INTRODUCTION

The foundation Stichting Study Tour Industria (SSTI) annually organizes the International Research Project. The International Research Project consists of two parts: the research projects and the study tour. The research projects will be conducted prior to the study tour and are based on a predetermined theme. After finishing these projects, the study tour takes place. The study tour is organized around the same predetermined theme. During the tour, companies and universities in the country of destination will be visited.

The International Research project is an initiative of students of the department of Industrial Engineering & Innovation Sciences at Eindhoven University of Technology. Students of the Master programs ‘Operations Management and Logistics’, ‘Innovation Management’, ‘Business Information Systems’, and ‘Manufacturing Systems Engineering’ are allowed to participate. The participants will conduct the research projects mentioned above. For the participants, the International Research Project is a great opportunity to apply their academic knowledge within an international business setting. Furthermore, IRP provides students the opportunity to gain in-depth knowledge about a subject of research that suits their interests and education.

The International Research Project 2018 will visit Dubai, Shanghai and South Korea. The theme of the International Research Project is “New Work Future: A Technology Driven Revolution.”

This brochure provides information for companies that are interested in the International Research Project. After a word written by the Rector Magnificus, this brochure provides more information regarding the theme and countries. Then, participation options are elaborated. Finally, the capabilities of the students involved are described and our Board of Recommendation is presented. Contact details are listed at the end of this brochure.

This brochure aims to provide a clear overview of the set up and scope of the International Research Project. Together with all the students involved, we are looking forward to welcome your company as a participant in the International Research Project and to a pleasant and educational cooperation.

On behalf of the SSTI,

Jorg van Heesch
Coordinator Contract Research
International Research Project 2018
Immersing yourself for a couple of very intense weeks into a pressing engineering challenge, and performing your research project in an international environment in Dubai, Shanghai or South Korea. In 2018, a number of students of the Department of Industrial Engineering and Innovation Sciences will have a unique opportunity to expand their horizons in a three-week International Research Project (IRP).

The Stichting Study Tour Industria (SSTI) has developed an inspiring study tour program with the theme “New Work Future, a Technology Driven Revolution.” A very relevant topic, since the consequences of the ever-increasing speed of technological innovations to the labor market affect us all.

What will happen to the many professional taxi-, bus- or truck drivers when autonomous vehicles become the norm? How will humans perform if every second of their emotional state and physical productivity can be measured? What happens when Augmented or Virtual Reality and Hologram technology are so perfected that it completely takes away the necessity for employees to meet each other in person? Or, what will become of societies when only intelligent and highly skilled people are able to retain jobs, and the rest of humanity has to rely on welfare?

These and many more questions will be addressed by the students of Industrial Engineering and Innovation Sciences. At our Eindhoven University of Technology, we always strive to apply theoretical and technical expertise in the real world, and contribute to solving societal needs. This innovative SSTI study tour is a perfect example of how our students expand their technical, geographical and cultural horizons, and work on concrete solutions in a business environment.

I am sure that with the additional support of the government, trade and industry, the International Research Project 2018 will be a great success for all participants and interested parties.

Prof.dr.ir. F.P.T. (Frank) Baaijens
Rector Magnificus
Eindhoven University of Technology
New Work Future
A Technology Driven Revolution

Technological change has reshaped the workplace continually over the past two centuries since the Industrial Revolution, but the speed with which automation technologies are developing today, and the scale at which they could disrupt the world of work, are largely without precedent.

The fourth industrial revolution is mainly driven by the upcoming robotization and automation of machines. Technology becomes more intelligent and drives companies towards new ways to deal with employment. It may seem as if humans are simply being replaced by machines, but the only thing that changes is the role of humans in the production process. Where machines take over some roles and jobs from humans, new jobs, knowledge and skills emerge that have to be filled in in order to make this new cyber-physical system work. Humans will be more focused on the programming, calibrating and maintenance of automated processes.

McKinsey, 2017
The changing work environment has its influence on many levels, which will be illustrated as follows.

➤ **Digitalisation vs human expertise**
There is the ongoing discussion about whether it is more likely to automate processes, or to keep investing in human resources. Elements such as expertise, experience, costs and the nature of work play a huge part here.

➤ **Labour flexibility**
Another part of the new work future, is the growing trend of flexibility in many industries. Due to the expanding digital world, employees are no longer stuck to their desk at the office, but they are able to work from home. This trend is caused by the evolution of the internet, growing digitalisation and the ability of companies to innovate. The expectation is that this trend won't stagnate, due to the improvement of for example virtual reality.

➤ **Feminization & Migration**
Besides the effects illustrated above, which are mainly technology and digitalisation, there is another more cultural side path of the new work future. Slowly, but significantly, more women make their way to the top of business. Due to differences in the way men and women think and act, this 'female shift' causes significant influence on the cultural aspects within companies. This is an important and interesting trend. Besides the feminization, the participation of migrated people in the labour market also has its influence on the way businesses work and cultural aspects within a company.

➤ **Dark analytics**
Big data enables us more and more to quantify theories and complex developments. This can be used to measure human performance as well. For example, cameras can nowadays monitor perfectly how employees work, which can be quantified in order to measure the effectivity of employees.

➤ **Behavioural operations management**
There are more aspects than the ones illustrated above that has its influence on the future of work. First, there is the influence of human behaviour on operations management. The way people work influences the optimization processes in many industries. The cause of this is related to Human Performance, the results are related to optimization processes. The research that is done here shows a good collaboration between those research directions.

There is a growing need for programmers and craftsmen, while jobs like accountant can be taken over by machines more and more. The way companies deal with that is an interesting thing to investigate.
This year the International Research Project will head to the Middle East, China and South Korea. The study tour will start in Dubai. The second stop will be Shanghai and from there we go to South Korea by boat. In South Korea, we will hire a few vans to make a road trip. We will visit Seoul, Busan and Daegu. During the study tour several company visits that have a connection to the theme ‘New Work Future’ will take place. Also several universities will be visited, and a visit to the Dutch embassy in Seoul has been scheduled.

The goal of the study tour is to explore and observe how the ‘New Work Future’ evolves in these countries. Each country is chosen based on their interesting economy and culture. The cultural and economy diversity between the countries makes the trip an educative journey through different parts of the world.

Once this knowledge has been obtained, we can use it to complement the research findings of the project we conducted in the Netherlands.
PARTICIPATION

Research projects can be carried out between November 2017 and June 2018. The students will work several hours a week on the project (the exact amount of time will be agreed upon later). When the project is too large for one student, it is possible to have more students working on one project. Each student is available for 100 hours per project.

The costs for the project are € 3,000,- per student.

ADVANTAGES OF RESEARCH BY THE IRP

The top 5 reasons why your company should a research assignment for the International Research Project 2017 are as follows:

▶ 100 Hours of research conducted by master students and supervised by experienced researchers of the department of Industrial Engineering & Innovation Sciences at Eindhoven University of Technology.

▶ A research project related to the concept of New Work Future is a good opportunity to become acquainted with this challenging business topic and the accompanying options for your organization.

▶ An invitation for a masterclass about several topics related to the theme New Work Future.

▶ An invitation for the seminar where results of the study trip will be presented and excellent recruitment offers (e.g. exhibition stands) will be provided (note: all participating students are selected based on study results and motivation, and belong to the best Industrial Engineering students).

▶ Excellent company exposure opportunities through social media and TU/e magazine.
Some research examples master students can do:

- **Business network analysis**
  The complexity of the network of relationships in which the firm is embedded can be brought to the surface.

- **Benchmark analysis**
  Comparison of the application of the intelligent automation concept to other companies.

- **Market research**
  Investigation regarding the value of customer needs for your company.

- **Process improvement**
  Identification of process improvement opportunities by conducting a scan of the process (e.g. identification of non-value adding activities).

- **Risk management**
  Identification of the risks in your business environment.

Of course any other ideas for research projects within Industrial Engineering are welcome as well. Companies that recently have been involved in the IRP include Dow, Maastricht UMC, NS, Vanderlande and Vodafone NL. On the next page, some examples of the past International Research Project and information about the research projects in 2017 are given.

Below some research examples of the previous International Research Project are shown. The theme of the previous year was ‘Intelligent Automation: Innovating Towards a New Industrial Era.’ Company names have not been listed due to privacy concerns.

- One company in the high-tech industry experienced troubles with their sales and operations tool, as employees have to write every month a report. The assignment was to design a tool that automatically checked and processed files. The monthly report can then be generated automatically.

- A chemical company had a need for a consistent sourcing model for plant maintenance stops (‘turnarounds’). Their production plants are divers, as well as their requirements for outsourced services during, after, and in preparation for these stops. The assignment was to define the substantially different maintenance stop types. Secondly, the student developed a purchasing price model per maintenance stop type.

- A transportation company observed the information demand from its customers is increasing rapidly. At this moment the company is automating is information supply, in order to supply information to its clients more accurately and rapidly, like locations of trucks and expected delivery times. The assignment started with a literature study to examine how other transportation companies inform their clients and how this information is useful internally. Furthermore, the company liked to develop a unique selling point in a few years and work more efficiently using their own data.

- A medical institute uses SAP system to store all kinds of parameters, like number of surgeries and average waiting times of clients. However, doctors find it difficult to extract these parameters from the system. The assignment was discuss with different stakeholders and built a dashboard in Excel, which indicates the required parameters and is easy to use for all stakeholders.
The students involved in this project are students of the Master's program 'Operations Management and Logistics', 'Innovation Management', 'Business Information Systems', or 'Manufacturing Systems Engineering'. All students have knowledge in Industrial Engineering, but also capabilities specific to their Master’s program. These capabilities will be discussed on the next page.

The majority of the selected students completed their Bachelor of Industrial Engineering at Eindhoven University of Technology. Topics the students covered during their Bachelor’s program include accounting, goods flow management, human performance management, stock control, organization science and information systems. The students of Industrial Engineering are focused on making improvements in companies and are ready to apply the methods and tools they have learned during their courses. The study program at Eindhoven University of Technology regularly involves group assignments. These group assignments enable students to train their analytical skills, their social skills and their presentation and cooperation skills.

OPERATIONS MANAGEMENT AND LOGISTICS
Operations Management & Logistics is a multidisciplinary field that covers such disciplines as supply chain management, manufacturing systems, information systems, business process management, human performance management, health care engineering, transportation, reliability engineering, maintenance, and operational finance. The program trains student in quantitative analyses. In all courses, the theory is related to existing research and students are shown how to apply theory in practice. For example, an alternative design of a control concept for a supply chain or a workflow process in an insurance company are investigated. They also learn how efficiency improvement or cost reduction can be obtained by advanced concepts.

INNOVATION MANAGEMENT
Innovation Management studies the management of innovation processes and develops theories, tools and techniques to make businesses more innovative. Key aspects of this discipline are knowledge management, strategic alliances, entrepreneurship, new product development, supplier partnerships, marketing management, quality management and technology management. Students learn how to use the knowledge that they gain in carrying out research into innovation management and in industrial applications. They also learn how to analyze the current innovative performance of a company, explain it in terms of quality, cost and time, and improve this performance by re-engineering innovation processes.

BUSINESS INFORMATION SYSTEMS
Modern organizations such as banks, insurance companies, ministries, hospitals, travel companies and webstores are critically dependent on their information system: when it falters, all the other processes come to a standstill. This creates a demand for experts who are able to face the challenges of both computer science and industrial engineering. The Business Information Systems Master program unites the competencies of the computer scientist and the industrial engineer. Through a balanced selection of computer science and industrial engineering courses, this program gives students a solid foundation to be able to design and realize secure and reliable information systems. Students can specialize in one of the four streams: business process management, healthcare, ICT services and logistics.

MANUFACTURING SYSTEMS ENGINEERING
Because of digitization and automation, the manufacturing industry is now rapidly changing. The whole chain of products, machines, factories, warehouses and customers, or the Internet of Things, is able to share and exchange information. To fully exploit this network of information for more effective and efficient production, the Manufacturing Systems Engineering Master program provides students with knowledge of the whole chain: from the technology inside the machine up to the level of supply chains. The program offers this combination of technological knowledge of high-tech production systems and knowledge of production processes and supply chains, and shows how to apply this knowledge effectively at both system and network level.
The IRP 2018 is supported by the following people:

- Prof. dr. ir. F.P.T (Frank) Baaijens
  Rector Magnificus
  Eindhoven University of Technology

- Prof. dr. ir. J.C. (Jan) Fransoo
  Dean of TU/e Graduate School
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- Dr. J.L.L. (Jeroen) Schepers
  Program Director of Master’s Program ‘Innovation Management’
  Eindhoven University of Technology

- Dr. T. (Tarkan) Tan
  Program Director of Master’s Program ‘Operations, Management & Logistics’
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- Prof. dr. ir. P.W.P.J. (Paul) Grefen
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- Prof. dr. I.E.J. (Ingrid) Heynderickx
  Dean of the Department of Industrial Engineering & Innovation Sciences
  Eindhoven University of Technology

- Prof. dr. E. (Evangelia) Demerouti
  Chairman of the board of HPM (Human Performance Management)
  Eindhoven University of Technology

The following executive committee is responsible for the organization of the IRP 2018:

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