

Magazine for Construction Management and Engineering

INTERVIEW

February 2016 | Number 24 | Volume 13

TRANSPARENCY



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EDITORIAL

Dear readers and colleagues,

We are very pleased to present to you the 25th edition of the IntervisiE magazine. As always this edition is packed with informative articles from companies, addressing current topics and developments in the construction industry nowadays. In addition, the magazine contains the traditional articles related to the master's track in CME, namely testimonials from CME students and alumni. Special attention has been given to major events from the ongoing semester such as the annual CME student trip abroad. This year our colleagues travelled to the city of Saint Petersburg, Russia where they had the opportunity to visit the St. Petersburg Polytechnic University, as well as some local building projects executed by big construction companies.

This edition of IntervisiE highlights the topic of 'Transparency' in the building industry, where this subject directly refers to the new methods and approaches in the project management of a building construction from the beginning of its planning until its final completion. The principle of transparency in the building process can simply be defined as a 'conversational model', allowing the better collaboration and communication between the stakeholders involved in it. The model provides visibility across the different stages of the production process, while at the same time showcasing their interrelatedness. When construction is seen as a flow, rather than a set of independent building phases, the demands for handling vast amounts of information rise, thus making the principle of transparency essential for the project management practices related to it.

This semester's issue contains a very interesting article from DPI, explaining the importance of stakeholder communication in the building process and the ways to achieve transparency through it. Furthermore, the article from Twynstra Gudde highlights the requirements for companies, which aim to become integrated facility organizations. This, and much more is waiting for you to read in the following pages!

At last, we want to thank everyone who contributed to the creation of this edition of IntervisiE!

Kind Regards,

The IntervisiE Committee



Chief Editor IntervisiE | **Tymen Pater** (left)

Editor IntervisiE | **Miryana Stancheva** (middle)

Editor IntervisiE | **Johan Slob** (right)

COLOPHON

General

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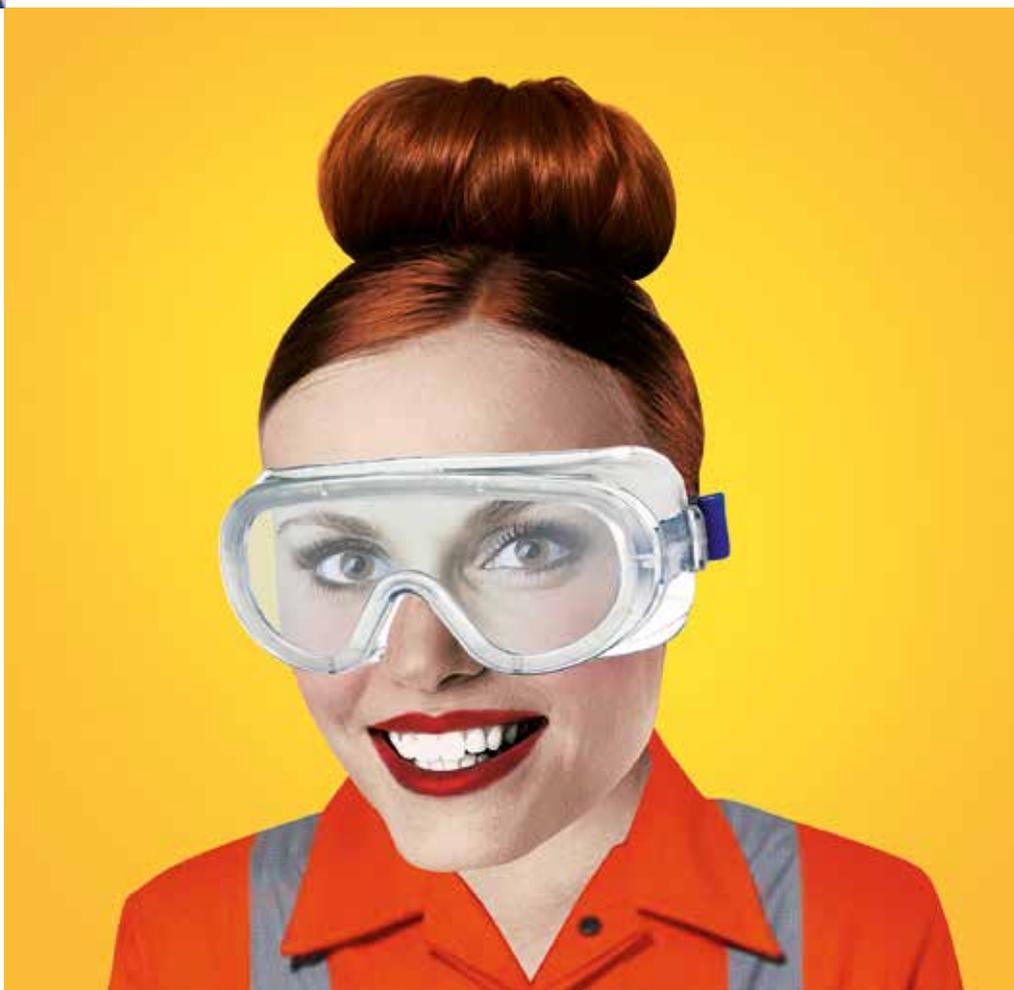
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NEWS & ANNOUNCEMENTS

SPRING / SUMMER

While the school year is almost towards its end and the summer holidays are right around the corner, we want to give you an overview of the educational and recreational activities, which the board of Of CoUrsE! organized for the CME students during this past semester. In this edition of *IntervisE* the 'News and Announcements' section covers the events the study association was involved in from the beginning of March 2016. If you're also curious about the upcoming activities we have planned, stay updated by subscribing to the Of Course! Facebook page. Another possibility is to come and visit us at the Of CoUrsE! corner in Vertigo, now relocated to floor 2.

Study trip drink March 22nd, 2016

On the 22nd of March the study trip committee organized a drink on floor 2 where all the attendants of the trip to Saint Petersburg, Russia got to know each other in a very enthusiastic and fun evening!

Lunch lecture by Heijmans March 31st, 2016



Our partner Heijmans gave us a very interesting lecture about process management in the practice. Among other things, we were able to see how systems engineering tools are essential in the day-to-day practice of project management for a construction project. And of course, afterwards we enjoyed lunch with our fellow colleagues.

BIM Workshop April 4th, 2016

During this workshop, Jaco Prince took the participants into the world of BIM at BAM. Many important topics were discussed at the meeting and answers to essential questions were provided some of which looked as follows: Why is BIM going to be an essential part in the future management of construction processes?; What is the stage of BIM adoption by BAM at this moment?; What challenges does BAM have in changing its working practices through the use of 3D modelling?. After providing an introduction about the ideas, visions and challenges associated with BIM, the second part of the workshop was organized around learning practical tips in working with Revit and this from the hand of an expert.

Company orientation day (COD) April 26th, 2016



On Tuesday, the 26th of April, the annual Company Orientation Day (COD) of the study association Of CoUrsE! took place. During this event, three different companies (Heijmans, DPI, and Hevo) got the opportunity to present themselves - their vision, scope of work, employer-employee relationships, and general company practices and to show the students the possibilities for professional realization within each company. Additionally, the companies provided two rounds of workshops for the participating students; Heijmans showed the communication process between stakeholders; HEVO introduced the organizational concept of a company and DPI challenged the students with a case about the tender process in connection with the stakeholder management. The lunch break was organized as a speed date session where the students got the chance to interact with the professionals, to exchange information and make valuable connections. After the second round of workshops each company conducted several interviews with students they have previously selected based on their CVs.

Study trip to Saint Petersburg, Russia May 3rd, 2016



This year the Of CoUrsE! Committee organized an international study trip to one of the world's most emblematic historic places – Saint Petersburg, Russia. For one whole week the CME students who joined the trip had the chance to visit companies in the building sector, the Saint Petersburg Polytechnic University and also a number of construction sites. They became acquainted with the city's wonderful architectural heritage, extraordinary history and rich culture by visiting places such as 'Venice of the North', known for its 400 bridges. And of course, apart from business and tourism, the 'to-do' list of the trip also included exploring the city's wild nightlife. If you want to know more about the study trip, you can find out the whole sequence of events on page 20 in this edition of *IntervisiE*.

In-house day with Twynstra Gudde May 18th, 2016



On Wednesday, May 18th, the members of Of CoUrsE! had the chance to visit the headquarters of one of the most prominent consultancies in the Netherlands, Twynstra Gudde, situated in Amersfoort. The event started with a short introduction showcasing the company's main fields of work, namely contracting and risk management. After the presentation the students were divided into four groups of five students each and were given a case to solve. In the first round, the students had to identify risks, their causes and consequences based on a short story. In the second round the students had to find ways to minimize the given risks and later present their finding in front of everyone. After the workshop was over, a meet and greet event in the cafeteria of the consultancy was organized, where the students were able to meet the professionals, exchange information and make valuable contacts.

Witteveen + Bos business course June 8th, 2016



The project 'Blankenburgverbinding' was central to the business course which took place in Deventer on Wednesday, June 8th, 2016. Students in the final phase of their academic study in civil engineering and construction management and engineering were invited to participate in the event and challenged to develop a plan for the Blankenburg connection between the highways A15 Maasvlakte / Main Port of Rotterdam and the A20 Westland / Haaglanden.

The Witteveen + Bos business course is one of the means that Witteveen + Bos aims to acquaint talented, highly qualified students with the organization and most importantly - to introduce them to its scope of work. Therefore, the students who took part in the course received the opportunity to put into practice the multidisciplinary project approaches of the company by taking the role of project engineers for a whole day. The participants worked in small groups with fellow students from different technical and managerial backgrounds on a solution for the given case study on the 'Blankenburgverbinding' project.

Annual CME BBQ June 17th, 2016



On Friday, June 17th 2016, our biggest annual event for CME students, professors, and alumni took place. In this event everyone was able to have a cozy and nice evening together which was not to be missed. Therefore, don't forget to check the up-coming events on our Facebook page (www.facebook.com/ofcoursecme).

of CoUrsE!
Construction, Management and Engineering

Lisbon | Stijn Kusters

For my third semester of my master I decided to go on exchange to Lisbon. I wanted to take the last opportunity to go abroad, develop myself, meet new international people, experience a new culture and of course enjoy my last year of being a student. I decided to go to Lisbon because of the beautiful and compact city filled with Erasmus people. The weather is perfect with the sea close by. Furthermore, it is a cheap and affordable place to stay and last but not least to get to know a different southern culture.



- Civil Engineering
 - Urban Studies and Territorial Management
 - Energy engineering and management.
- I wanted to follow several courses with a total amount of 23 ECTS.

When I arrived at the university two courses that I wanted to follow were not given in English or not provided at all. Furthermore, documents delivered by the TU/e stated that the IST offers real estate courses, in practice this is not the case. This was a disappointment but there was enough time to change courses. The only disadvantage was that I entered one course after 4 weeks

in the semester. At the end this was not a problem because the level of education in Lisbon is a bit lower in comparison with TU/e whereby I was able to catch up everything. At the moment I am following four courses. Three of them are orientated on urban building science and the other one is an economics course. The courses are relatively easy to follow if you keep track of it every week.

Study

The start of the exchange semester on the university (Instituto Superior Técnico) was excellently organised. The university organised an orientation week for all the new exchange students. This orientation week was a perfect way to immediately meet new people, get to know the Portuguese culture and the city. Portuguese students showed us around the campus. During this week several activities were organised like Portuguese evening, a welcome dinner with Fado music (Portuguese tradition) and a surfing day. Although it is one of the biggest universities in Portugal the campus is not that big. You cannot compare it with the TU/e campus back home. The IST campus mainly exists of old authentic buildings which results in facilities and services that are not as good as in Eindhoven.

There is no faculty at IST which can be compared to CME, so I took my courses in three different faculties :



Besides that, the university provides different accommodations to stay for the exchange period. I decided to search for something on my own. Luckily I knew someone from another university who was staying in Lisbon before me. He

recommended me a flat with four floors with all Erasmus people. In total, I live with 8 people from all different countries in one apartment. The apartment is in the middle of the city. It is 5 minutes with the subway to the university as well to the city centre. It is the perfect accommodation because of both the location as for all the nice people in the flat. We do many activities together and you have contact with the whole flat. A lot of accommodations are provided for exchange students for a relatively cheap price. If you do not know someone who stayed in Lisbon before then the best way to find an accommodation is to go to Lisbon, stay in a hostel, and search for it by yourself. Do not get an accommodation from the internet. Many people who did this changed their accommodation because it wasn't what they expected.

Lisbon

Besides to the study, I'm also enjoying the life in the city. Lisbon is built on seven hills. It is a city with many different viewpoints, steep slopes, small streets, historical trams and surprising places. The viewpoints are the perfect location to hang out with friends between the local people to enjoy the weather and drinking a beer during the sunset. Lisbon is located along the Tagus river which makes it also a very nice place to hang out. Furthermore, the beach is 20 minutes away by train or by bus. Many surf classes are organised on the different beaches. The conditions on those beaches are optimal for beginning surfers. I am not a pro yet but I managed to catch the waves.



The Portuguese people are very friendly and speak unexpectedly good English. Lisbon is an amalgamation of foreign influences. The Portuguese kitchen, which is known for their fish, is very attractive. In the Netherlands we eat around 6pm, but in Portugal it is normal to eat at least after 9pm. People in the Netherlands are always on time for meetings and appointments, but in Portugal it is almost rude to be strict on time. I had to adjust to this situation in the beginning.

For Erasmus students Lisbon is a really nice place to stay. Meeting new people turned out to be very easy. I met many nice people at my university and in my apartment. Besides that there are two Erasmus communities that organise different activities during the whole semester where you meet many different people. All the Erasmus students from the different universities are connected with those communities. Those two communities organise surf trips, trips to different cities, walking tours and a lot of parties. This was especially very nice in the first few weeks to get to know everyone. Furthermore, Lisbon is not expensive and relatively cheap to live. If we go out, most of the time we go to 'Bairro Alto'. This is a neighbourhood in the centre of Lisbon which is known as the nightlife area of Lisbon with all small bars and little cafes. It is the ideal area for students because you do not pay more than 1 euro for a big beer. All the (Erasmus) people are gathering in Bairro Alto to drink a beer and have a nice evening. Lisbon is also nice because of its weather. There were many days that we went to the beach, went surfing and enjoying the weather on the different 'miradouros'.

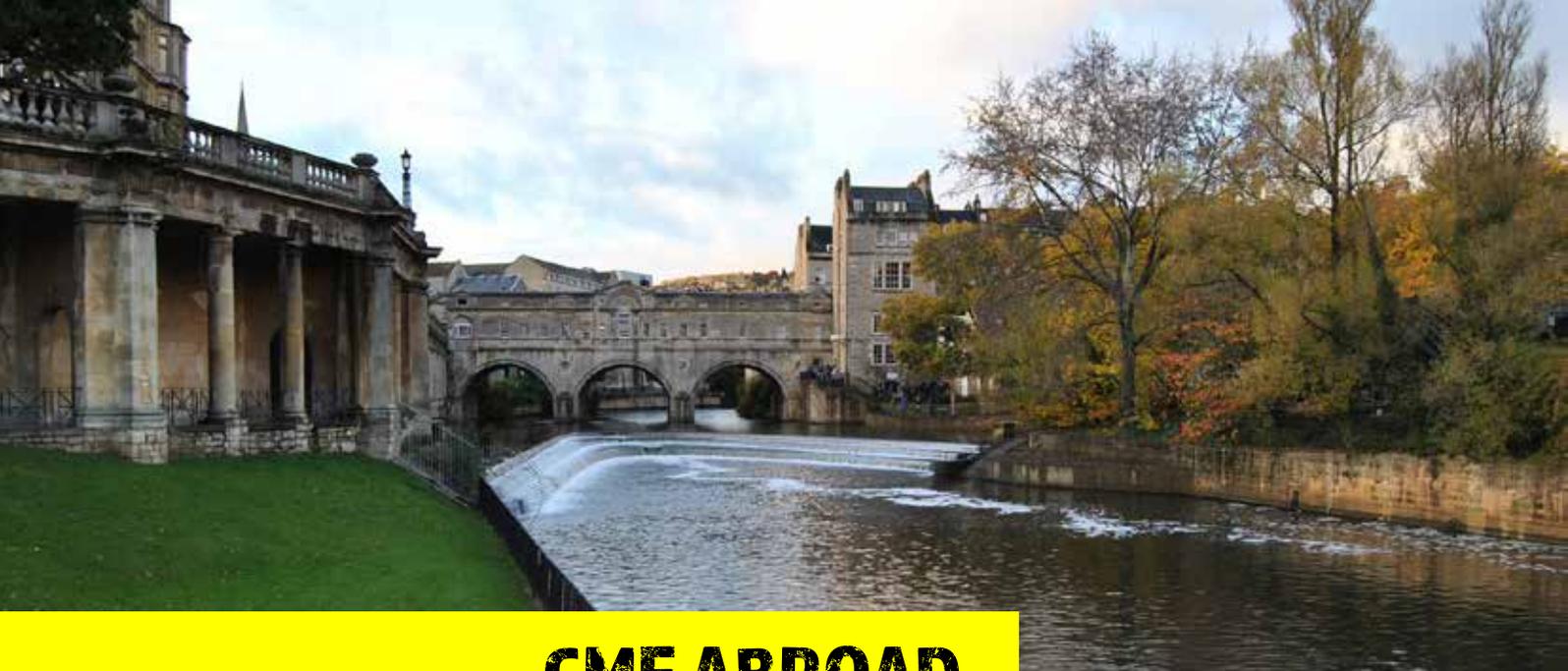
Next to all of this, I try to see as much of the country as possible. Seen the fact that there are some holidays and free days it is no problem to make some nice trips. The ratio between free time and studying was perfect, especially because Erasmus is much more than just studying. Recently, I made a 5 day trip through the Azores with two Dutch people and a German guy. It is a volcanic island located in the Atlantic ocean. It was one of the most beautiful places that I have seen in my life. It has beautiful landscapes, lakes, waterfalls and thermal nature pools. We rented a car and saw the whole island in 5 days. There is still a lot of volcanic activity on the island. We were swimming in natural pools and five meters further there was a small lake where the water was boiling. Besides the Azores trip, I went on a road trip to the west coast of Portugal and the Algarve in the second month of my stay. I rented two cars together with 5 Scandinavian people and two Germans. We saw the most beautiful beaches, sunsets and surfed on the best places. The next trip that I'm planning to do is a road trip with three/four other people at the end of my stay to Porto at the north of Lisbon. If you go on exchange and you want to travel do not wait too long during your stay. Before you know it is the end of your exchange period and you do not have the time anymore to do the things that you wanted to do.

Lisbon is a truly unique and amazing experience. Sunbathing on the beach, surfing, going out in Bairro Alto, student parties, the road trips, travelling, getting to know new cultures: everything was amazing. Lisbon is probably one of the best places for Erasmus. It is a beautiful city, compact, filled with Erasmus people, affordable and perfect weather. It is the total package that makes the Erasmus experience one of my best experiences of my life till now. I am very grateful that I have met so many nice people and for sure made friends for life. If you are still doubting to go on exchange then I really recommend to every CME student to GO! Feel free to contact me if you have questions regarding exchange and/or Lisbon.

Cheers !



Stijn Kusters
MSc Student CME



CME ABROAD

RITESH BRISPAT

Why did I decide to embark on a journey as an exchange student? The reason originates from many desired goals and interests. A few years ago; I never thought about leaving my comfort zone to study abroad, let alone learning to adjust to a new environment. After completing my bachelor's thesis in Suriname, South America and participating in the "International Exchange USA 2015 Committee", my aspiration for this new experience grew more. The fascinating stories and experiences of my fellow classmates sparked my interest. Tales of the culture differences and mesmerizing scenery as told to me by my fellow classmates were very intriguing and acted as a further impetus to traveling abroad. By now I was convinced and had no second thoughts about continuing my studies in a whole new country. I kick started this new journey of my life by carefully securing the various courses available at different universities and also the accommodation and cost of living.



Whilst I was considering the topic for my thesis, I managed to pick relevant modules that were available at Loughborough University. I chose the course "Civil & Building Engineering". This course was designed to give students an insight about energy usage, BIM and planning. "Civil Engineering in Developing Countries" was one module that I had to opt for in spite of not having a particular interest in it. However, this module became interesting when I started learning CME. This can be traced back from the basics of cities in constant development and increasing population. It was understood that cities need better infrastructure. This can provide practical and available solutions to important factors of human civilisation such as the prevention of diseases to decrease death rates. Moreover, the lack of knowledge concerning governmental and private enterprises was linked to the result of stagnation in the development of urban areas. Therefore, the economics, politics and social

After careful consideration, I decided to travel to the UK, but I still wasn't certain on whether to study in Scotland or England. It was somewhere around December 2014 when I finally made up my mind to start as an Exchange programme at Loughborough University. You may think Lough...what? It is pronounced as 'Lufbrah'; fortunately I was not the only one struggling with the pronunciation. Apparently, many international students, or for that matter even the British struggle with the pronunciation. Loughborough is a small town situated in the county Leicestershire, in the Midlands of England. You may know other cities such as the City of Leicester and Nottingham, which are both also from the same county. The English weather has a well-known reputation, so I prepared myself for the worst. However, during my stay I was fortunate enough to experience good weather. Even the British were amazed by the weather in autumn and winter.





aspects of the Civil Engineering module gave me an insight on how to trigger stakeholders and address barriers in developing areas.

Loughborough University is famous for their Technical Engineering and Sciences; this is why it was named “Loughborough College of Technology” for many years until 1993 when it was officially named “Loughborough University”. Likewise, Loughborough University is also known for its Sport Sciences and Sport Technologies. They have excellent sport facilities with endless opportunities all in one huge campus. Their campus is the largest single University campus in the UK. Therefore, I used the opportunity to try other sports for fun.

My accommodation was located on campus. It is common for first year students (informally called “fresher’s”) to stay on campus. Fortunately, I found accommodation with mainly 3rd and 4th year students. It could be worth checking for off campus accommodation too, nevertheless I had great neighbours during my stay.

In Loughborough, I came across a lot of people. Besides the British, I also met numerous exchange students from Europe and outside Europe. The British are a little bit reserved (except when they are drunk) and therefore takes a little more time to connect. In the beginning I could not fully understand some students who were from the north of England because of their accent. After a few days of “sorry, can you repeat that”, I would eventually understand them comfortably. It was easier to connect with exchange students as we were all sailing in the same boat. Together with other exchange students we planned trips to other parts of the UK. These trips were decently priced. Some lovely destinations included York, Chester and Bath. Just before Christmas we began a road trip starting from the west (Manchester and Lake District), then to the north (Glasgow and Edinburgh), and back to Loughborough through the west again which we also managed to make a short stop to Newcastle. Due to the flooding of the North areas of the



UK, we had to adjust our route, this was challenging but it made a memorable trip to reflect back on.

It was also lovely to experience Annual events such as Bonfire Night, Diwali and of course Christmas in the UK. Bonfire Night was interesting because the event is also known as “Guy Fawkes Night”, a commemoration of the failure of the attempt to blow up the Parliament Plot in 1605. As a result, this event is traditionally celebrated with fireworks and bonfires. Diwali is a Hindu festival (the festival of lights) with Diya’s, fireworks, mithai (sweets) and performances. This is celebrated in all parts of the UK but it is concentrated mostly in Leicester. This is because the majority of the Indians in the UK live in Leicester.



The exchange program gave me the possibility to develop my interpersonal skills, adjust to different environments and cultures, and helped me observe the differences of approaching CME topics. I observed some differences between approaches of the Netherlands and the UK. For example, taking measures to improve energy efficiency with policies, regulation and incentives. During my stay in the UK, I also recognised interesting companies that are not familiar with the general public in The Netherlands

If you ever have the opportunity to study abroad, I would encourage you to go for it with full enthusiasm. Get out of your comfort zone and experience the student life outside your own country. This would naturally broaden your horizons and help you evolve as an individual. There is nothing to worry about as the registration process between the universities is well organised and hassle free. If you’re still in doubts then please do not hesitate to ask around!

Ritesh Brispat
MSc Student CME

Adventures of a third culture child from Dubai to Eindhoven

A quick google search will define a “third-culture kid” as a child who has spent a significant part of his or her development years outside the parents’ culture. They frequently build relationships to (and have elements from) all of the cultures they are related to, while not having full ownership of any. As for myself, having been born in Dubai to Egyptian parents who migrated in their 20s to the United States, then myself moving to Seattle just after my first birthday, only to be brought back to my birth city before I turned six, and then left all this behind to now live in The Netherlands, I feel I somewhat fit the profile of a self-titled third-culture kid.

When I was asked to write an article about myself and where I am from, I realized that sometimes the hardest question you can ask a third-culture kid is where they are from. What does that really mean? Is it where my parents are from? Or where I was born? Or where I lived the longest? It could also mean my “passport country”? Or perhaps where I grew up? The answers to all of these questions would lead to different answers, but I decided that in the end home is where the heart is (or where the Wi-Fi connects automatically, for the newer generations), and for me that place would be Dubai. As a child, I found it very hard to relate to Egyptians and Americans my own age, and found the people who understand me the best are other third-culture kids. For that reason, Dubai is a haven for me as the city is filled with other third-culture kids as well as expats and immigrants and people from all over the world, which made it easy for me to fit in. It is also the city I grew up in and spent the most time in and the city I have the most friends in as I spent most of my development years in. As a result, Dubai would be my city of choice when asked where I am from, especially when there is no chance to explain the backstory.

Having said that, being born or having lived there for whatever amount of time in the expat-majority city of Dubai does not entitle you to the nationality or even a permanent residence. Consequently, my time in the concrete jungle of Dubai came to an end with the ending of my study visa at the end of my bachelor’s degree, and a new city and new adventure awaited. I graduated in 2014 with a bachelor’s degree in Civil Engineering with a minor in Economics but quickly decided that that is not sufficient in this day and age, and set my mind on obtaining a master’s degree. Having come from a very engineering-biased family, coupled with my experience from my bachelor studies, made me realize the importance of engineering and construction management early on, and it helped shape my choice of a master program. Yet, the choice of the university still eluded me. The European university system and reputation attracted me to apply to several universities across the continent, but the teaching language and my high standards restricted my choices to just a handful, and out of those TU/e stuck out as one of the very highly rated universities that also combines an international student friendly atmosphere as well as a safe city, a unique and attractive combination, making it an easy choice of university.

As of the time of writing, I am 8 months into the two-year Master-track of the CME program at the Eindhoven University of Technology (TU/e) and my opinions about the program and the university as a whole are remarkably positive. Courses are mostly project and group based which plays to my strengths, and the faculty and staff are knowledgeable, friendly, and helpful. Academically I find myself engaged not overwhelmed, mostly owing to the structure and course load spread throughout the academic quarters.

Eindhoven as a city has proven to be delightful beyond my expectations, and my new experience with smaller cities as are commonly seen in Holland has demonstrated its charm to me. The weather has reared its ugly head at times but I have also surprisingly grown accustomed to it, mechanically checking the weather forecast for rain as soon as I wake up, and instinctively plan my day and my attire around it. At the end of the day, even the cold rain and half-past-four in the afternoon sunsets could not bring down my positive attitude, I was delighted to say I survived the depressing winters of Holland.

The sports facilities provided by TU/e also deserve an honorable mention as they have managed to fill my time and provide me with valuable social and athletic opportunities, as well as feed my unhealthy obsession with soccer (sorry, football). The variety of classes and various sports on offer as well as their affordability, on top of the high standard facilities, have not gone unnoticed by me and they have managed to add an important element to my life in Eindhoven.



Overall, 8 months into my journey at TU/e and Eindhoven, I look back and find myself to have dealt with the initial cultural shock admirably well, lucky enough to have befriended a great set of internationals and sociable locals, and pleased enough with my academic and day to day life. They say a happy life is earned, not given, but TU/e and Eindhoven have so far made it easy for me to earn my happiness. I look forward to the remaining time I have here and to obtaining my Master’s degree, as well as being able to look back fondly and proudly at my time in TU/e.

Cheers!

Omar Abdelghaney
MSc Student CME



Transition to the Graduate School

As a student who started in the old CME program and now follows the Graduate School program, I would like to tell something about my experiences with this transition. This article is about the differences between the old CME program and the new Graduate School (GS), which started in September 2015. This is the first study year the Graduate School program is introduced, so I initially started my studies in CME in the old program and then, had to switch to the new updated program the university was offering. In this way I had the chance to experience both and now I am capable of making a comparative evaluation of them.

In September 2014 I started with the pre-master for the master Construction Management and Engineering. In February 2015 I finished the pre-master and started with the master's program. I enrolled in the old program, which meant:

- 69 ECTS compulsory courses;
- 1 ECTS Essay;
- 10 ECTS elective courses;
- 10 ECTS research proposal;
- 30 ECTS graduation project.

I started in February with three compulsory courses: research approaches for Construction Management & Urban Development (14 ECTS), process management in urban planning & development (8 ECTS) and collaborative design and engineering (8 ECTS). In the new program these courses are split up in six parts. These six courses are: collaborative design (5 ECTS) + systems engineering (2,5 ECTS), process modeling and information management (5 ECTS) + case study process modeling (2,5 ECTS) and urban research methods (5 ECTS) + Big data and experiments for urban analysis (10 ECTS). Only four of these courses are compulsory, whereas the other two are specializations. So the Graduate School in comparison with the old program offers the same number of ECTS but divided into smaller courses where the students have the opportunity to have a choice in what they want to take, depending on their personal aspirations for the future.

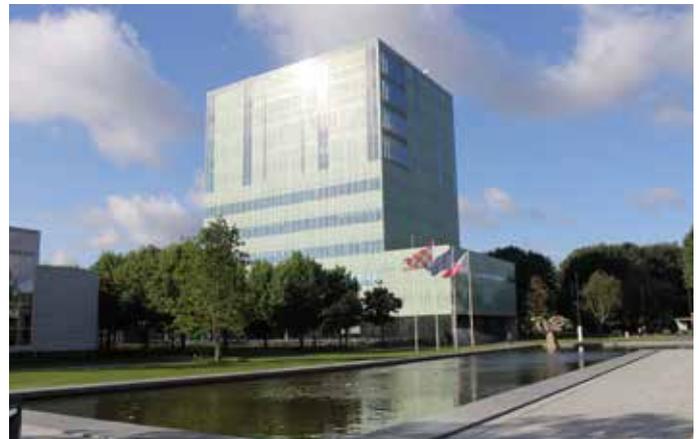
The main idea behind the new Graduate School is a more flexible master program where the student is allowed to customize his or her study plan in accordance to their interests. The master program currently consist of:

- 30 ECTS compulsory courses;
- 35 ECTS elective courses (out of a predetermined list);
- 15 ECTS free electives which can be chosen from any department at the TU/e;
- 10 ECTS research proposal;
- 30 ECTS graduation project;
- (15 ECTS) international experience which consists of courses from the (free) electives.

The program is indeed more flexible in the sense of getting to choose and that is valid not only for the specialization courses but also for the free electives, which can be selected from any department at the TU/e as long as the choice contributes to the academic direction the student wants to pursue. Of course, a new program cannot be launched without any difficulties along the way. Apart from the fact that I embraced the changes with excitement, there were also things I personally had an issue with. Some of them had

to do with the thoughtfulness behind the general organization of the quartiles, namely:

- The course System Dynamics, which is compulsory, is only given in the fourth quartile. Because of this, an international experience was not possible in my study program.
- The compulsory subjects are not well distributed over the year and therefore, you cannot always do the free electives you would like to do.
- If you start in February, instead of September, which is the case for many pre-master students, you have less flexibility in your personal study program.
- Especially for me as transition student, it was hard to fill in the puzzle with the new courses and the ECTS.



In conclusion, the Graduate School program has many advantages for the CME master students, especially for the new students who start in September. The most important aspect to mention is the flexibility of this program when compared to the previous one and the focus on tailoring your own academic path. A point of improvement for the Graduate School program is, in my opinion, the better distribution of compulsory courses over the year and the increase of options to select from in terms of specialization electives. Hopefully, in the next years the concept of the new program will evolve significantly and become even better organized, more structured and flexible.

Elaine Kieboom
MSc Student CME

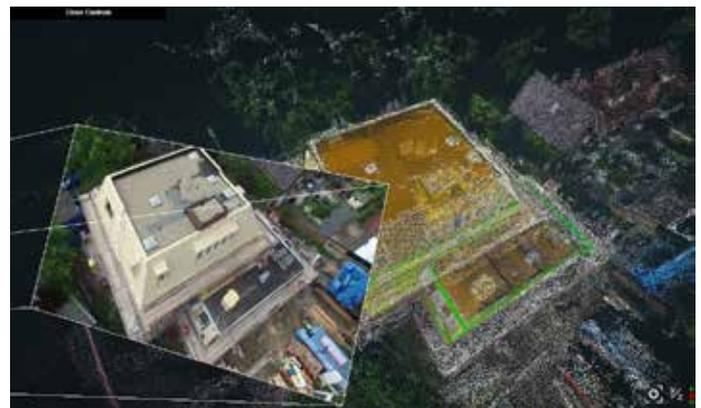
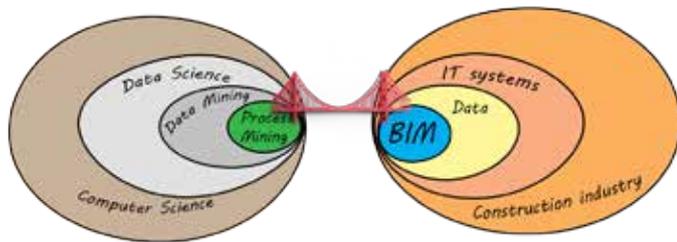


Why Coffee, BIM, Drones and Process Mining are perfect ingredients for graduation

Drones, RFID, GPS, Internet Of Things, Intelligent Camera Systems, Big Data, Data Science, Process Mining, Building Information Models! It is clear that the last years a 'Data-Explosion' occurred. We are facing a growing amount of technology in our daily lives as well as in the construction sector resulting in more available data. 'Data is the new gold' which sounds fancy, but data could be very valuable. How could we collect this value?

Process mining is a research field which tries to answer this question. With help of smart algorithms and 'Event-logs' information about processes is gained out of big data sources. With the right tools this information can be translated into useful insights which are valuable by causing substantial cost savings.

from the University of Illinois. I had two-weekly skype meetings with a professor and some students from the RAAMAC group. They helped me to compare Drone Images with the BIM model. I also met a programmer which helped me creating software. Without these people my research would not be as successful as it was now. So I can really recommend CME students to search for people who can support you. If you meet people with the same mind set or ideas, you will see that they really want to help you!



But what potential has process mining in the construction sector? And how is it related to BIM? My graduation research focussed on optimizing construction processes with such technologies. Where BIM gives a structured database, process mining provides algorithms to analyse big data sources. If process related information, such as schedules, are connected to building models they form a solid basis for progress monitoring, process analytics, and in addition are reusable for risk identification in new projects.

Autonomous progress monitoring with drones

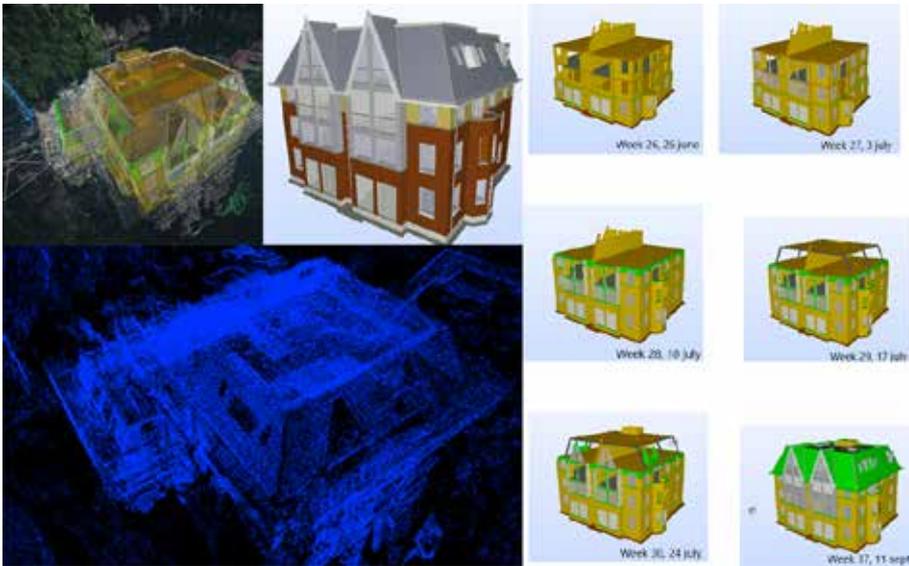
I really wanted to deliver a final product which was not only a theoretical framework, but was also proven in practice. Therefore I or-

Don't stay on your own island during graduation

While starting my research I knew I needed some people around me to help and consult me during my research. Therefore, I started by drinking coffee with a lot of people to expand my network. I spoke with BIM and process mining experts, practitioners on construction sites, students and professors from other programs and universities. As a result of drinking coffee I managed to create a group of people which helped me achieve a lot more during my project. For example, I contacted other universities which did 'cool stuff' and as a result I was honoured to work with The Real-time And Automated Monitoring and Control (RAAMAC) group

Case study: Systems Engineering Process Mining

Techniques that improved performance in other industries are more often adopted in the construction industry such as Systems Engineering (SE). Interviews with SE experts conducted within this study have indicated that SE IT systems supports with managing their project and helps to prove that the clients' specifications are realized. However, it is not known if those systems support an efficient process. Practitioners indicated that a lot of people are involved in such projects who all work in parts of the IT systems but nobody has a clear overview of the overall process. This study explores the possibilities of discovering parts of the design process with process mining techniques. By use of a case study at a large civil project the potential of process mining within the design phase of construction project is assessed. Data preparation was labour intensive but valuable analyses were done with process mining techniques. Real bottlenecks are found, process variants are discovered, social networks are exposed and improvements in the design process can be made. Due to this experimental study, the process engineers realized that the organization doesn't control the field of information- and data modelling enough. It is concluded that it is valuable to use process mining to give continuously feedback loops to the project managers and contractors. Process mining gives unique visualisations which enables refreshing insights. In addition, process mining analytics did realize that some IT systems are used to store information, but those systems don't automatically facilitate an efficient process.



ganized a case study. The goal was to create insight in bottlenecks of construction projects for project managers. Consequently, a database with as-built information about construction projects had to be created. For that reason, I targeted to autonomously monitor construction sites. By creating as-planned BIM models, and comparing them to as-built models I was able to create an as-built database. Hendriks Bouw en Ontwikkeling facilitated the project and provided full access to the construction site and BIM models. I made the as-planned BIM models myself. Dreamfocus Droned was willing to fly weekly over the construction site with a drone resulting in high resolution images. These images were converted into as-built models by RAAMAC. The deviations between as-planned and as-built are stored in a database. This database can perfectly be analysed by project managers with process mining tools such as Disco and MyInvenio. Questions like; who did what during the project, who is most influential on the project, which step in the process takes too long and which building elements are deviating from schedule? can be answered. As a result of the study, a state-of-the-art workflow with BIM, Drones and Process Mining is created which enables knowledge reassurance and fact based problem discovery for contractors.

Experimental Process Mining case studies

Since I had not much experience with process mining I conducted two case studies to learn about the technology. The first one at a large contractor (wants to stay anonymous), and the second one at the facility management department of Erasmus MC Hospital. Both case studies are published in papers, see the yellow blocks about case study.

These case studies were highly informative, I had the change to look into the operations of these large organisations. In addition, they were very enthusiastic and very willing to help. So if you are planning to explore some new technologies, I really recommend searching for real cases at companies. This enables you to orientate for interesting companies, expand your network while giving your research experimental substantiation.

Searching for an interesting graduation study?

During my research I was the first one

who bridged the gap between BIM and Process Mining. Therefore, a lot of things in these research fields can be studied further. So if you are interested in subjects like BIM and data analysis with Big Data I recommend to read my master thesis which has several recommendations for further work. In addition, I know that several companies are interested in graduation students regarding these topics. If you have any questions, need some help or you just want to drink some coffee, you can contact me via: stijnvanschajjk@gmail.com.

Interesting links:

The dataset which I created contains BIM models, Point Clouds and Event logs and is available for everyone and can be downloaded via:
<http://bit.do/DataSetSchependomlaan>

The thesis, case studies and final presentation can be seen via:
<http://www.slideshare.net/StijnvanSchaijk>

The Real-time And Automated Monitoring and Control (RAAMAC) group from the University of Illinois:
<http://raamac.cee.illinois.edu/>

Free online Process Mining course:
<https://www.coursera.org/learn/process-mining>

Process mining tools (free for students):
 MyInvenio: <https://www.my-invenio.com/myinvenio/>

Disco: <https://fluxicon.com/disco/>

Stijn van Schaijk
 Graduate MSc CME



Case study: Process Mining with facility management data

This experimental study explored if facility management data is suitable for analysing processes around building elements with process mining techniques. By use of a case study at a hospital the potential of combining process mining with maintenance data is assessed. It can be concluded that with some data transformation maintenance data is suitable for process mining. Moreover, the facility managers were surprised by the visualisation techniques and gained clear insight in the error handling process. As a result they discovered problematic building elements and odd processes. In addition as a result of this analysis the facility managers were surprised about the amount of money which was spend to short (and unrealistic) jobs and they are going to monitor those errors for next months to figure out how this maybe can save them money. A notifiable quote was mentioned by one of the facility managers, she said: "We can probably save more money by investing in data analytics than by firing our own people".

The facility managers where definitely interested in using process mining more in future projects. In order to enable process mining on a larger scale it would be useful that facility management systems adapt an 'export to event log' function. Also element names should be consistent in order to make analyses easier and more reliable.

This study just explored the topic of facility management based process mining and has proven some useful applications. More (case-) studies are required to assess the potential of this topic. In addition it would be useful to study the potential of integrating different data sources from other phases, for example the design -or construction- phase, in building elements life-cycle in order to gain insight in the process on a longer time span.



DREAM & DARE FESTIVAL I

60 YEARS OF TU/e

The “Technische Hogeschool Eindhoven” was founded 60 years ago, on June 23th 1956, by the Dutch government with prof. dr. H.B. Dorgelo as the first rector of the institution. The official opening under the patronage of Queen Juliana took place on the 19th of September in the same year. At that time the demand for highly trained professionals with technical education in the area of Eindhoven and Southeast Brabant was constantly raising against the backdrop of the region’s rapid transformation into a powerful industrial area in which technology played a central role. The establishment of the new school was initiated and supported by companies such as Philips and DAF Trucks, which had a great influence on the economic prosperity of the region during the 1950’s. Halfway through the 1980’s, the institute changed its name to “Technische Universiteit Eindhoven” (Eindhoven University of Technology) as it remains until today.

This year the University celebrated its 60th anniversary with the Dream and Dare Festival which took place on the campus grounds during the weekend of the 22th, 23th and 24th of April and accommodated a variety of events, as well as 17.000 visitors. The kick-off of the festivities was marked by a Dies Natalis (Latin for ‘birthday’) celebration on the 21th of April, held at the Catharina church in the centre of Eindhoven. At the event the Rector of the university, some professors, as well as alumni were invited to give speeches. On Friday the 22nd the actual opening of the festival took place on the university campus where Wim Koch (Director SSC Eindhoven), Arnaud Brombaucher (Dean Industrial Design) and Ingrid Heyndericx (Dean Industrial Engineering & Innovation Science) abseiled from the top of the Vertigo building. Following this remarkable opening, an intriguing science show was given in de Blauwe Zaal of the Auditorium building.

The next day of the festival blended a variety of events on the TU/e campus, where three stages were erected, namely the Main stage the Dream stage and the Dare stage, hosting the music program of the festival. Regardless of the cold weather, the good mood during the day was preserved due to the performances of artists such as Nielson, Liptease, Jet Rebel and Chef’Special, who kept the visitors dancing throughout the afternoon. Apart from that, the student wind orchestra Aulettes and the symphony orchestra Ensuite also gave great performances that weekend. Throughout the day,

various bands, comedians, choirs and dancers from the TU/e also performed on the Dream and Dare stages. During the afternoon the visitors had the opportunity to abseil from the Vertigo building; to visit the first in the world drone café, created as a student project; to enjoying a variety of local and foreign foods; play bossaball; visit the photography exhibition in the Dream and Dare pavilion and of course, visit the beer-crate-bridge built over the Dommel river by TU/e students.



The beer-crate bridge was constructed entirely from beer-crates without the use of glue, tie rips, tensioning straps, screws or any kind of bondage materials for additional stabilization. The students from the study associations SUPport and KOers were the ones in charge of building the structure over the Dommel river, which passes through the university campus. The project is a yearly competition between the Eindhoven University of Technology and the Delft University of Technology, where the main purpose is surpassing the record previously set from the other competing team. In order to beat the world record from the previous year, set by TU Delft, the height of the bridge needed to excel 5 meters and the structure had to remain undisturbed and without additional supports for one hour. Two crate towers on both sides of the bridge filled with bottles of water, a few meters high each and weighing in at 1.5 metric tons a piece, were holding together the construction from the moment the supporting scaffolding was removed. The first attempt of constructing the bridge failed due to the strong wind, the second attempt, however, was successful and that was enough to bring the world record back to Eindhoven. The final result was a beer-crate bridge with a length of almost 27 meters and a height of approximately 7 meters.



ly as on campus, at the club a Dream and a Dare stage were created, where DJs such as Kraantje Papie, Kris Kross Amsterdam, Wouter S. and Moderon entertained the audiences.

The following and final day of the event, Sunday the 24th of April, was dedicated to children. A tour via several campus buildings was organised, including a science show, presented by Tim Hofman and Valeria Zeno (BNN). During the show a team of scientists dressed in long white laboratory gowns performed a series of exciting experiments, while at the same time a professor from the University was explaining the visuals to the children.

During Sunday morning, drone races were held on the grass field in front of the FLUX building. A special track was set up and the racing drones reached speeds of up to 90 km/h, however, only a

few of them were able to reach the finish line. It was spectacular to see how smoothly the participants were able to navigate the drones and although there is still a long way to go until such races become technically mastered, the whole idea and its execution were extremely entertaining to watch.

During the entire three days of the festival, it was possible to order a drink at the drone-café situated between the MetaForum and

The one thing that cannot be missing on a large-scale event like the Dream and Dare festival is good food and drinks. The food choices varied from burgers to Italian food, from fish and fries to Suriname and Spanish dishes, from ice cream to pancakes. Apart from the so called 'Foodstock', a community lunch was organised in front of the MetaForum building where warm and cold dishes were tasted by 300 students, teachers and employees. At the same time the participants were entertained by a lottery and a quiz about the 60 year history of the TU/e, where some even received the challenge to present their vision for the future of the University.

Of course, such an important event can't be held without the presence of alumni and for that occasion, in the warm connection between the MetaForum and the Matrix buildings, a special "Alumni avenue" was created. There graduates of the University were able to engrave their names and year of graduation on the glass panels of the passageway. Alumni who have completed their studies as long as 25 years ago were present at the celebrations and in order for all of them to be gathered and 'inaugurated' in the "Alumni avenue", students with large balloons searched the campus for them during the event.

At 23:00 o'clock on the 23rd the celebration on the TU/e campus ended, but for those who had the opportunity to buy a ticket for the after party in Effenaar, the festival was just halfway through. Similar-

the Matrix buildings. Designed by a team of twenty students in a nine-month period, the café was the first in the world experiment which tries to test such type of technology in a real life situation. The devices were able to fly autonomously by the use of visible light which they could detect and which guided them from the bar to the clients. They were also able to scan the handwritten order of the client and subsequently, deliver the drink in a closed glass jar. In retrospect, the drone-café experience became the focal point of the festival because it provided its visitors with an exclusive sneak-peek into the future of non-human operated services.

The Dream and Dare festival was an unique event organized for the 60th anniversary of the Eindhoven University of Technology and most certainly, the people who joined the celebration will remember it with pleasure and joy. The theme of the festival indirectly refers to a future of eagerness and motivation, so let's hope that in the following years, everyone involved with the TU/e will follow their dreams and dares to challenge themselves in their utmost important life pursuits.

Johan Slob and Miryana Stancheva
MSc Student CME



ACME EINDHOVEN

INTRODUCTION

This year the CME alumni association “Association for Construction Managers & Engineers” (ACME) has been introduced. The association connects all the CME-alumni and aims to share knowledge in our field of interest and to strengthen each other’s network.



The kick-off event

On the 29th of May the ACME kick-off event was organized at Rijkswaterstaat in Utrecht. This was the first ACME event and has been regarded as a great success! With over eighty alumni present on the kickoff, the demand for an alumni network proved to be evident. As a response to the broad field of expertise of our alumni, a wide range of themes were discussed in the program.

The program started with an informal pub quiz which focused on the themes CME, TU/e and the construction sector. The main goal of the pub quiz was to get people out of their comfort-zone and meet new people. The most explicit example was the question about how Bauke de Vries drinks his Coffee, from which the answer wasn’t included in our multiple choice. However Bauke himself was able to provide us with the right answer.

After the opening and the pub quiz, the ACME café took place. During this café alumni could choose out of six different themes. In this way alumni could interact with other alumni and exchange knowledge, regarding their common interest. Each theme (Contracting, Future cities, Energy and Sustainability, Technology in the

construction sector, Cooperation in the construction sector, The alumni association) was pitched by one of our alumni, resulting in a statement or question to initiate a discussion. The groups then used their combined knowledge to tackle the statement and brainstorm for new ideas.

Between the first and second round of the ACME café, a debate regarding a few interesting statements, that concerned contractor, consultant and client, took place. During this session the alumni could debate and take a stand in favour of, or against the statement. After the debates the second round of the ACME café started, where alumni again could choose from the same themes, but now with different pitchers.

And, of course it wouldn’t be a kick-off event for our alumni association if there was no toast to celebrate. While raising the champagne glasses, we toasted on the broad interest in an alumni association, the successfulness of the day ,and of course the establishment of ‘Association for Construction Managers and Engineers’, our own CME alumni association! After the toast the program ended with a drink where everyone had the time to meet and greet their old study friends.





An alumni association, and now?

In order to share knowledge, invitations to events and jobs, a Linked-In is active for all CME alumni. If you are an CME alumni (graduated) we would like to invite you to join the Linked-In group. The CME alumni group is called Association for Construction Managers & Engineers ACME.

At the moment we are organizing our association, as the association representatives we aim to have a facilitating role regarding events. Each year we aim to have one bigger event (like the kick-off event) and several small events, initiated by the alumni themselves. We think that events organized from the bottom up will be most valuable to the alumni network, so if you have an idea to organize an event, please let us know!

Furthermore we have received a lot of suggestions from the alumni who were present at the event, regarding the tasks and the role of the alumni association. If you have any more suggestions please let us know.

You can contact us via LinkedIn or by sending an e-mail to ACMEindhoven@gmail.com

We want to thank all the alumni for attending the event, the representatives of the university and study association of CoUrsE! And finally Rijkswaterstaat for facilitating the day. See you at the next event!

Jakko Heinen;
Graduate MSc CME



Erik Wieringa;
Graduate MSc CME



Jesse Weerink;
Graduate MSc CME



CME Alumni and the Association:

- During the of CoUrsE! BBQ of 2015, the idea of the CME alumni association was emerged.
- Currently CME counts 306 alumni.
- At this moment 5% of the alumni is entrepreneur.
- Most alumni work at a construction firms, followed by consultancy firms.
- Heijmans is the biggest employer for CME alumni, followed by Arcadis and BAM
- Systems Engineering was the number 1 topic suggested by alumni for the kick-off event.

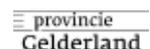
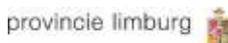


Association for Construct

Alumnivereniging van Construction Management



Design & Consultancy for natural and built assets





heijmans

tion Managers & Engineers

& Engineering, Technische Universiteit Eindhoven 2016





САНКТ-ПЕТЕРБУРГ

STUDYTRIP 2016

This year the Of CoUrsE! study trip committee organized an international study trip to one of the world's most emblematic historic places – Saint Petersburg, Russia. For one whole week the CME students who joined the trip had the chance to visit companies in the building sector, the Saint Petersburg Polytechnic University and also construction sites. In addition to the educational activities, the group of 21 students became acquainted with the city's wonderful architectural heritage, extraordinary history and rich culture.

The journey started by leaving Eindhoven on the 3rd of May to spend one exciting week in St. Petersburg, Russia. At 10.30 we met each other at the Schiphol airport to check in, hand in our luggage, and afterwards relax until the time to board the plane came. At that time unfortunately, we were not in a full team of 21 students as we were supposed to be because one of our fellow students figured out at the last minute, on the train from Eindhoven to Amsterdam, that he forgot to take his passport. Our beloved chairman of the 13th board had to travel back to Eindhoven from 's Hertogenbosch to pick up the document. Even though the journey started in such a hectic way, altogether there was no reason for worries because the travel committee of the trip made sure that everything went exactly by plan. So the group of 20 students checked in at Schiphol, passed the security checks and the message was received that due to an incident the train on which our lost member was coming to meet us at the airport would be significantly delayed. After many attempts to slow down the group, to delay the plan and to explain the situation to the stewardess, we left in a group of 20 students to St. Petersburg.

After a relaxed flight we arrived in St. Petersburg where we were picked up by a bus which brought us to the hostel. During this trip, our tour guide told us already a lot about the city and also emphasized how lucky we are with catching a good weather because the city of St. Petersburg counts usually only 60 sunny days each year. We arrived at the hostel and after the check in and the division of rooms, the group was ready to explore the city. What is the best way you can explore a city which you visit for the first time? Well, by having diner. Therefore, we decided to visit a restaurant where we tasted so special dishes from the Russian cuisine and experienced the Russian way of working. Although we wanted to order drinks first and the meals afterwards - since most of the Russians did not speak English, they could not understand what we exactly wanted. We ordered an appetizer and a main dish with the expectations that they will arrive in the right order, however, all dishes (appetizers and main course) were served together. Some of us started with their appetizers, while others received their main course first. The most unfortunate of the group had to wait quite some time until they get their order. After this initial experience we went out for a drink to celebrate, on the first place, that most of us made it to Russia.



The following day of the trip, May the 4th, the planned program began with already a full group of 21 students. Thanks to KLM our 'lost sheep' was able to join us from the second day on. Of course, no day can begin without a steady breakfast, so we went by the plan and visited the place that was initially booked but after realizing that it only opens at 9, we had to find an alternative. After all we visited a place, a 24 h bakery, which by selling us food made its weekly turnover in only 5 minutes.

On the schedule of that day a visit to the construction site of the Lakhta Center and a visit to the Renaissance construction

company were planned. After our breakfast we were picked up by a van of the company, which brought us to the construction site where we had a security check, waited for 15 minutes and were brought back to the van. We waited for quite some time before we heard that we won't be allowed to visit the construction site due to unclear for us reasons. Therefore, everybody went back into the van and we travelled further to the company.

our faculty's bar carrying the same name, was actually situated on a rooftop.

The third day of the visit, the 5th of May, the program started a bit later so we were able to have a lovely Russian breakfast at the place that we weren't able to visit the day before. This day a visit to the NHC company was planned. This company constructs the Western High-Speed Diameter (WHSD), the largest public-private partnership in the world in the field of road construction. The highway should solve the traffic issues of St. Petersburg.



At the company, we had a presentation about the Lakhta Center. The Lakhta Center is a project of Gazprom, the largest natural gas company in the world. The Lakhta Center, will be the tallest tower in Russia and Europe, 462 meters high and will be finished in 2018. During the presentation, the company explained how they organise the planning and the way of construction, using special cranes and building techniques. The company served us a good lunch after the presentation which ended with a Russian cup of tea. After the visit we made a group picture in front of the building and left back to the city centre.

We started off the tour with a brief safety instruction, after which we went for a walk on the completed parts of the motorway. The section that we visited first was a bridge which due to the narrow space, too small for the eight lanes planned, had two levels on top of one another. We went up to the top of the bridge by a small elevator and a few staircases where most of us couldn't stand straight in. Afterwards, we visited the rest of the project, where the eight lanes were situated on the same level. During the whole tour our guides explained a lot about the construction and about the challenges of the project. St. Petersburg has a lot of cold weather, but during certain periods the temperature can rise significantly. For

Since we didn't visit the construction site and had some time left, we decided to spontaneously explore the city. The bus driver was kind enough to drop us in the north of the centre so that we could walk back to the hostel, look around and relax for a while. In the evening we went out for diner and visited a SkyBar, which unlike





WINTERPALACE

the large steel construction of the bridge a lot of additional calculations were necessary in order to make sure that all parts fit with each other. In order to keep up with the planning, which by itself was another major issue for the company, the workers worked on the bridge 24/7, in shifts of 12 hours. We were explained that even under very cold, very warm, windy or rainy weather conditions, the work must go on.

After the visit to the university we went out for dinner. During this dinner, a music group asked the guests to sing something from the music bundle that lied on every table. Our group tried to entertain the rest of the guests in the restaurant by singing the only English song in the bundle full of Russian songs. This moment presented the "Yellow Submarine" (The Beatles) in an entire new perspective.



On Friday, May the 6th, we went out to visit the St. Petersburg Polytechnic University Peter the Great. Unfortunately, they sent us the wrong address (the difference between street and lane can have major consequences) so we were a bit late but by the time we finally arrived, they warmly welcomed us with drinks. Firstly, we started with a presentation given from Olga Krylova about the programs the university offers, both in Russian and in English. The TU/e has a contract with the university of St. Petersburg, so for those who are interested feel welcomed to ask. After this presentation we went to another building where some students presented their architecture projects. Those presentations were followed by a tour around the campus, different laboratories and a workshop.

After the tour and after experiencing the nice views from the top of the bridge, we went off to the next activity. A meeting in the Graduate School of Management (GSOM) was planned where a group of students held presentations about Smart Cities. The case they had was named "Innopolis City", which stands for "the city of the future". The idea behind it is that the city will be self-sustainable for the people that live, study, work and live there. If you finish the university in Innopolis City you are supposed to work here for at least three years in an already existing company, or start your own business. The idea also suggests that there will be no taxes levied in order to help entrepreneurs build the city. In 2030 the city should count 155,000 citizens, 60,000 of which are highly qualified specialists. After the presentation we had some discussions about smart cities with the students from the school. In addition to that, Stijn (chairman of the 13th board of CoUrsE!) gave a presentation about our education program at the Eindhoven University of Technology (TU/e). After that Geoff presented his master's thesis focusing on fast charging point for electric cars around the city of Amsterdam.

This workshop involved a mechanical laboratory with a lot of pressure machines, such as the concrete crushing test, steel split test and the torsion test. The thing that made this particular laboratory very interesting was the fact that all the machines, except





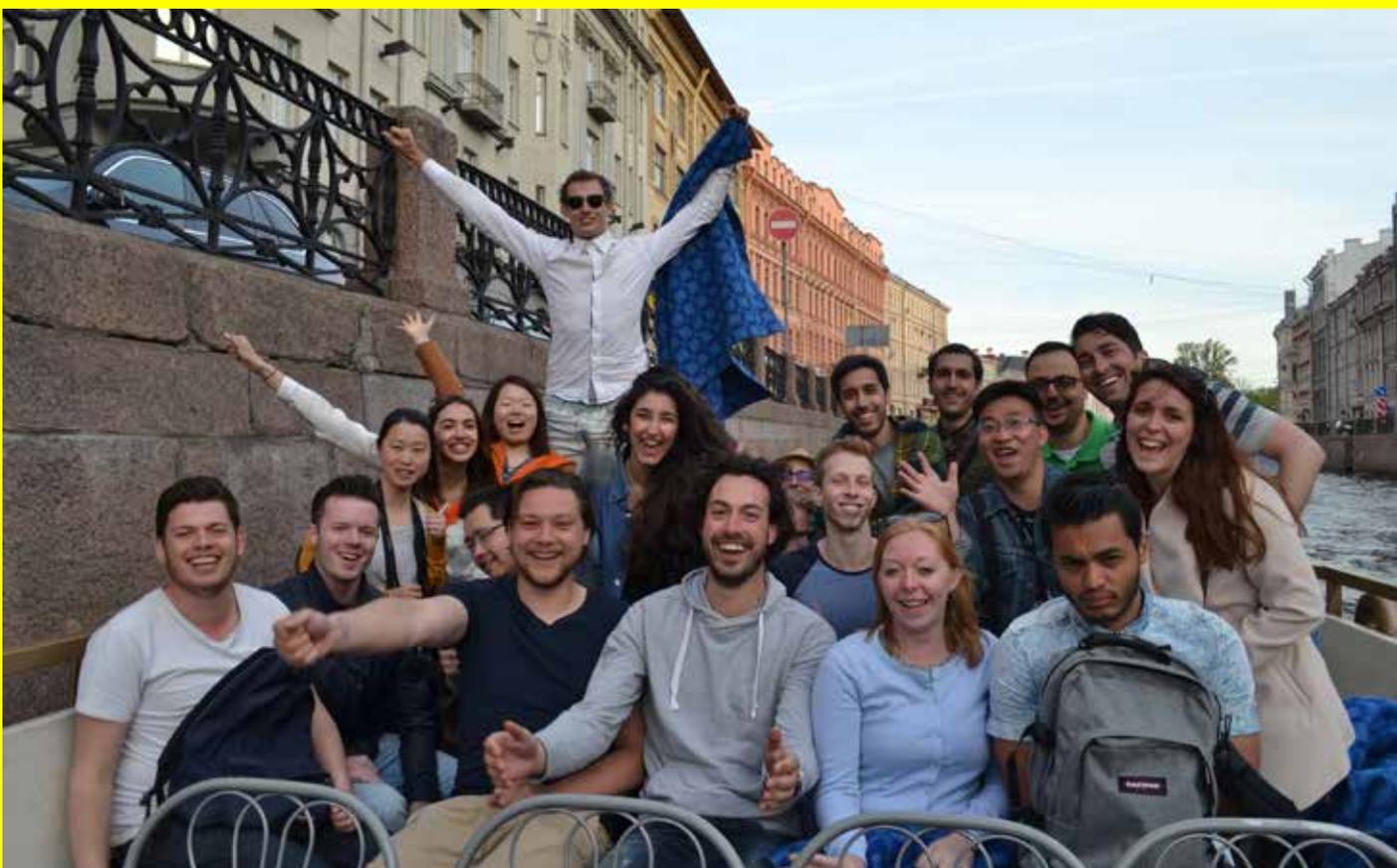
for one, were more than a century old and still in use. We finished our visit with a quick lunch in the university canteen because we had to go to our next activity.

We were picked up again by the van of the Renaissance company for another presentation. The presentation was given by Mr. Bora Basok and was related to several projects a few of which were situated in St. Petersburg. One of them even involved a Dutch Company (van Oord) and was consisting of the development of a new residential project on a reclaimed land near the seashore. During the presentation there was a lot of interaction, movies, pictures and interesting information. Because all good things come to an end, however, we left the company for the last time. The van of the company brought us back to the hostel so we could go out for dinner.



The committee discovered a really nice restaurant close to our accommodation, called Mickey&Monkeys. The restaurant was quite modern and had good food choices, however, we had a deja vu because there everything was served in a mixed up order, which was a reminder that we were in

a very different cultural environment than we are used to. Another amusing part was that everything we ordered was displayed as an individual item on the bill, which resulted in the longest bill of the trip (>1 meter).





ROOFTOP CLIMBING

On the first day of the weekend, the second last day of our trip, a lot of cultural activities were planned. The first thing in the morning, after the lovely breakfast, we went out for yet another city tour. Unfortunately, we missed the guide, or there was no guide, or due some other mysterious reasons the tour did not happen. The group split up, and in smaller groups we started to do the tour with Wikipedia as our guide. So after all, we did not miss the highlights of St. Petersburg: The Admiralty Building followed by the Bronze Horseman. This is an equestrian statue of Peter the Great made in commission of Catherine the Great. The statue pedestal is the largest stone ever moved by humans. It weights around 1,500 tonnes. After this great statue, we moved further to Saint Isaac's Cathedral and of course the Church of the Savior on Blood. In the afternoon the

group gathered in the park next to the Hermitage to pay a visit to this famous museum. We admired the exhibitions, rooms, halls, art and decorations for almost three hours. The time we had there was way too short to see everything but it is good to have something to come back for.

The day was almost towards its end but the committee had another activity planned! As a compensation for the situation in the morning, we went on a boat to see the city from another point of view. During the boat trip, we sailed through a maze of canals and enjoyed amazing views of the city. After this trip we were tired but satisfied, so we ended our day with a good meal.

The last whole day in St. Petersburg was of course again filled with activities. A small change was made in the program so that we were able to visit the Peterhof Palace. To reach the Peterhof Palace we had to take a high-speed ferry (we measured over 60 km/h) which was already a great experience and 40 minutes later we arrived at the desired location. The Peterhof Palace was the summer residence of Peter the Great (the Hermitage was the winter residence) and the highlights of the place were the famous Samson Fountain and The Grand Cascade. After a few days in the city itself, it was nice to be in the fresh air, in a close proximity to the beautiful gardens and buildings. The morning ended there and we felt that we had to go back for a 'rooftop experience'.





diner and thanking the committee for all their hard work and effort they put in making this trip a (Peter the) Great success. Monday, the 9th of May we packed our stuff and had some time to buy souvenirs. This day was also known as “victory day” in Russia and the Russian people celebrate the end of World War II. Due to that, the streets were extremely crowded. Also a lot of parades were held. At 14:00 the bus from our arrival picked us up at the hostel and to keep the tradition, this time we were again with 20 instead of 21 people heading towards the airport. Luckily for us, we were complete on the airplane, so after all 21 students from Construction Management & Engineering made it to Russia and back in one peace.

In the afternoon the committee found someone who did rooftop tours, where we should have a nice view over the city of St. Petersburg. This tour was a bit strange, since it was not some kind of a fancy hotel/bar on the rooftop of a building but rather a tour on the top of some old apartment buildings, where we had to move between the chimneys, phone wires and satellite antennas. Of course, this was a perfect location for another group picture, but since we're all engineers, we thought it was maybe not the best idea to sit/stand all at the same spot, but we managed to make one. After everybody had taken their pictures we had to leave the roof for our trip back downstairs. This trip started by crawling through a very small window in the roof, for some very exciting, because the roof was quite steep.

After this experience we all needed a drink, so we visited the vodka museum. We had a small tour where everything about the history of vodka was explained. The foundation, the different types of glasses, the times that vodka was forbidden in Russia and all the other information that you possibly can know about the Russian beverage. After the tour it was time to taste three types of vodka together with a small typical Russian appetizer. Unfortunately, with the visit of the vodka museum, the exciting week in St. Petersburg was completed. For some of us this was a big relief and a reason to drink another vodka to that. The only thing to do now was having

Hereby, we want to thank all participants and a special thanks to the committee for the effort they put in making this trip possible and for the good time we had in Russia!

The 'Of CoUrsE! Tour 2016' committee: Marianiki Kravari, Patricia Diaconu, Ivan Klop, Mario Santamaria and Fran Bernal

Johan Slob
MSc Student CME



Transparency in Building Processes

Dr. Gamze Dane – Assistant Professor, Information Systems in the Built Environment

Building projects are complex tasks. They are done in collaboration of several stakeholders from different backgrounds to perform many processes such as to plan, design, build, operate and deliver the building. Above mentioned stakeholders can be architects, engineers, contractors, construction managers, owners, building users, operators and governmental agencies. During a building process, all these stakeholders should understand each other's expertise, intentions and actions. Therefore, the collaboration and communication between the stakeholders are important because a miscommunication or distinction between them can cause delays in the process.

The recent concepts such as sustainable or green buildings adds more complexity to the building processes. Because such concepts involves different criterion and different requirements for time, money and quality measurements. As a result of that, new stakeholders are involved in the building processes and also the expectations from the existing stakeholders differs. Such developments can cause problems between stakeholders as the expertise of stakeholders may not be known to others or the new tasks are not well defined for existing stakeholders.

Due to the complexity and occurrence of unfamiliar situations in the building processes, transparency has become an important concept as a solution. So that stakeholders can perceive and understand the aims, goals, rules and circumstances of the project and actively participate during the project. Therefore, transparency requires correct and timely flow of information within stakeholders. This information can be documentation of the project such as drawings and specifications, physical and virtual 3D models, budgets and invoices. It can also be information about the sequence and organization of the process itself such as schedules, organization charts or responsibilities matrices. By using such information, the increased participation among stakeholders is enabled in the building process.

The transparency of the information in the building process can be provided by means of several tools. One of these tools is "process mapping" which is used for visualizing work processes by showing how inputs, outputs and tasks are linked. This visualization is done by flow charts and diagrams. A process map stimulates the understanding about how work is done, which major steps should be taken to produce an output, who performs the steps, what problems consistently occur and how to solve these problems. Process mapping not only allows us to understand where a change in processes will have the greatest impact on improving quality but also where we are at the process and how we got there. Since it is not possible to define a new plan for a change without knowing where to begin.

Another tool that can be used for information transparency is "Building Information Modeling" (BIM). BIM is a tool that depends on smart models to generate and manage construction projects. It represents a way of technical communication in construction in a way that everyone (stakeholders, project construction and design team members) that is involved in the building process can understand the project. Because using BIM during a project assists all stakeholders to monitor the project status in different phases. By

providing accurate and accessible information/data for all stakeholders, BIM increases the transparency in building processes and empowers project stakeholders to make better-informed decisions and respond quickly to project needs.

Apart from above mentioned tools, generating information both quantitative and qualitative together with the stakeholder knowledge contributes significantly to improved understanding and increased transparency. One of the ways of doing this is using "Multi-criteria decision analysis" (MCDA) which are proposed as a method to enhance stakeholder involvement in management and to facilitate decision making of complex problems. MCDA helps the users dividing the decision into smaller and more understandable parts, analyzing each part and integrating them to make reasonable solutions. For group decision making, MCDA allows groups to talk about their decision possibilities for an existing problem and makes them understand the attributes that are valuable for each stakeholder. This approach overcomes the limitations of unstructured individual and group decision making by providing decision transparency.

All these tools empower recognition of the project status, problems, responsibilities and interdependencies for building projects and enables understanding, feedback, communication and improvements during the processes. Therefore, transparency can be enabled which leads to reduced uncertainty and costs, and build consensus among stakeholders.



dr. Gamze Dane
Assistant Professor TU/e

Communication is the key!

Nick Waterman – Consultant, DPI

We create new building structures which have to be taken down before completion, we think we can fulfill new contract forms by using old methods and we are able to misjudge the risks that are involved in both small and large infrastructure projects... We are speaking the wrong language!

“What do you mean?”

One of the main reasons for the mentioned above is the miscommunication between the people involved in the building process. On one hand, the roles between the involved parties in the building industry change. Before the new contract forms (UAVgc and performance based contracts), the client used to put up a set of requirements and in most cases, to make a preliminary design based on these requirements. The task of the contractor was to build the project, which was in fact designed by the client. So there was a clear separation between design (DNR2005) and construction (UAV '12).

After the introduction of the integrated contracts, the client takes a more directing role and interferes less with the building process. The client still puts up a set of requirements, but the design process is handed over to the contractor. To be able to control the project objectives and to manage the quality aspects, clients use System-based Contract Management (SCB). This means that the client tries to control the design and construction process by performing several audits on products, processes and the quality system of the contractor. Although this sounds quite straightforward, practically it gives a lot of frustration at both sides.

First of all, clients find it difficult to specify the structure and to allocate this design into the right requirements in the early stages of a project. Furthermore, they often do not have the required knowledge to make a correct judgment about the essential products and processes to fulfill the project objectives. This makes it difficult to ask the right questions to the right person at the right time. On the other hand, contractors are not familiar with the quality system as demanded by the integrated contracts and find it difficult to prove that they meet the contract's requirements.

In order to understand each other, both client and contractor need to start the dialogue. It is important that in the early stages of a project both parties have the same ideas about the outcome. Questions like “What products are you going to deliver?” and “What do you intend with this requirement?” need to be a common practice. It is important that both parties are transparent, that they learn from each other and that they point out deviations to each other. Do not only follow the contract's requirements exactly, but use it more as a guideline to achieve the best outcome for both parties. Not only the contractor benefits from a well-organized quality system, but also the client can profit from it.

“What do you need?”

Nowadays, infrastructural projects get more and more complex. To meet the expectations of our clients and to measure up to the requirements, we create (large) interdisciplinary teams. These teams consist of persons who are experts within their own niche and find

it therefore difficult to take a helicopter view on the entire project. Furthermore, it is possible that different contractors are responsible for different stages in the building process. This means that information needs to be exchanged during the overlapping phase. This requires excellent conversation skills from all contractors. Therefore, the key in this process is to start the communication between these experts in order to create the right environment for consultation.

“Let me explain!”

DPI acts as an interpreter in the building process. We are familiar with all parties within the building process and therefore, we understand what is needed to implement SCB in a correct way. We help clients with describing the project objectives and allocating the project requirements. We show contractors the essence of SCB and try to convince them that these audits are not tests of the client but opportunities to improve their already well organized business.

DPI creates the environment for consultation by letting the experts talk. In LEAN- or Brownpaper-sessions the experts get aware of the total scope of the project. They explain to each other which information they need and at what time they need it, in order to complete their assignments. By organizing these sessions on a periodic base, risks and possible bottlenecks in the design or optimization come to light in an early stage. This makes it easier to prevent the project from exceeding both planning and budget.

These modern contract forms need an input from the work field in order to be fit for their purpose. Clients as the Department of Public Works (Rijkswaterstaat) and municipalities ask contractors to help them in achieving this. Together we can create a building environment which suits us all. If both clients and contractors learn to be more transparent in their activities and recognize opportunities during the process, this new way of contracting could be more profitable than the traditional contracts. Transparency is needed to create respect for each other's interests and thus, to trust each other during the process.

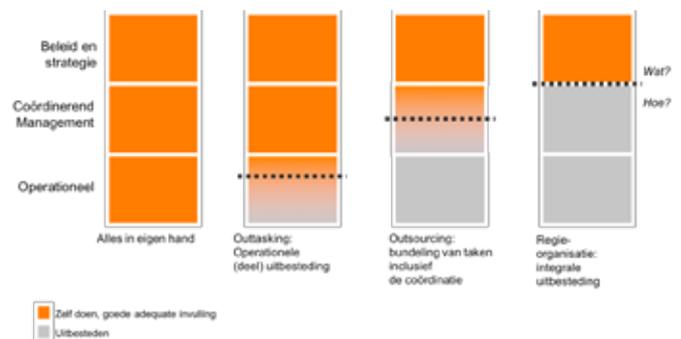
Communication is key!

Nick Waterman
Consultant, DPI



Twynstra Gudde has considerable experience in executing integrated facility scans for organizations wishing to be an integrated facility organization. When is a company qualified to be an integrated facility organization? To answer this question we offer a integrated facility scan based on the following three perspectives:

- **Maturity:** is the facility organization capable of successfully undergoing the transformation?
- **Effectiveness (quality):** To which extent do the services meet the goals? Does the facility organization contribute to the success of the organization as a whole in terms of, profitability, client- and employee satisfaction or other factors?
- **Efficiency:** is there optimal use of resources?



Determine the maturity

We use our *Facility Management Maturity Model® (FM3)* to measure the maturity of the organization based on seven aspects:

- **Strategy:** does the facility organization have its own mission, goals and strategy and is it regularly monitored?
- **Initiatives:** is there a good relationship between the facility organization and the client in pro-active initiatives? Is there room for manoeuvre (for example responsibility, focus on the market) and do they have the competences to be successful?
- **Organization:** is there a balance between the hard aspects (strategy, structure, systems) and soft aspects (employees, culture, management style) within the organization model and are these sufficiently developed?
- **Management:** is the company well organized (e.g. financially/economically/governance) Are the reports, budgets and management structures sufficient?
- **Processes:** are the processes clearly documented? How are projects managed? Is the organization aware of the complaints, requests and errors, and are they being followed up?

- **Change:** how much experience has the (facility) organization with organizational change? Is change a conscious process? What is the learning ability of the organization?
- **Environment:** is there active environmental management? Are the developments, experiences and expectations of the internal and external stakeholders managed?

The aspects are judged on the basis of a number of detailed questions. These are discussed with the facility organization management.



Determine the effectiveness

A customer satisfaction survey can show the effectiveness of the service (a combination of customer value and the satisfaction with that service).

Items measured which are important to the customer include complaints, professionalism and customer service.

Combined with the output of a benchmark study, this results in a clear vision which can be used for further communication with both clients and suppliers.

Determine the efficiency

It is important to have a clear vision on the following aspects which determine the level of cost:

- Characteristics of the building portfolio (e.g. size, distribution, age)
- Capability of the organization to plan upfront and control the overview of level and quality of demand
- (Quality)level of services.

Benchmarking clarifies and inform us about the performance- and costlevel as well as processes within an organization. By comparing your own level with a relevant reference group, it is possible to determine how efficiently services and housing are organized.

When is an integrated facility ambition appropriate?

To answer this question we use an assessment framework.

- *Size and complexity*; if the facility organization is relatively small and simply organized, an integrated facility organization is not possible due to the explicit division of demand and supply.
- *Degree of maturity*; if the necessity and/or the ambition exists, are the conditions and competences sufficient for a integrated facility organization?
- *Performance and efficiency in control*; if the business is transparent and the governance is well organized, effective outsourcing is possible and the integrated facility organization has management information which is relevant for the specific customer demand.
- *Effectiveness in control*; the combination of an external benchmark (efficiency) and customer experience (subjective effectiveness) provides strategic level tools to improve the overall effectiveness of the support.

Meer weten?

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