Magazine for Construction Management and Engineering

INTERVISIE

February 2016 | Number 24 | Volume 13

RESHAPING THE FUTURE

Once in a lifetime projecten

Bij AT Osborne ben je dagelijks betrokken bij *once in a lifetime projecten*. Van de Noord/Zuidlijn, het stationsgebied in Utrecht en Beter Benutten tot de renovatie van het hoofdgebouw van a.s.r. Verzekeringen en het nieuwe Martini Ziekenhuis in Groningen. Samen met collega's werk je samen aan spraakmakende, maatschappelijk relevante thema's en boeiende projecten.

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EDITORIAL

Colophon

General
!ntervisie is a publication of of CoUrsE!, the study association of the master track Construction Management & Engineering (CME) at the Technical University of Eindhoven.

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Contact
of CoUrsE! Study Association CME, TU/e

Vertigo vloer 2
Postbus 513
5600 MB Eindhoven

Telephone +316 189 720 81
Website www.ofcoursecme.com
Email info@ofcoursecme.com

Dear members and relations,

With great pleasure we present you the 24th edition of the !ntervisiE Magazine. As always this edition is packed with informative and interesting articles. This edition contains all the traditional topics, including testimonies from CME students and alumni, the CME Annual Conference, companies' articles, and much more. This year the CME conference was a 3CME symposium and was organized by the study associations of TU Eindhoven, TU Delft and University of Twente. The CME students of all three Universities met in the Auditorium of TU Eindhoven for a trip to "Destination Innovation", a detailed description of this phenomenal event is available in this magazine.

The subject of this !ntervisiE is "Reshaping the Future" which was chosen because current innovations (Big data, BIM, 3D printing, Smart city movement, etc.) are reshaping the traditional way of doing things in the construction industry. With the rapid rate of new technology, engineers are striving to use the technology to automate the construction processes with the end goal to optimize the quality, the efficiency and ease of these processes. Additionally, competitiveness is slowly turning into collaboration. Companies are now even working with their biggest competitors to create more sustainable and better quality end products.
As you will see, the articles from the different companies were picked to be in line with the theme of the magazine. A very interesting interview was held with the director of Railinfra Solutions vof and pmc-leader Railinfrastructuur. Hendriks gives us an overview of their application of BIM in the field of collaborative engineering. And KAW explains their take on the negative changes in the building industry. This and much more is waiting for you to read in this amazing magazine!

At last we want to thank everyone who contributed for the creation of this edition of the !ntervisie. For all readers: "Enjoy reading this magazine!"

Kind Regards,
The !ntervisiE committee

Chief Editor !ntervisie | **Xaief Ezechiels (middle)**
Editor !ntervisie | **Geoffrey Ward (left)**
Editor !ntervisie | **Tymen Pater (right)**

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TABLE OF CONTENTS

of CoUrsE!

Construction Management & Engineering

Reshaping the Future

NEWS AND ANNOUNCEMENTS

While the new school year has almost just begun the Year 2015 has just ended. In this year, like all past years, of Course! worked hard to provide the CME students (and enthousiasts) with a number of educational and recreational activities. This edition of the Intervisie magazine "News and Announcements" covers the events the study association organized and will from the start of the school year 2015/ 2016. If you're curious about future events stay updated by subscribing yourself for the of Course Facebook page. If you have an idea for an event, we invite you to pitch it to us in our corner, on any given day, on the fifth floor of Vertigo.

New Committee

September 14th, 2015

A new school year brings new beginnings. This year started off with the installation of the 13th board of the CME study association of Course!

From left to right:

Raúl Panohaya Gómez	Secretary
Claudia van der Graaf	Commissioner of Activities
Yonne Rekveld	Treasurer
Sofia Tzouli	Commissioner of Education & Intervisie
Stijn van Enckevort	Chairman
Jens Boersma	Commissioner Public Relations

On the 14th of September the 13th board was officially installed with the traditional "Constitution Drinks". Here CME students had the chance to wish the new board "good luck!", by drinking a beer with them. After the drinks the old board treated the new board to dinner, where they gave the newbies some tips and pointers.

Kick- off event: the CME Bowling Night

October 6th, 2015

The annual bowling night is the traditional kick-off event of every new CME board. This event started with pizza and a beer on the fifth floor of Virtigo. In this way of Course prepared the CME students for what was to come.
At the annual bowling night CME students challenge each other for ultimate glory, for the winner gets the CME bowling trophy. On this night, twenty five of the best CME students took part in this fierce battle. The night was long and fun, but like all battles there could be only one winner. This year's champion is Melvin "the Great" Melzen! Until next year Melvin has the privilege to keep our trophy safe.

Glow Evening Route 2015

November 11th, 2015

the 11th of November, 2015. The event, which was GLOW's 10th anniversary, is all about 'Light Arts' revolving around the theme of Nature and Architecture. This year's route took spectators through the city center of Eindhoven and looped through parks and buildings. Along the nearly 5 km route, a seemingly endless display of unique projects lit up the city. Notable projects were: 'Diplopia', a 3D light show projected on Catharinakerk, 'Large Fire Tornado', which is self-explanatory, and 'Inside Out: The Cathedral' using light to make the outdoor space feel like an indoor space ,and the breath-taking 'house of light and music' in the Stadshuisplein. If you missed this year, don't worry, there is always next year!

The CME Symposium

November 25th, 2015

Destination Innovation, a Roadmap to the Future

The symposium is equivalent to the yearly CME conference. Every year a conference is held separately on each university, organized by the CME association of that university. This year the associations worked together and organized the "Destination Innovation, a Roadmap to the Future" symposium for CME students of all three universities.

The symposium took place on Wednesday the 25th of November in Eindhoven. The symposium was a great way to explore the innovations in the Construction business, and meet ambitious students of fellow Universities.

Make sure to check out page 16 for a full recap on this spectacular event.

New Years Pub Crawl

January 7th, 2016

The end of the year 2015 meant the beginning of 2016. A new year filled with new opportunities and new possibilities. In celebration of this fresh start Of Course! and SERVICE teamed up for the "new year, let's drink beer!" pub crawl in the famous Stratumseind bar street of Eindhoven. The crawl took place on the 7th of January 2016, and marked the first of many collaborative events with the study association SERVICE.

Around midnight most people drank their last beer. Some called it a night and went home, while others proceeded for more and continued the night somewhere else.

CME ABROAD STUDYING IN ...

Alex and Tessa

STOCKHOLM | SWEDEN

Stockholm | Alex Jacobs, Tessa Voorwinden

It was on a Thursday, somewhere in November 2014, that we were standing in the SkyBar! Underground. While we were having a beer, Tessa very enthusiastically said she decided to go on exchange in Sweden, and added quite jokingly that I should go as well. Within the heat of the moment I said yes, with the impression that she was joking.

We had this exact same conversation, within the same environment, several times in the following weeks. For Tessa it still felt like a joke, but I started to seriously think about going abroad, about going on exchange. And when the deadline for subscription was there, I was convinced to go.

Very conveniently Tessa already did a lot of research what university would be a good choice. The most important requirements were a good level of education and that the courses would be in English. Within the shortlist the KTH in Stockholm was the best option. Arranging the application was quite easy in comparison with the choice of the courses. There were a lot of options but in the end we chose basically the same courses. Besides that, we were put in the same student accommodation by the KTH as well.

The accommodation was previously a nursing house in the village Farsta, south of the city center of Stockholm. It takes 45 minutes with the subway to go to the university. That was a bit of a downside when after arrival, but soon there was the understanding that we should be very lucky to have some arranged accommodation at all. The Stockholm rental housing market is close to non-existent.

The first few days were all about meeting new people and by all sorts of activities knowing them better. In the first month there were a lot of fun things to do, study wasn't that intense yet and also the weather was great. From pub-crawls to sightseeing in Stockholm and Uppsala. From Octoberfest to hiking true Tryesta National Park. From movie premieres to kayaking, we did it all (and even more) with the new group of friends from the Farsta student accommodation. Anyway, after that month some intense study time was needed, but there was the knowledge some trips were going to be made.

The courses themselves turned out to be a good choice. With 'Swedish Society' we learn about the culture, habits, and famous things in Sweden. But also do a lot of trips to museums and special neighborhoods. The course 'Smart Cities' is a nice extension on the knowledge already conceived from the CME master. Besides these mutual chosen courses there were also some individual chosen courses that meet our interests.

Meeting new people while being on an exchange turned out to be very easy. Everybody is new and tries to find new friends. Now it is really nice to know people from all around the world. Comparing all kinds of cultures, experiences and ways of life really is a great added value of an exchange. Sweden itself is a very beautiful country were nature is still widely available and almost everywhere. Even in the cities there is place for water flows and trees.

There were also other students from our faculty that are studying in Sweden. We managed to get a group of 6 people together in Stockholm and had a little Eindhoven reunion. It may be a very obvious thing but all of us considered Sweden as one of the most beautiful countries and we would really recommend everybody to go on exchange for at least one time.

Cheers!

Miryana Stancheva

EINDHOVEN

The Netherlands | Miryana Stancheva

From Bulgaria to Eindhoven

My interest in the built environment began at an early age, due to the fact that I grew up in a small provincial town and therefore the urban landscapes of the big city have always fascinated me. Following my interests, right after graduating from high school, I decided to move abroad and start my Bachelor studies in architecture at the Bauhaus University in Weimar, Germany. After working for six months at an architectural practice and being able to observe and communicate with professionals, however, my interests in the field started to shift in a slightly different direction from the architectural design and planning. I realized that I was very intrigued by the ways a construction project is implemented, by the processes involved in its realization and by the subjects of sustainability and energy efficiency. These interests I mainly owe to the crucial differences between the building culture of my native country - Bulgaria and the one I witnessed in Germany. The strictly strategic and well-though-out approach of planning not only highly efficient buildings but also functional urban infrastructure and public spaces was something new and exciting for me. After completing my Bachelor studies, having discovered my inclinations towards more technical and managerial subjects, I started my second internship in construction management at BAM Germany AG (BAM Construct). This to a great extend influenced my goals for the future. The constant collaboration with engineers, managers, contractors and quality surveyors gave me a great insight in their areas of activity and helped me choose the direction of my upcoming education. The new set of skills that I acquired at the company comple¬mented the knowledge, gained during my architectural studies and created a strong foundation for my professional development and growth and the possibility to objectively assess my choice of master. Working at a Dutch-based company allowed me to also receive an insight in a different working culture and prompted me to consider the possibility of continuing my education in the Netherlands.

The master's degree in CME at the Eindhoven University of Technology drew my attention after an extensive research for postgraduate programs in construction management with not only managerial but also economic and techni¬cal focus. The reason for my appreciation of the 3TU program in CME is the variety of courses, which cover a broad spectrum of fields, allowing the students to take an active role in directing their studies towards the spheres of their interest. Coming from a country, where the construction industry needs not only professionals, who understand the complexity of processes involved in it, but also people with deep knowledge of technology and innovation, the incorporation of courses such as Systems Engineering and Process Modeling and Innovation Management is one of the great advantages of this degree for me.

Prior to coming to the Netherlands I expected to experience a sense of similarity with the lifestyle I had in Germany but I couldn't be further from the truth. The short travel distances between cites, the typical Dutch architecture and of course the enormous width of the bicycle lanes were the first impressions I got from the country. In no time I had to adapt myself to using a bicycle as my main means of transportation and I had to get used to the surprises the weather sometimes might bring. As in my native country – Bulgaria the temperature amplitudes in summer and winter might vary significantly (from +42 to -30), in the Netherlands I was pleasantly surprised to discover that the climate is mild throughout the whole year. Another aspect of the country, which I found quite intriguing was the extent to which people from all ages and backgrounds are able to freely communicate in English.

My start in Eindhoven can be described as an unendless sequence of positive emotions due to the outstanding organization of the introduction weeks. I was amazed by the amount of events which we attended, varying from informational to recreational, the thoughtfully planned activities and the numbers of students volunteering in the whole process. I couldn't wish for a better start of my studies as I got to know a lot of Dutch and international students and was able to make friends from the very beginning.

Two of the main assets of the Eindhoven University of Technology in my opinion are first of all the numerous student organizations which one can join and second of all the sports center and the broad scope of activities which it offers. The student organizations on campus vary in terms of size, goals and activities they organize. Some of the associations are linked directly to specific master tracks, some involve students of a particular department and others such as the sport associations gather students from all different backgrounds. The university sports center is the biggest in the Netherlands and is one of the most preferred places of the students for recreational activities.

Currently I am at the very beginning of my second quartile but so far I can say that I am confident that I took a good decision by choosing the CME Master-track in Eindhoven. I find the lecturers and the persons responsible for my program to be very involved in providing a quality education and also to be very cooperative and approachable. Although my studies are conducted in English I found it important for myself to invest some time in learning Dutch, so I joined the classes provided by the university. It can be extremely helpful to have a knowledge of the native language, especially in case you decide to work in the country, so I can definitely recommend the internationals to try learning it.

For the upcoming two years I have set high expectations for my studies in terms of acquired knowledge and skills and in terms of achieving a good overall performance. The international environment at the TU/e is a prerequisite for meeting and interacting with a lot of interesting people and thus having an undeniably enriching experience, which makes me even more motivated to obtain my Master of Science Degree here.

GRADUATION THESIS

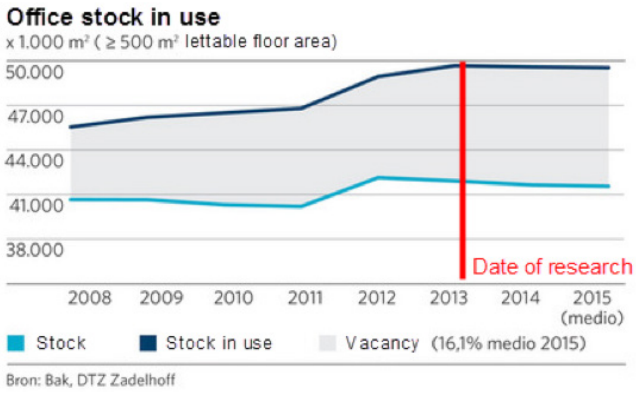
MARK VAN SWAM

Potential Transformation of Vacant Offices into Housing for Young People

Optimization of Decision Making Process

Vacancy and re-use are both actual issues of today where commercial parties are struggling with. What to do with it? Depreciation and take your losses? Temporary re-use, wait until better times, demolition or permanent transformation? There can be concluded that an owner of vacant real estate can make a plan to tackle the current situation or can choose to wait, and to give up control. An appropriate statement would be "Winners have a plan, losers an excuse!".

A small oversupply on the office market is necessary to react on the dynamic working of the market. A healthy vacancy rate should be around 5-7% of the stock. It is well known that the vacancy rate in the Netherlands is unhealthy for several years. To indicate the size of this problem we have used figures from 2013. At the time the office stock in the Netherlands consisted of 49,4 million m² of which 7,3 million m² was vacant. This means a vacancy rate of 14,7% (more than double in a healthy situation). It is important to keep in mind that this problem was/is still growing.



This imbalance can be explained due the fact that the labor force stops growing, the new way of working is gaining popularity and the surface area per workplace per employee is decreasing. In order to prevent extended vacancy, it is necessary that a substantial portion of the outdated stock on the market will be removed. One way to do this is through transformation of vacant real estate.

Problem definition

During my graduation research I've developed a Decision Support Tool that supports an investor in an early stage of the transformation process to get a justified answer to the question if transformation of a vacant office is (financially) feasible. I have done this research under supervision of prof. dr.ir. W.F. Schaefer, dr.ir. B. Glumac and dr.ir. B. van Weenen, and performed this project at Camelot Leegstandbeheer & -Advies.

For an investor, such as for example Camelot, it is important to distinguish vacant buildings with potential for transformation as early as possible in the process. This is important because feasibility studies during the initiative and definition phase need a large investment of both time and money, while there is no guarantee for success.
An investor has the goal to optimize the exploitation of vacant offices by maximizing returns and minimizing risks. A large amount of vacant real estate is available for transformation, but an investor must determine quickly whether a vacant office is suitable for other purposes and if transformation is financially feasible. A lot of different factors collectively determine the possibilities and potential of transformation. An important conclusion is that transformation projects only are successful when the new function(s) provide in need. The supply must match demand.

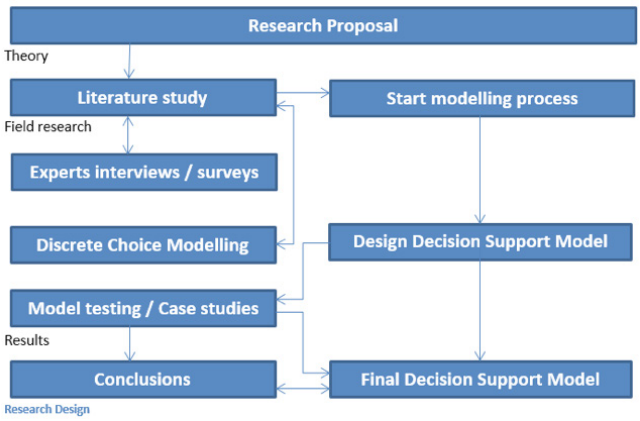
The main research question during this research was:
"How can the process of assessing suitability of vacant offices for transformation into housing for young people be optimized?"

During the research I have provide an overview of the most important factors and barriers that influence the transformation potential of vacant offices into housing for young people, from both supply and demand side. An important note is that financial feasibility plays a crucial role in the investing decisions of companies and investors.

Research Methods

The theory defines a conceptual process in which financial feasibility is crucial for the feasibility of transforming vacant offices. This research is focused on potential transformation of vacant offices into housing for young people. This

suitability is evaluated on several factors: potential tenant (target group), suitability of the building (location and building) and financial feasibility. The output of the study is a Decision Support Model that gives insight on the feasibility of transformation based on a financial feasibility analysis (DCF). The tool allows an investor to make a quick but substantiated study at an early stage of the transformation process.



Literature study
The first phase of this research starts with a literature study related to vacant offices and possibilities of transformation into housing for young people. The decision making process of investment in vacant real estate and the actual transformation process will be investigated to detect challenges and opportunities. The key factors in the transformation process and their possible impact will be obtained.

Discrete Choice Model
The second phase relates to understanding of the target group preferences. Therefore I have used a Discrete Choice Model (experiment). The discrete choice modelling approach requires that a representative sample of customers, in this case 260 students, make choices in simulated situations derived from realistic variations of market offerings. The responses of potential future customers are used to identify empirical key patterns, providing a relative weighting for each driver.
With this information it is possible for developers to select the optimal combination of attributes to develop a profitable and sustainable value proposition that, under normal competitive constraints, will maximally leverage their available resources. Based on the outcomes of this part the Willingness To Pay can be determined. This is the amount of money that the consumer is willing to pay for a certain alternative.

Pairwise Comparison
Multi-criteria assessment will be used in the third phase since no single criterion can adequately address all the issues involved in complex decisions of this type. This scientific methodology is used to rank the multiple factors and issues on the basis of influence and importance. For example: MCA can add scores on economic, environmental and social criteria together. The goals of the MCA are organizing data, giving more transparency to the decision making process and supporting decision makers. Therefore pairwise comparison will be used. A questionnaire for experts was conducted in which the experts have to evaluate the most important attributes, arising from the literature study, among each other.

Case study
Based on all obtained information a Decision Support Model was developed so that the decision making process regarding transformation of a vacant office is as efficient an low-risk as possible. The Decision Support Model is evaluated and validated by working out a case study. The results and process were subsequently evaluated by experts of Camelot.

Results
Not all vacant offices are suitable for transformation, so it is not realistic to expect that the vacancy problem will be completely solved by this way of removing (outdated) vacant offices from the market.
In this case the potential of a vacant building is observed from both perspectives, demand and supply side. This ensures that the process of assessing the vacant building is more efficient.
Financial feasibility plays a central role in the investing decisions of investors. In the developed support tool financial feasibility is determined according to the Discounted Cash Flow (DCF) method. Hereby the (potential) future rent is based on Willingness To Pay (WTP). And the necessary investment is based on a cost indicator which is justified by the use of a Pairwise Comparison experiment.

Target group preferences
It is remarkable that not the high level of price but attributes as shared facilities, semi-private facilities and no outdoor space have the biggest negative influence on housing choice behaviour. The attributes as private facilities, apartment and garden have the biggest positive influence. Of course this is reflected in the WTP.

Supply side
Functional and technical are the most important categories in terms of transformation potential according the surveyed experts. From a functional point of view, the criteria expansion possibilities and flexibility are the most important. From a technical point of view, the criteria state of construction and asbestos. Criteria that have very little influence on the transformation potential are the category cultural and the criteria Administrative support under the category legal.

Financial Feasibility
At the end of this study the results of the research on both demand and supply side are translated into costs and revenues, by which the financial feasibility can be tested in a Discounted Cash Flow analysis.

By using the developed support tool, the assessment process regarding the potential of vacant offices for transformation into housing for young people can be optimized. This means that quickly can be determined whether a vacant property is suitable for transformation or not.

3TU-CME Master's Thesis Award

on June 16, 2015 I received an email stating that I was nominated by the professors of the TU/e as one of the three nominees for the 3TU-CME Master's Thesis Award. I was pleasantly surprised, and after some research I found out that this Award is created 'to give excellent graduation work of CME the attention among a wider audience'. For each of the three universities where the CME master is taught, one graduation project is nominated.

After a period of more than two months in which the winner was chosen by an independent jury from industry, I received the 'redeeming message' on August 25, that my thesis was chosen as best CME Master's thesis of the year 2014 – 2015. The reaction of the jury is as follows:

- "The report is well written, easy to read and is strongly substantiated";
- "The complexity of a social problem is very well unraveled";
- "The development of a decision support tool, that can be used under different circumstances to see under which conditions transformation of vacant offices into housing for young people is feasible, actually adds something in methodological sense";
- "This research provides a great kick off for a more comprehensive decision support model that is applicable in every situation and market";
- "The graduation has a widely set up, but provides many direct practical starting points for stakeholders in this segment".

As the winner of the 3TU Construction Management and Engineering Master's Thesis award 2014-2015 I received, on the 3TU CME kick-off day at the University of Twente, a cheque with the value of €1.000,- after giving a short presentation about my research.

3CME.nl
For students and alumni in Construction Management & Engineering

HOW ARE YOU DOING?

SAHUL REDDY KADARPETA

My entrepreneurial venture may not have been profitable, but it was the biggest success in terms of lessons learned.

As I write this article, I flip through the pages of my graduation thesis and the course files from my CME student days. Seven years down the lane they still manage to find a place on my laptop.

I first arrived at the TU Eindhoven as an exchange student from India back in January 2008. I spent 4 months researching on construction waste management techniques practiced in the Dutch construction sector, towards my undergraduate thesis. I worked under the guidance of a PhD professor from the built environment department and as a result, frequented the Vertigo building. I would spend a lot of time walking through different departments housed in it and browse through posters of interesting research topics and projects. On the ground vloor of the Vertigo, displayed some of the designs of students from architecture, structural design and other disciplines. These works reflected the high quality of research and innovative though processes being applied in the field of built environment which ultimately inspired me to continue my journey at TU/e. I enrolled for the master's program in CME in fall 2008.

I spent most of time at the TU/e attending classes, working on assignments and sipping some good Dutch coffee with the fellow CME students on the 5th floor. I enjoyed socializing events like borrels at different department bars and the occasional OfCourse barbecue and bowling nights. The strong international community of Spanish, Italians, Eastern European, Latin Americans etc. exposed me to new cultures and made life as a student much more fun and interesting. Witnessing the Dutch team go to the 2010 FIFA finals, Queens day celebrations, study trip to London are some of the memorable moments of my student life at the TU/e.
I was one of the first international students in CME which was initially challenging to adjust to the Dutch mannerisms like punctuality, straight forwardness, teaching style etc. However, the program coursework required frequent interaction with professors and fellow students which helped me adjust and quickly adapt to such challenges. CME curriculum focussed mainly on integrating research and innovation to develop sustainable and energy efficient efficient urban areas. The Technology Entrepreneurship course stressed on the importance of financial and marketing knowledge for engineeers, who otherwise tend to look at problems from a technical point of view, to design more complete and effective solutions.
I also wrote my first business plan *(3D Clicks - An online business startup focused on promoting BIM as a tool to reduce construction cost and material overruns and improve efficiency in terms of time. It came a close second in the Rabobank Business Plan competition held at the end of the course)* which gave me the confidence and knowledge to start my entrepreneurial venture after TU/e.

At my current job, I require frequent communication with designers, estimators, project managers and engineering teams through phones, emails, video conferencing etc. The basics we learn in the collaborative design course in CME are an exact reflection of these real life situations. This holds good for any career in general and most importantly the construction sector. What makes my task even more challenging is the diversity of people in these positions. NYC is so culturally diverse that I need to adapt my communication skills accordingly. Communication is the key and I am still working on improving it!

Study trips to London and Denmark organized by OfCoUrsE and CME (I was a member of the study trip commission to London) were very encouraging to me as a student. I visited construction companies and project sites where I had a chance to interact and network with the professionals, work on assignments, which reflected the real life challenges faced by them. These experiences provided a reality check to the theoretical knowledge of Project Management and Urban Development course gained in the classroom. For instance, we worked on a Green House Gas (GHG) Protocol assignment for Heijmans, where we suggested ways to reduce the carbon footprint of its operations. The conversion of Arsenal's Highbury stadium into an affordable housing community was a perfect example of brownfield redevelopment. In fact I picked my master thesis topic after the 2010 trip to municipalities of Stenlose and Hillerod in Denmark. This trip provided ample knowledge of the governmental policies and regulations required to drive energy neutral housing communities, which I have reflected in my thesis.

My journey after CME has been nothing but a Sine wave (ups and downs), and like every other student faced dilemma regarding career choices at some point of time. I have found some answers as I progressed through my good and bad

choices. Soon after graduation and still running strong with entrepreneurial ideas, I went back to India and started a small construction business in 2011. The aim was to promote sustainable construction practices in the Indian construction market. I tried to replicate the management approach used by construction companies practicing sustainable developments. But I couldn't assess the Indian market well, which was not ready for the high initial investments incurred in sustainable construction practices. Further, due to lack of experience in implementation and execution I could not achieve the set targets over the next two years. It was a set back and I quit the business. As a young professional who couldn't succeed in the field, I had studied and researched for close to 3 years, my confidence took a hit. I had no backup plans to pursue an alternative career and felt stranded and I wasn't ready to start from the scratch again.

The following months I spent time on doing things that I liked, playing football, traveling etc. I realized that my strengths lied in good research work (Undergraduate thesis, business plan and master thesis) and it was a good way to regain my confidence and restart my career. I spent the next few months applying for research programs all over the world. I secured a research grant to carry out research to improve biogas production from wastewater and a full scholarship for a masters program in Environmental Engineering. I moved to New York in Fall 2013 and over the next 18 months successfully carried out a research for New York's biggest waste treatment plant to increase their biogas production by adding foodwaste. This second master's degree widened my career opportunities and helped me regain my confidence back.

I am currently working as a Project Control Engineer for railway division of Metropolitan Transit Authority (MTA), in the city of New York. My job involves developing construction schedules, planning manpower and monitoring day to day project performance using earned value analysis. I handle projects which require environmental impact assessment and face issues like soil remediation, ground water contamination etc. The $10 Billion East Side Access Project and the multi-million dollar Sandy Rehabilitation projects are some of the noteworthy projects I am currently working on.

I am still in touch with my CME colleagues and follow their career paths on LinkedIn. I believe, the similarities in our education, age and current economic, job market scenarios etc. make them ideal for drawing inspiration. It is important to be constantly learning from others and exploring opportunities. I have managed to learn from every step I made in the past 5 years after TU/e. My entrepreneurial venture may not have been profitable but it was the biggest success in terms of lessons learned. I wanted to bounce back after my failure and I succeeded. This reminds me of the quote by Paulo Coelho *"And, when you want something, all the universe conspires in helping you to achieve it".* I have now made it a habit to keep learning and explore new opportunities as they come. As I write this, I am also filling up an application to go back to college for an advanced certificate course in BIM starting spring 2016. Remember the business plan I mentioned earlier? Who knows, I might be an entrepreneur again!!

Thank you OfCoUrsE! for giving me this wonderful opportunity to share my experiences. And thank you TU/e, I still hold punctuality and frankness in high regard, the qualities I learnt from the Dutch.

[1.] MTA operates trains, subways and buses round the clock (24 X 7) and moves 8 million people on a daily basis between Manhattan and neighboring boroughs. The subway and train systems are over 100 years old and MTA spends billions of dollars every year in upgrading and maintaining them. Keeping the service round the clock and still executing construction projects is the biggest challenge for MTA.

3TU CME SYMPOSIUM

DESTINATION INNOVATION

November 25th, 2015, the first 3TU symposium was a fact. Collaboration between the TU Delft, TU Twente and the TU Eindhoven always has been an important point on the agendas of all three TU's, especially in the CME field. Probably when choosing the CME studies, the collaboration between the 3 TU's in the Netherlands was one of the main topics you remember from master events and information about the master. As the organization of the event, we can state that we are proud to contribute to this collaboration by not only collaboration in the education field, but also in the activities field. The three study associations, of CoUrsE!, ConcepT, CME dispuut and the 3TU federation worked together to set up this collaborative event.

The day started on a Wednesday for a large part of the visitors with a long journey to the south of the Netherlands, Eindhoven. Once arrived at the "blauwe zaal", everyone was welcomed with a cup of coffee and got ready for the first inspiring speaker: Reimar von Meding from KAW Architects. Reimar was taking us through the world of the circular economy in the built environment. Not only his renovation shop, was a topic of his story, the need for a circular market and his fascination for it, were evenly important. With this talk in our minds, it was time for the innovative lunch of Jelmer. While enjoying the innovative food of Jelmer, everyone was tested on his personality during an interactive presentation. After following two of the three workshops of Heijmans, Brink groep and Count and Cooper, it was time for the last speaker: Johan Postma from iQ living. iQ living is a modular housing concept of Ballast Nedam. And eventually, the day finished with a network drink, where the innovative topics could be discussed enjoying a drink and some snacks.

By the time you are reading this, the next 3CME committee is probably already brainstorming about the next 3CME event. And hopefully the 3CME event of next year will be an even greater success than the 3CME symposium. This way, the collaboration between the universities and the study associations can be continued. I hope to see you all there!

Intermediair voor bouw en industrie

EMPLOYMENT IN THE NETHERLANDS

How is the current construction industry job market for entry level positions in the Netherlands?

The construction industry has recently seen tough times, which was felt most heavily by entry level positions. The vacancies available were often filled by experienced people, preferably by someone who did the same job with a competitor. So, it was difficult for beginners to intervene and get the chance to build their level of experience. In the past year, however, much has changed in the industry and you find that companies are investing again in young talent. Distinctiveness and the presentation remains important as supply is still high.

How can students find job openings and build a network?

Your network building starts during your studies. Let yourself see and hear into the market. This may be because you are active in a study association and in contact with companies, but also through a related internship or part-time job. Business social media, such as Linkedin, are still rarely used by students, but here you can gain a lot of market and company information so that you can show that you have a passion for the job for which you are studying. Even better would be attending and organizing networking events where you personally acquainted with important people in business.

What prospects are there for international students? What obstacles do internationals face?

The crisis had many companies look for projects outside the country, which may be in the interest to international students. The question is whether this persists if the market picks up again in the Netherlands. In addition, there are a number of companies with international offices where career opportunities may lie. Inside the building, the language barrier can be a problem, not everyone has mastered technical English.

What are common mistakes made during an interview? How can they be fixed?

The most common mistake in an interview is poor preparation. People want to seem "natural" so they are not prepared for "standard" questions or do not search for sufficient background knowledge about the company itself. Because of tension, it can happen that you therefore do not speak freely or do not have good questions for your interviewer. An interview is an interaction where you search if you match with the company. The contribution of the applicant should be as large as that of the employer. This is the moment you get more insight into the business and if you see yourself working here. Seize that opportunity! Thereby having a good preparation also shows that you are motivated and interested in the job and organization. Immerse yourself in the website, imagine and understand the job function your applying for, look at the Linkedin profile of your conversation partner, but also know how to identify your motivation and know your good and bad qualities.

How can Continu help students start their career?

Continu has a large network in the building industry in which we know where opportunities lie and in which organizations. Putting people and businesses in contact with each other is our core business. We look not only for open positions, but mostly to personalities; who fits where and how are your skills best utilized? So we figure out together which position fits you best as a person. Also a good introduction track and support for start-ups is essential as a foundation for their future career. We are very careful with our customers to ensure enough space to develop themselves, and we also take part in guiding the customer in their development. So start your career in the right direction and from that position continue to develop yourself.

What overall advice would you give to students?

If you just got your driver's license you know how to do it, but you really learn to drive by doing it. That's what obtaining your degree is; ensure that you gain a lot of practical experience during the start of your career. Of course you will make mistakes, which you'll learn a lot from. Many construction engineers dream of a job as a project manager, but don't be afraid to start at the bottom. A role as a planner, designer or estimator will make sure that your foundation is strong to ultimately fulfill the role of project manager.

Author:
Merel Maas
Marketing Communication Co-operator at Continu


THE BEST WAY TO PR


EDICT THE FUTURE...


IS TO BUILD IT TO


GETHER

RESHAPING THE FUTURE

Construction industry has a very conservative image, despite all the good researches and developments that are done at universities and in industry. Innovations in society have evolved over last decades mostly from innovations in ICT. Whereas initially these innovations were primarily focused on the hardware and software technologies itself, recently ICT research reaches out to the built environment. Instead of developing new appliances that utilize ICT hardware and software, researchers now investigate how ICT can be embedded in the built environment.

ICT industry progresses at much higher speed then the building industry. It is interesting to know why, but in the article I will focus on the consequences for CME research and education. In CME we do not educate computing science, neither will CME students become software engineers. However, to be able to communicate with software engineers and to understand ICT innovations, a basic ICT knowledge is indispensable. This basic knowledge is needed to perform BIG data analytics, to control 3D printing processes, to layout energy networks, to plan city infrastructure, to trace people's behavior, to measure climate conditions, to monitor safety, etc. In conjunction with system developers, CME students can act as entrepreneurs, because to have contextual knowledge, namely they know the technical aspects of the built environment and the social aspects of its inhabitants.

Technological developments often stem from fundamental research as executed by our colleagues from Electrical Engineering and Computing Science. After a successful prototype in a laboratory, the new product faces a long process of adoption by its intended users. Especially in this phase CME students can and should play an important role. At first the CME students should recognize the potentials of a new technology. Secondly he/she should understand the technical implications of implementation in the built environment. Thirdly, the social aspects are investigated, and the financial feasibility are analyzed. Through these studies an important step is made towards market introduction. We know from many previous CME graduation studies, that it was concluded that a new technology was unaffordable, people did not appreciate it, uncertainties are too high etc. All of these will lead to new fundamental or applied research, contribution to a hopefully finally successful introduction of an innovation.

Apart from the technical, financial and social aspects of a new product, policies imposed by European, National or local governments play an important role in reshaping the future. In CME research we often make models to investigate

the effects of different policies. In order to make forecasts under different scenarios we make abstractions of reality and implement simulation models. Model making is a core engineering skill also for CME. Models allows for capturing the complexity (to a certain extent) of real world situations or processes such as a city or the construction process. Models also support communication with non-experts (citizens) and with experts (e.g. other engineers). Our group at the TU/e has a strong tradition in model design and implementation which is acknowledged by our colleagues and by building practice.

I am confident that the combination of expertise from the built environment and management, grounded on solid knowledge scientific methods and techniques, will put CME students on the front of new developments, and that they can actively contribute to a good place to work and live in.

Prof. dr. ir. B. (Bauke) de Vries
Chair of the Design Systems group
of the Faculty of Building and Architecture
@TU/e

St. Petersburg

of CoUrsE!
CONSTRUCTION MANAGEMENT AND ENGINEERING

International Study Tour 2016

"URBAN CHALLENGES"

This year's CME study tour will visit Saint Petersburg from the 3rd to the 9th of May, 2016. The theme "Urban Challanges" will be investigated by visiting companies, the local university and construction projects. Known as "Venice of the North", Saint Petersburg is one of the world's most beautiful cities with wonderful architectural heritage, an extraordinary history and rich cultural traditions. For more information about upcoming international study tours visit www.ofcoursecme.nl

AT OSBORNE

CONSULTANTS & MANAGERS

Bert van Griensven

Reshaping the future: is cooperation back in fashion?

Since the financial crisis in 2008 and the resulting economic downturn, the tender market has primarily been characterised by fierce competition and a strong focus on price when the time came to award projects to bidders. After 7 years of economic misery, many (larger) contractors are now so slimmed down that they are unable to bear the risks that low-bid projects entail. The focus has now shifted away from price-based tendering towards a more risk-averse approach. The new approach has a renewed focus on quality and includes a built-in measure to spread risk, i.e. cooperation with subcontractors.

Clients have also started to realise that awarding projects to the lowest bidder also results in significant risks, the risk of bankruptcy, claims, budget excesses due to extra work and a failure to meet quality expectations. Clients also feel a need for tendering strategies that focus on factors other than price, and they are looking for new ways to achieve more while spending less. In addition to low price, clients are starting to look at creativity and innovation. And they are giving the market the freedom to develop better solutions, all to acquire a better final product. Trust is an essential element in today's changing tendering market, which means that co-operation is essential.

Co-operation is an essential part of the tendering experience in today's market.

In addition, there are numerous other reasons to cooperate with other parties on projects. One important reason is the steadily increasing size and complexity of projects. The longer duration of projects is another. In integrated projects that include the exploitation and/or maintenance phase, maintaining a good relationship with the client over a period that spans many years is essential.

Are technological developments resulting in more cooperation?

Although it results in increased productivity, the implementation of most new technological developments is costly. With their belts firmly tightened as a result of the crisis, enterprises offset the higher costs by avoiding risk. And new developments that rely heavily on technology also require cooperation with other parties in the construction process (e.g. BIM) in order to generate added value.

We have to explore the issue from different perspectives in order to answer the question of whether cooperation is a new trend.

Cooperation on construction projects, e.g. between OG and ON and/or between different contractors, has never been a self-apparent process in the relatively conservative construction world. Where it occurs at all, cooperation is often limited to a single phase of the project, during the execution phase, between the contractor and subcontractors, for instance. It is far more difficult to cooperate in projects with integrated contracts because the cooperation in such projects has to extend over multiple phases. Cooperation is not limited to the execution phase, but must also occur in the design phase. In addition to the fact that the design phase employs methods and techniques that are foreign to the execution phase, the types of organisations that are involved in these phases are fundamentally different. Experience has learned that cooperation in multiple phases is not something that happens automatically, and that does not apply to just integrated contracts.

I recently read that PRINCE2 and project-based creation are currently the most commonly used project management methods. PRINCE2, which was developed by the ICT sector, is frequently used in construction projects. This method is highly instrumental, which makes it very 'blue'. It almost completely ignores the human factor. That is one of the reasons we organised the 'PRINCE2 for construction projects' master class earlier this year. Project-based creation, unlike PRINCE2, is extremely 'people-oriented'. Project-based creation is seldom used in the construction world, despite the fact that it is an excellent complement to the PRINCE2 method. Why not give it a spin?

According to a recent thesis project, the determining factors

for project success are a viable budget, a viable schedule, the right people, strong risk management, a professional client organisation, the right contract form and cooperation. Many of these factors are non-technical in nature, but are human factors. Amongst the participants involved in the project, cooperation was the most frequently identified determining factor. Cooperation encompasses involvement, trust and reliability, short lines of communication, rapid decision making, balanced vested interests, personal contact and flexible attitudes.

My colleague Geertje van Engen investigated the concept of trust in alliance projects and attempted to embed this concept into a performance measurement system. Alliance projects are a perfect example of projects that require intense and far-reaching cooperation. Although she did not succeed at embedding the concept of trust into a measurement system, she was able to incorporate other criteria that are related to trust into the system: careful team selection, open and frequent communication, response to the first conflict, mandate and commitment, project start-up, physical cooperation, feedback and evaluation, celebrating successes, good relationships at management level and arranging process agreements in advance.

The key to successful cooperation in projects is finding the right balance between technology and the human factor, between structuring and cooperating, between procedures and people. To cooperate successfully in projects, the parties involved, on both the client side and the contractor side, must be willing to learn from each other.

As an analogy to the project development world, where it is all about location, location, location, it should all be about cooperation, cooperation, and even more cooperation in the construction world!

Witteveen + Bos

Richard Pater

Q&A interview with Witteveen+Bos

Richard Pater is Director of Railinfra Solutions vof and pmc-leader Railinfrastructuur who has been working for Witteveen+Bos for 22 years. He works in thier company offices located in Utrecht and Deventer.
Witteveen+Bos is an independent privately owned engineering and consultancy firm. We are working in the Netherlands and several international locations such as Dubai, Singapore, Jakarta, Kazakhstan, Ghana, St. Petersburg, Latvia and London. We have more than 1000 employees, Witteveen+Bos offers its clients value-added consultancy and top-quality designs for water, infrastructure, environment and construction projects. Our turnover (2014) was ME 119 with a result after taxation of ME 15.3.

"Collaboration has to be part of your culture and it has a lot to do with risk management."

What kind of culture is there in Witteveen+Bos when it comes to collaborating?

"When the company started in 1946 Mr. Witteveen and Mr. Bos drew up a contract of just one A4 in which they stated that they were going to work together. The last sentence in this contract read: 'At this moment we can't tell each other everything and we can't arrange everything with each other, but in good trust we are sure that if we have problems we talk with each other and settle them.'
The company has since then used these words as a foundation for work relationships within the company and build cooperative relationships with other companies. This is what W+B is still doing now and how they think other companies should and probably will conduct business in the future.
Additionally the collaboration of employees within our company is also important. Witteveen + Bos is continuously improving and reshaping this aspect within its own company. Trust, loyalty and treating our employees like family is one of the key factors that makes this company great and will help it continue to strive for greatness.
In Witteveen+Bos finding the best solution for our clients has utmost priority, even if it means making our employees travel between places or even countries for an entire project duration. When such a project is done we then talk to our employees to find a project in the living area as compensation for their hard work. In this way the company cultivates a family culture by listening to our employees and finding them the best fit within the company."

What is the reason why companies, like Witteveen+Bos, are now leaning towards working with other companies on projects instead of doing entire projects on their own?

"Experience has taught us that the problems in the world will become bigger and more complex. For example: Clients aren't looking for a parking solution anymore, now they want a solution on mobility, connections, and the behavior of people in a certain area.
As a relatively small company which operates in the big leagues, Witteveen+Bos is sometimes too small (in volume) to compete with big engineering companies but at the same time too big (in reputation) to compete with smaller companies. The only way to survive is too be very good in what we do. And if a certain project requires knowledge on an engineering aspect we cannot provide, our mindset and family culture helps us to find a company with which we work together to create the best collaborative solution for our client."

How does this trend toward collaboration affect the quality of projects? And risks? Efficiency?

"If two companies want to deliver the best solution for their client, they will find a way to work together and present their solution as a collaborative product.
Now companies are instead of working with sub-contractors, they tend to partner up with other companies in consortia. In this way the risks are distributed along the companies, which increases the efficiency and quality of projects.
The majority of large contracts are tendered for consortia. Witteveen+Bos is always preparing for the future. Good preparation reduces risks. Additionally, finding the best engineering combination beforehand increases motivation to win contracts. Important to mention is that if a company is able to execute a project on its own, it should be confident enough to do so. Collaboration is nice, but is not always the best solution."

What role has money taken in this trend?

"For Witteveen+ Bos strategic market preparation is very important. Sometimes projects are in our radar one or two years before they are up for tender. This gives us enough time to find the best partners (if needed) and divide the work accordingly. In this way you do the work in what you are the best at and get paid for that work. So in the latter money is important, but like in all partnerships it should always be divided fairly."

What new issues have arisen with new collaboration practices and how can they be answered?

"Collaboration is nice, but it's not always the best solution. The market has to stay competitive to maintain the quality and efficiency of projects. Dividing the work in a project should always be based on expertise. This is very important and fair to companies working together.
Collaboration is nice when the project is running smoothly, but when something goes wrong a lot of problems arise which make collaboration seem not that beneficial. Big projects bring big risks which smaller contractors cannot handle. My advice to them is to stick to what they are good at, don't let collaboration with many other companies blind you to the risks involved in big projects. If they do decide to collaborate in a big project, try to play a small role so the risks for you are also small. Collaboration has to be part of your culture and it has a lot to do with risk management.
It is a procedure which takes time, thorough communication and a good analysis of costs, risks, turnover and client volume".

"Collaboration is a procedure which takes time and trust, thorough communication and a good analysis of costs, risks, turnover and client volume".

Do you always work with the same group of companies or do you expand your network? How do for a trusting relationship?

First you have to look at the clients, then at what they want. Check if you can provide the best solution on your own. If the answer is no, find a company who you can work with to want the contract with by finding the solution as a cooperation. In this way the company you approach to work together depends on the project itself. Of course your first choice is one of the more established companies, but in some cases these companies are already tendering for the same contract with other companies. Then it's nice to find a smaller company to work with. These companies are very enthusiastic to win, which makes their work ethic and ideas that much more brilliant.

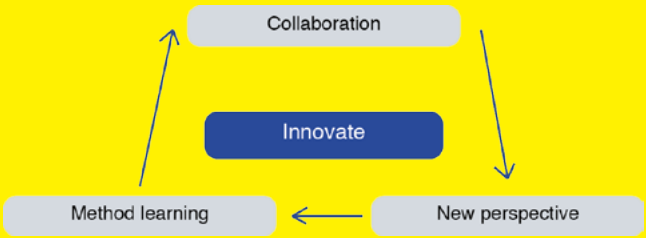
How do you see the collaboration in the next 5 years? 10? 25?

"Most of the contractors should change their way of thinking. The traditional way of dividing projects in main and sub-contractors will have to change. Look at contracting in another way. In which way you can be innovative and unique. Additionally contractors have to realize that the client's wishes are the secret to a successful project. Try to see the project through his eyes and find out what he really wants and expects the project outcome to look like. Another main issue that needs to change is the risk management. One way of reducing risks is to dissect the project and divide each task or action and assign a date or time to it and them maintain the predefined time management. The key is to think ahead and be prepared.
If we talk about the legal side of contracting, the bigger the project the bigger the legal responsibility. In this way contractors will have to rethink the amount of projects they can handle."

How do collaborative tools play a part? What sort of collaborative tools are commonly used? How has the BIM and collaborative design evolved in the lifetime of Witteveen+Bos?

"Witteveen+Bos uses BIM to make a kind of master document for all the information of a project. Witteveen+Bos has different departments and when it comes to civil engineering projects we have recently started using 3D modeling and virtual reality to visualize the projects for clients. For example: We design a road which goes through a tunnel. We then make a 3D simulation of this for our clients. They can then sit in a car, drive on that road and experience going through the tunnel. Clients know what we're good at and what we can deliver, but by making them experience their end product before it is built we create a unique selling point which makes us stand out even more from other companies. In this way the client sees and experiences early on what he's paying for, and can offer his feedback and thoughts on the design. In turn this reduces costs, because the validation and verification stage can happen before anything is even built. If you google Witteveen+Bos and virtual reality you'll find more information.
This new approach is a combination of marketing, communication and collaboration. Marketing in the sense that clients like being able to experience their product, communication because we can now get feedback from the client about the design at an early stage and collaboration because different parts of the design are made by different parties and put into one. In my opinion, this will be the future way of working together, with a client, a contractor and an engineering company. This sounds simple, but it is very difficult to organize."

Witteveen + Bos



How do you stay unique and keep a competitive advantage when you work together?

"A simple answer is just the way of working together. Witteveen + Bos always strives to find the best solution for their client. This is already one key point that makes and keeps us unique. The individual experts that make a company are and always will be unique. It's an attitude, it's a culture. The things that can't be taught like the drive and passion of individual people, are the soft skills of working and what makes a company stand out from others". Even when collaboration is necessary for a project, by maintaining your own work ethic and attitude a company will be just as unique at the end of that project as it was in the beginning.
In these modern time maintenance is key to survival. As the learning curve becomes shorter the entry barriers become lower. Maintaining your market share really depends on maintaining your work ethic, your attitude and keeping up with modern technology.
In my vision of the future, it is very important to watch out for startup companies. The majority of these companies are very innovative and have an entire different mindset on the way things should be done. These indirect competitors are not predictable, which is why they should be treated with more caution then our current competitors like Royal Haskoning, DHV or Arcadis.
Innovation doesn't work on demand. Innovation is something which is a process in talking to other people about their experiences and ideas, or even their take on your idea. You have to be curious, the soft skill of people which create innovation or innovation opportunities. In this way innovation and collaboration are closely related."

Give us a case where collaboration was successful? And didn't work?

"Collaboration is only successful if all the parties involved can see the benefits and advantage of working together. If even one can't see the advantage or doesn't feel it and there is no combined ambition then collaboration will not work."
A few years ago I was talking to a client, he was looking for support to win an important project. He mentioned another engineering company with good references in prior projects.

They were in the race as well. I questioned myself what this client really wanted: 'the best engineers to win the project'! I proposed to team up on outstanding knowledge. The client did and all the engineering companies were involved in their strength. Our client won the tender/project and it became a successful project."

What advice would you give to CME students who want to work for Witteveen+Bos?

"Pass your exams, because I'm convinced that as a student it's important to work for the highest grade you possibly can. What you also need to develop during your study are the soft skills, so be curious, be a team player. If the team doesn't run as smoothly as you want, think about how you can change that or what you want from someone else to change.
Working as an engineer in Witteveen+Bos is getting the best out of yourself in a total of volume of a thousand people. The trust and family culture is a fundament in our company and we hope that each employee has the opportunity to work on his own career combined with the ambitions we have as Witteveen+Bos. I always say that the ambition of the individual must fit in what we as a company can deal with, and it must not become the other way around that we as a company want to develop in a certain way in which our employees do not fit. Then we have to change too much or fun in working will decrease so much that people will not enjoy working for us anymore. The key is to be not only a good engineer, but also a smart human. If you're smart and curious you can always find a job in Witteveen+Bos. In job interviews I always look for passion. Good grades are important and your thesis is interesting, but why was it interesting for you? What was fun about your thesis? What wasn't fun?
Convince me that you want to work at Witteveen+Bos, because if you do get the job you'll have to be able to, at some point, convince a client that your work is good. So apart from communication and passion, you also need to be able to trust your coworkers and be able to help them or ask them for help when it is required.
As a student always think about how and in what way you can use the knowledge you obtain to make something better. Try to think about how you can develop yourself and what courses can add to your personal development. In the end you should do what you love, so be sure to be very good in what you love to do".

"Innovation doesn't work on demand. Innovation is something which is a process in talking to other people about their experiences and ideas, or even their take on your idea. You have to be curious, soft skill of people create innovation or innovation opportunities. In this way innovation and collaboration are closely related."

HENDRIKS
Bouw en Ontwikkeling

Joost van de Koppel

Collaborative Engineering at Hendriks Bouw en Ontwikkeling

Hendriks Bouw en Ontwikkeling is a family business based in Oss and founded in 1922. It houses five co-operating disciplines; project development, construction, mechanical installations, electrical installations and operations & maintenance. Based on our three pillars BIM, Lean and collaboration, all five disciplines are used in an integral approach to fulfil the client's wishes. Currently, HBO employs approximately 220 people, with a strong growth in young professionals in recent years. We are active on the residential construction market, with over 200 houses realized in 2015, and in the commercial construction market with a speciality in health care facilities and schools.

Open BIM

Hendriks started using BIM, or Building Information Modelling, for the first time in 2008 in a few pilot projects. These "little BIM" projects led to a "big BIM" project which in turn led to the decision to fully implement BIM in all projects. For a few years now, every project is completed using BIM irrespective of the phase of the project and the quality of original documents and/or models. BIM at Hendriks is based on the open BIM philosophy;

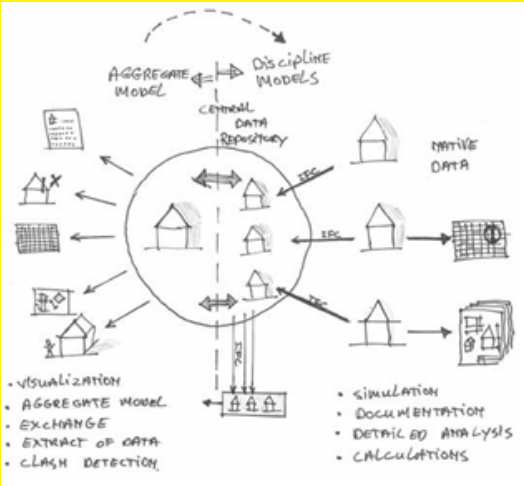
- Open sharing of information
- Open standards
- Integrated design
- Best of Breed
- Chain digitalization

This means that we use BIM to design and engineer a project in an integral manner to derive the optimal solution for a client. This implies that all stakeholders in an collaborative design and/or engineering process must be willing to share their information in a transparent manner throughout the project. This is done by using open standards such as ifc and bcf. In this way, every stakeholder can use the software they are most comfortable with, or in other words; which they can best add value with. In turn, the models derived during the design and engineering phase are used to manage subcontractors and suppliers during construction. Preferably, the ifc's are used as direct input for the production line of the suppliers.

The BIM process

The way we use BIM at Hendriks Bouw en Ontwikkeling is very much according to the "reference model" principle described by van Berlo and Beetz in their 2012 paper (see Fig. 1)

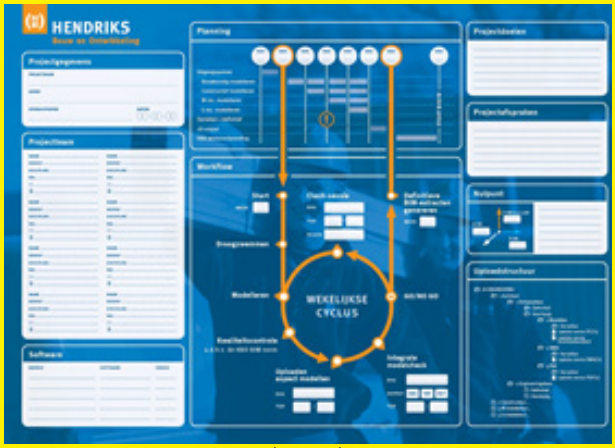
Often, people think that there is one single model (central model concept) in which every stakeholder models his own part. This has proved to be unsuccessful in practice due to several technical and legal limitations. For one, ifc import in most modelling tools has many limitations and ownership of data is a big issue. With the reference model concept every stakeholder models in their own preferred software in which the models (ifc's) of other disciplines are linked as a reference during modelling. The different aspect models produced by the project team members are combined by the contractor in a coordination model where clash detection, information extraction etc. takes place. This process is iterative and takes place on a weekly basis.



(Fig.1)

Every BIM project starts with a kick-of meeting organized by HBO. All the different stakeholders are represented by at least the BIM modeler. Often during a BIM project a so called "BIM protocol" is used to document all the product requirements and process agreements. At Hendriks we separate the two by using the BIM placemat (see Fig. 2) during the kick-off for process agreements and the Hendriks BIM norm for product requirements. Basically, the placemat serves as a tool for determining the project specific process agreements as we found that burying them somewhere in a 25 page protocol led to mistakes. During the kick-off the project team, software versions, origin point and project goals are all determined. Also, the planning and the required information for each discipline is discussed. Finally the different steps in the weekly cycle are agreed upon. The cycle consist of several

successive steps; modelling, quality control; uploading, model check, clash session. This process is always coordinated by the contractor, as they are responsible for the overall quality and coordination. At Hendriks we always do the model checks on a Thursday and the clash session on a Friday, both in our BIM lab. During the model-check the quality of the aspect models is checked. In other words, a compliance check is done to see if the models comply to our BIM norm. The BIM norm describes general requirements concerning model structure and naming and specific requirements necessary for efficient processes with our subcontractors and suppliers. The results of the model check are discussed during the clash session with the different project team members, after which an new cycle starts. When the coordination model is free of clashes and meets the requirements set in the Hendriks BIM norm the engineering is done and we continue using the model to feed our suppliers and contractors. This is the current BIM process in a nutshell.



(Fig. 2)

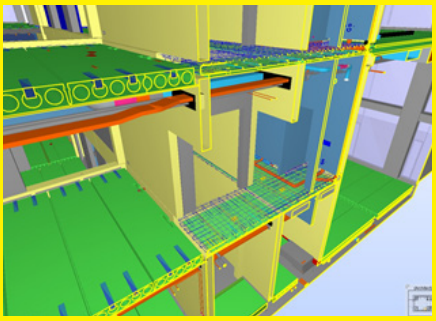
Revolution

It is easy to forget, especially when you're not familiar with the "old" methods, that only a few years ago the engineering process was completely different. Most things were done using paper and highlighters, drawings were not intelligent and data was not linked. For example, Plus Ultra is a 8500 m2 project with the handover at the end of 2015 (see Fig. 3). The first model-checks in the design phase took place in September 2014. Such a complex project with complex installations necessary for the laboratories cannot be realized in such a short time span using traditional methods. BIM is really revolutionizing the construction process. The step from the drawing board to 2D CAD didn't change the process of drawing that much, it just meant doing the same thing quicker. However, the step from 2D CAD to BIM implies a change in process, in the way we think about collaboration and integrated design. The construction industry by nature is a very fragmented industry. BIM has the potential to transcend the traditional borders by serving as a data source during the entire lifecycle of the building. At Hendriks we are constantly asking our suppliers and subcontractors which information they would like to have in the model. In this way we can feed the modelers during the design and engineering phase with the information that is needed later on in the process. In fact, this principle applies to every phase of a project; What information do you need at which point in the process to reach a certain goal? In other words, what is the minimum viable product.

Innovation

We are currently also asking this question to our clients. Maybe the biggest advantages of BIM are during the operations and maintenance phase. As a leader in BIM innovation it is the responsibility of Hendriks to inform clients of opportunities they would perhaps otherwise be missing out on. Additional innovations in BIM involve further automating engineering tasks. When models are of constant quality and always contain the same information on the same place, rulesets can be used to check certain things that are normally checked by an engineer. In this way, an engineer has more time to spend on finding smart solutions for engineering problems. Also, we are currently doing a pilot with drones to look into the possibilities of automated process monitoring. In this pilot we will compare as planned data (BIM + planning) to as built data (BIM + drone data). Even though such innovations may seem far-fetched, in today's society changes succeed each other very rapidly.

In my opinion that's also where the strength of a young professionals lies, in disrupting the rusted patterns in the AEC industry. One of the most heard clichés in the industry is "that's the way we always do it", which should be an immediate trigger to look into the process. Compared to businesses, universities are probably more focused on innovation. Therefore, as a student you are pretty well informed on the latest technologies that exist in your field of study. However, the most important competence in my opinion is the "meta-competence", the one that helps you to learn new competences quickly. With this and a good sense of curiosity you can make great things happen.



(Fig. 3)

Chris Jonker

"3D printing gives architects even more freedom with their creativity. Complex shapes are no longer an issue with 3D printing. Designs can change right before printing, so last-minute alterations do not cause a problem."

How does BAM view the technology of 3D printing?

Today, 3D printing is widely known to be used in our every-day lives to create unique small scale products with personal 3D printers. In the construction industry, the scales get bigger. All types of construction projects have intricate pieces that have been traditionally created by molds, but each mold can be used for only the one purpose – a single product shape. 3D printing is a technology that can fabricate unique, creative, and complicated project forms without requiring any molding whatsoever. Such an innovation creates quality, time, cost, and safety advantages over traditional prefabrication methods.

How is BAM applying 3D printing?

BAM is using a specific type of 3D printing called "D-shape" printing. This technology is a robotic building system that uses sand and a special inorganic binder to crease a custom, stone-like structure. The D-shape printer is made up of a 6m by 6m aluminum frame, creating the boundary space for construction. A series of motors direct the binding nozzles to their exact position to place the binding agent and apply the next layer of material. Before any printing is done, a computer-aided design must be created. These are the basic instruction that will be followed by the printer. Here, the real creativity of the architect can be put to the test. The building process is similar to a paper printing by placing the binder on a layer of sand and continuing the process until a 3D structure takes shape. The excess sand is removed and left standing is the 3D printed object.

BAM has created a custom bench with the D-shape printing. This is a unique bench that has been inspired by a Mobius strip. But this product is the first phase towards a much more ambitious goal: the Landscape House.
Universal Architecture, the architects of the Landscape House, has teamed up with BAM to help realize the project in the city of Amsterdam. 3D printing will be used to create each unique, curved section in a pre-fabrication process and assembled on site. This innovative project will act as an exhibition art museum and is estimated to be completed by 2017. This will be the first large-scale project created by a 3D printer.

Figure: 3D printed bench

What are the advantages of 3D printing?

3D printing gives architects even more freedom with their creativity. Complex shapes are no longer an issue with 3D printing. Designs can be change right before printing, so last-minute changes are no problem. This creates a more flexible design. Costs can be lower than traditional methods, but the technology must become used more commonly for this to happen. Furthermore, designs can be shared and improved through an open source. So, a design from found on the internet, downloaded, customized and printed on the same day.

What are the main challenges facing 3D printing?

With most new innovations, high costs is a problem. At the moment, the cost for printing is quite high. But with each additional use of a custom design, the price would go down per product. When the printers, materials, and binding agents become more common, this will also cause prices to reduce.
Material diversity is also a problem. Other important building materials such as steel and glass cannot be used with the D-shape printer. For example, the Landscape House requires reinforcing steel in the stone façade, but printing custom steel and stone together is a problem that needs to be solved. Expanding the types of materials used with 3D printing will be undeniable important with shaping complex designs and reshaping the future.

What sort of innovation needs to take place for 3D printing to become a commonly used tool?

The first steps are the most expensive, which slow the adoption of 3D printing. But when the industry start seeing the advantages, then the technology takes hold. Look for 3D printing to become much more commonly used in the built environment within the next 5 to 10 years.

bam

Mobius Strip: When there is no beginning or ending.

Figure: Landscape House concept render

Reimar von Meding

Disruptive Changes in Building Industry

Times are changing. Every generation has this idea again and again. The fact that things are changing is maybe the most constant factor in human history. Who can say if the changes in our days are more important than let's say the invention of fire, the wheel or the end of the Roman Empire. But it is quite sure that we are facing important changes to happen within the next decade. The question is what this will mean to the next generation of engineers in all fields and disciplines?

The western European post-war, service-oriented, prosperity-state, built on Anglo-Saxon market principles comes to an end. The systems we have built during the last century are getting more and more useless. Society changed faster than politicians can develop visions. The big question is, wether this change will take place as revolution or evolution. A few examples:

Democracy

The western-European democracy is based on the idea that politicians take decisions as chosen representatives of the people. Their decisions are based on their personal, individual moral and ethical principles. But not a single European democracy works like this. Politicians are no representatives of society but are full-time-politicians. They have never done anything else but politics. The decisions are not based on individual accountability but the force of parties. In fact in not a single European constitution political parties have status. It is a miracle why they have the biggest power of all. Our democratic systems developed (or let's better say: deformed) because of the Anglo-Saxon idea of a liberal, market-driven world, where economic growth has become the only reference.

As we all learned, stability is always based on balance. The enormous prosperity of Europe has been sold with a dramatic situation in other parts of the world. As this today comes to our living rooms by television and internet, we realize that we cannot walk this path any longer.

Health-care

Our health-care system is built on the idea that the government cares about us. Every month we pay money, to be able to stop working at 65 if we like to. This concept causes a gigantic amount of money that has to be organized in gigantic organisations for health-care. All these organisations in itself again cost a gigantic amount of money. We have an expensive system, too big to fail, based on the idea to stop working at 65 that nobody will do in future. Hasn't it become necessary to develop better alternatives?

Energy

Our energy-system is the same like the health-care system. In former times we paid a lot of money to develop a big network. We gave this network to private parties almost for free, whose business case is based on central power plants. But now we need a system based on decentralized power supply and the fact that we will reduce using energy dramatically. How can we change the system to make this possible?

Housing

The housing market is still based on the idea of a "complete" family: father works, mother is at home and you have a car and children. While in fact nowadays men and women are working, children are no longer a privilege of married couples – not even of couples with different sexes. And we have a huge amount of new kind of families with parents divorced, re-marrying, giving birth at the age of 60, and so on.

The future of the designer and engineer

The biggest change in world history comes with accessibility of information. This also changes an important principle: In former times, inventions and innovations by driven engineers caused changes in the way things were made. For example: the romans invented building walls not by masonry but concrete. This was the chance for the empire to build walls all over Europe and conquer the continent. For example the invention of reinforced concrete, decades later. It allowed architects to step out of the principles of tectonics principles and to become artists rather than architects. And for example the invention of cell phones that caused a full-access-society.

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For this "inventions" we had engineers with the mentality: "give me a target and I will fix it!". Problem solved. But there is no problem to be solved any more. The world has turned. It is not the big inventions that change the world, but the need and wish of people to change the world through their personal lives. This means that the engineer who solves problems is no longer needed. Unfortunately, engineers and designers are still educated to "solve problems" others define. While they must become the ones who develop visions and targets, based on the real needs of people.

For example:

As an architect you deal with the needs of your clients. The client of an architect – or an engineer or product designer – is almost never the one who uses the design in the end. Most of the times the client is a professional party (housing corporation, project developer), whose business is renting and selling but not using. As a designer you are caught in the process from design to selling. The result is a focus on efficiency and rationality. While the focus should be effectiveness and quality. The only way to reach this is to develop new visions and principles, that combine the need of the professional client and the one using the buildings. If you want to develop new principles you need not only to understand the way things are made but also the way things are used.

Health-care

A good example is real-estate for health-care. Buildings for health-care cost money to be developed. But the amount of energy and maintenance during lifetime of a regular health-care building is about five times the amount of money you need to build the building. And the amount of money you need to give care is two-hundred times as much as the building originally costs. What should be changed: focus on principles, how to develop healthy, flexible, sustainable buildings for health-care. Spend twice the money on building it if you can reduce the amount of money spend for maintenance and care. By doing so, you talk about an extremely effective development. This is not just theory. We already developed the first buildings, that prove that a more expensive building with high quality safes more than the building costs on energy and care. And it even has a big effect on the use of medicine and happiness of the inhabitants.

Sustainability

If you want to retro-fit your private home, you have to ask an architect, who asks a contractor, who buys work from a subcontractor and so on and so on. You never know in the beginning what you will get in the end for what price and what quality. And as an extra effect all things are too expensive, because they are invented for each and every project again and again. Why can't you buy the sustainable retrofit of your home as a product in a regular supermarket? We developed Reimarkt as the first retail-formula to make this possible. We developed retrofit products for regular housing typologies, set up a structure for online and offline marketing and started selling products in the city of Enschede.

Empowerment

The third example is about empowerment of inhabitants. For the renovation of social houses we thought about how to give the right to decide and maximum influence and responsibility to the inhabitants. We developed a new kind of business and called it "Wijkbedrijf", which can best be explained and translated as "District – company". It is a new company, owned by the inhabitants, together with the landlord and the contractors for the renovation. The business of this company is not only to take care about the costs and effects of the renovation, but about all "business" around the house: maintenance, sustainable solutions, care for each other. Inhabitants can work for their own company and earn money with it.

Change

It is up to everyone to feel inspired to find their own way to be part of these kind of developments. It is for sure that the next generation of engineers and designers has a great opportunity not only to be part of change, but to change themselves.

"When you make a choice, you change the future"
- Deepak Chopra

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Let's connect?!

Wil jij zien op welke wijze Heijmans aan de ruimtelijke contouren van morgen bouwt? En ben jij nieuwsgierig welke spraakmakende en innovatieve concepten Heijmans ontwikkelt en realiseert?

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