Cisco DNA Center Assurance, using AI and ML for better network performance and stability”. The practical part developed by Cisco Networking Academy were available for students to download and students worked on labs and project using their own personal computers. The total number of registered participants at the Cisco Online Winter School 2021 was 86 students from the six universities that participate in the project BENEFIT (UBL, UNTZ, UNSA, UNI, UNS, UB), by the time of generating these report 29 of them successfully finished all activities.



Figure 3 – Cisco Online Winter School 2021

## 4 Conclusion

This document describes the framework for the implementation of internships and co-supervised theses in industry. It also offers a description of project results regarding the implementation of stated frameworks. As stated in the previous chapter, there were 59 internships and 26 co-supervised theses realized (16 bachelor theses and 10 master theses), compared to the planned project target aiming at 12 co-supervised theses and 48 students included into internships. As it can be seen, the planned targets were achieved despite the significant negative impact of the Covid-19 pandemic and the cancellation of certain activities that required traveling.

## 5 References

- [1] Joan E. McLachlon, Patricia F. Hess: Internships for Today's World; A Practical Guide for High Schools and Community Colleges, Rowan&Littlefeld 2014, ISBN 978-1-4758-0601-4