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1 Introduction

This document clarifies the exploitation activities as a part of the *ENGINE* model way of learning in the Blue Industry companies. The model is a company needs based. The purpose of the model is to serve the growing needs for qualified and skilled work force in the industry. There is a growing need for qualified engineers as a productive worker on the field yet studying takes time and internships are fairly short. As a part of Blue Industry education development, RADICAL project has provided a way of learning combined with theoretical studies at the higher education institutions and an increased workplace placed learning in the industry. Through the *ENGINE* (ENgineering Innopeda® Education) model developed in the RADICAL project the companies are deploying a student who is engaged in the company for the degree study period. Companies benefit from long-term development and an engaged student and students benefit from hands on learning and real life experience with complex problem solving. Students gain accurate working life knowledge and companies gain able and suitable work force quicker than in a traditional way of learning. Partner companies have good experiences on the *ENGINE* model. One partner company used the education possibility offered through the *ENGINE* model to educate existing staff for more responsible positions. So far, more companies are interested in learning more about the model and possibly participating in the future.

2 Changes in the Society

2.1 Growing demand for qualified work force

As the world is changing, the education needs to adjust to match the demands of the changing work environment and growing organisations. Mr. Joonas Mikkilä from Suomen Yrittäjät, Federation of Finnish Enterprises, displayed clear suggestions for the education to change. Joonas Mikkilä spoke in the Regional Networking Seminar of RADICAL-project organised in Turku 29th of May and clarified that 58% of the small and entrepreneurs are stating that availability of qualified workers restricts the growth. Mr. Mikkilä continues that 14% of the companies who answered the small and medium size entrepreneur's economic barometer in 2019, stated, that the availability of skilled labour is a major barrier to growth.[1]

A year before, the economic barometer (1/2018) stated that every fifth company of small and medium sized entrepreneurs work in cooperation with higher education institutes. This often means short projects, bachelor level thesis as well as internships. One important part of co-operation in Finland is a continuing education for working life adults. According to survey by Ministry of Economic Affairs and Employment of Finland, those companies that cooperate with higher education are often more growth oriented, more international and they are more optimistic about the economic trends [2].

Mr. Mikkilä expresses that the need for qualified workers in a changing environment of qualifications challenges the education system. Education system is often too slow to meet the changing needs of work environment. For example, Meyer Turku expects cruise passengers to grow with 40 million passenger in the next 20 years. This means a growing number of experts are needed in various areas of building ships to the raising number of passengers and required tonnage of ships. A quick employment of qualified students can be helped through the *ENGINE* model type of education.

A combination of work life practice and education in the higher education institute provides a reckoned learning model to overcome the natural boundaries set through experiential learning [3]. Executive Director of Continuing Education Center Palmenia, University of Helsinki Antti Kauppi [3] states that, a development of solutions from complex problems and new working practices cannot take place through experiential learning. Such learning requires an aware cogitation on problem situations and account of structural settlement options as well as in depth knowledge of the relevant environment [3]. The *ENGINE* model offers a solution to gain this required in depth knowledge of the working environment. Higher education qualification requires an extensive and broad knowledge base in order for the Industry to benefit from graduates [3]. This means a balance is necessary between the theoretical studies and learning at work place. Such balance is sought to benefit the industry and students in the *ENGINE* model way of learning and working.

2.2 Growth of the demand for workers in the maritime sector

The European maritime technology industry is crucial for the economy and employment in Finland where around 30,000 people were employed and 8 billion Euros' annual turnover was generated in 2014 [4], which is about 3.5% of Finland's GDP [5]. The maritime industry in Southwest Finland is growing rapidly and large companies are outsourcing production to many related fields. Many outsourced companies are small or even micro size companies and are facing a rapid demand for growth. The same phenomenon is descriptive for the whole Blue Industry in Southwest Finland. The growth of the European maritime industry has led to growth of the sector in Southwest Finland.

Ministry of Economic Affairs and Employment of Finland list trends in Maritime industry in Finnish Maritime Cluster Report (2016). The report names trends such as circular economy as a rising practice, and applications of new energy sources, sustainable business models, usage of marine resources, international regulation changes, digitalization and automation [6].

Higher education institutions cover topics named in the report. Graduate students are familiar with prevailing mega trends and can identify new trends in business. Yet, students often lack the ability to apply the knowledge readily in practice. Internships are short and school projects even shorter. Mr. Mikkilä encouraged education establishments to look into the ways of educating so that it better serves the needs of the growing maritime sector. Maritime sector needs qualified, educated workers quickly, yet education is often long and it takes time before the graduate engineer is fully functioning productive worker at the industry. Mr. Mikkilä challenged the education to look into ways, which serve the needs of the industries more effectively. Continuous learning, including updating the skills of those in work, must be a requirement for education as way forward, states Mr. Joonas Mikkilä when speaking in Turku in May 2019.

2.3 Demands in the Blue Industry

A larger local Blue Industry company is Meyer Turku. German based Meyer Werft owns Meyer Turku. Meyer Turku expects a growth of cruise passengers to grow with 40 million passenger in the next 20 years. Expected growth can be seen also in the built ships becoming larger and larger, which raises the demand for qualified workers in the building process. Meyer Turku estimates the growing tonnage of built ships to grow from the present 100 000 tonnage into 400 000 tonnage in 2030. That equals two large cruise vessels in production per year. (Meyer presentation 2019.)

The demand of such large producer of vessels grows the demand for higher capacity and efficiency of production in the related companies as well. Subcontractors in the chain are facing the same demand for growing need of capacity and efficiency. Quality of the work needs to be high and processes fluent and timely right.

3 Learning

3.1 Partner companies in the first phase of the project

In the beginning of the RADICAL project, 14 selected potential partner companies were interviewed to clarify the company needs and to make a curriculum plan of the possibilities for an ENGINE –model. From the interviewed companies, 35,7 % were micro and small sized companies, employing up to 50 persons, 21,4 % were medium sized companies, employing between 51 and 200 employees and 42,9 % were large sized companies, employing over 200 employees. The results of the interview gave a base for a curriculum development, which allows Blue Industry Companies that were as partners in the RADICAL project in the first actual try-out phase.

The companies were chosen from interested local actors. Meyer Turku and Carinafour from Kaarina municipality, Finland started as partners in the Radical project to test the *ENGINE* model in practice. Important criteria were to be able to mentor a student throughout the program and to provide challenging tasks in relation to the education and curriculum learning objectives. Meyer Turku was interested in taking up to 20 *ENGINE* students. Twenty students would have been the maximum amount of students possible to start in the *ENGINE*-model in the testing phase. And to be able to test the model more accurately a variety of workplaces was sought for. Carinafour was interested in providing further education to one of their workers in the *ENGINE* model. This gave an interesting set up of testing with two differing approaches.

3.2 Exploitation at Meyer Turku

Two students started their second year of engineering studies working at Meyer Turku alongside of the studies.

Logistics Process Engineer Mr. Aleksi Ruuhela evaluated the learning phase of two students at Meyer Turku during March – May 2019. Mr. Ruuhela worked as a mentor for the students. Two students were second year students of Bachelor of Engineering in Industrial Engineering and Management degree program. Meyer Turku interviewed potential students for the *ENGINE* -model in the beginning of February and two chosen students commenced work at Meyer Turku at the end of February. An agreed development work commenced beginning of March.

The development project at Meyer Turku was to study the storage processes and its timely flow. The objective was to solve a problem of lacking parts, to identify the core problem of lacking items and to quantify the problem. Storage workers started collecting data of lacking items and the students summarized the data into a developed reporting tool. The result gave an analysis of two major reasons for the lacking of items in the storage. Final report suggested corrections into the processes.

Mr. Ruuhela opened up the work as mentor by listing the tasks. As a mentor, he signed the contracts with the students and trained them into the job and work environment. Mr. Ruuhela held a 5 to 30 minute morning meeting every morning. Reports were directed to him as he was in charge of the project. Mr. Ruuhela reported that as a mentor the challenges are the restricted time available, orientation of the students in a short time for the project and the daily guidance time needed. Mr. Ruuhela found that students could be given

research projects, various measuring projects and situation analysis. As a mentor the combination of limited time and defining a project scope of a project for students are issues that need solving. Students need to familiarize themselves with the subject and relevant work environment regarding the project. Time limitation sets demand and challenges students especially in their first projects. Working environment is complex and lacking tacit knowledge restricts the ability of the students to execute their projects. Yet looking at processes as an outsider, may give an opportunity to make decisions in a more straightforward manner.

3.3 Exploitation at Carinafour

Mr. Pekka Lahtinen from Carinafour has been working with the company for six years. He started engineer studies in the industrial engineering program at Turku University of Applied Sciences. Mr. Lahtinen is one of the students testing the *ENGINE* model. The model made it possible for him to gain qualification while working as a productive worker in the familiar company. Carinafour is a company developing and operating modern production systems and supply chain processes. Carinafour employs some 50 workers and has an annual turnover of 8 Million Euros [7].

During the pilot, Mr. Lahtinen worked at Carinafour two to three times a week and rest of the week he studied at Turku University of Applied Sciences, learning theoretical approach to engineering. Mr. Lahtinen comments that working in a familiar environment makes it easy to take up new challenges as a student. Mr. Lahtinen finds it rewarding, that during working days he is able to apply the newly acquired knowledge from theoretical lessons at work place. Mr. Lahtinen finds it challenging to combine studies and work as working life takes you with it so completely. As one of his tasks as a student at Carinafour Mr. Lahtinen did an activity mapping during the spring 2019. During the summer months, there are no theoretical lessons. What has been learned is applied at work and Mr. Lahtinen worked as a work planner.

Chair of the board at Carinafour Mr. Ari Viitanen was very pleased of an opportunity of a worker to qualify for more demanding tasks within the company. Mr. Viitanen stated that the *ENGINE* model is an excellent tool in lowering the co-operation threshold between enterprises and institutes of higher education. In his opinion, in order to make the most of it, the student in the *ENGINE* model studies needs properly challenging tasks, which again requires support for the student to manage the task and learn, by solving the problems in the work environment. Mr. Viitala also appreciates the fact that the entrepreneur, involved in the *ENGINE* model, is able to influence the content of education and training and so help the education to develop and stay accurate for entrepreneurs needs. He continues that through the *ENGINE* type of learning, a gap that might otherwise exist between education and skills necessary in the profession, is not present in this model.

4 General Exploitation

Several dissemination occasions helped in distributing the knowledge of the developed method of higher education. Such model of a combination of higher education and work life practice to an extent as in the *ENGINE* model, is not common in Finland. Many companies in Blue Industry Sector, as well as several other companies, have developed an interest into the model as part of their acquisition of skilled labor. This interest was raised through various activities.

Several Fairs were targeted with RADICAL presence. *Meriverkostot 2018* and *Meriverkostot 2019* are Maritime industry networking fair for subcontractors in the Maritime sector. Companies in Maritime Industry were targeted in *Navigate Fair* in 2018. Recruiting fairs *Rekry Expo* on spring and autumn in 2018 as well as *Lieto Rekry 2019* were targeted as maritime sector recruiting fairs for companies in Southwest Finland and for the unemployed and students looking for new education and work possibilities. Also, general interest of companies was gained at the fairs. *Meet Your Future* in October 2019 was an event where all interested future partners were able to meet.

Three Radical Newsletters were sent to the companies and people, who had given the permission for sending in the events. To reach more international stakeholders, the consortium members agreed on posting the newsletter by using their own social media accounts in LinkedIn and Xing.

Staff of Turku University of Applied Sciences have personally contacted over 20 companies and many of them have been interested in the model. An additional 16 students, who already have an on the job training place in their existing workplaces, applied and commenced the first year of engineering studies at Turku University of Applied Sciences. These students were attracted mainly through the possibility to qualify and work at the same time. This shows the growth of interest in on-the job-training and higher education combination to develop existing staff into more demanding positions.

5 Conclusion

The *ENGINE* model has shown that the companies benefit from the students work placement as students work at the company more than usually during their engineering studies. Companies are able to challenge the students to grow their expertise and benefit from the students growing as part of the organisation as skilled and integrated work force. Experiences as a mentor are limited time available for orientation and guidance. Coming up with defined project scopes suitable and challenging enough for the students to manage and learn is the work of a mentor at the company. Mr. Ruuhela from Meyer Turku advises to give students various measuring tasks, research projects and situation analysis type of projects. It is necessary to train the students to the job environment and to define the project scope. Daily morning meetings were a good practise to follow and guide students in their projects. An easier task for a student was to work at a familiar place while gaining a formal education at the higher education institute. Students benefit from challenging, yet manageable tasks. Students claim, that working life takes you easily with it and studies might take a second place. Yet all participants realize the importance of theoretical studies as part of the career.

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