Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners ([Examencommissie-BK@tudelft.nl](mailto:Examencommissie-BK@tudelft.nl)), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

<table>
<thead>
<tr>
<th>Personal information</th>
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<tbody>
<tr>
<td><strong>Name</strong></td>
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<td><strong>Student number</strong></td>
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<td><strong>Telephone number</strong></td>
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<td><strong>Private e-mail address</strong></td>
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<thead>
<tr>
<th>Studio</th>
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<tbody>
<tr>
<td><strong>Name / Theme</strong></td>
<td>Smart Real Estate Management</td>
</tr>
<tr>
<td><strong>Teachers / tutors</strong></td>
<td>1. Ir. Monique H. Arkesteijn 2. Dr.ir. Ruud Binnekamp</td>
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**Argumentation of choice of the studio**
The choice of ‘Smart Real Estate Management’ studio for the graduation was determined by few different reasons. First of all, it is closely related to the topics from Real Estate Management (REM) course and Corporate Real Estate Management field, which I found very interesting and challenging, taking into consideration the wide spectrum of problems the field covers. I found the REM course as one of the most absorbing and fascinating and finished it with highest grade. I knew that I would like to continue developing my knowledge in this field during my graduation.

After attending the introduction lectures to various studios, I was reassured that I had the biggest possibilities to enhance my skills and knowledge with the SREM studio. It refers to up-to-date problems and provides an opportunity to deepen knowledge about emerging concepts (like smart buildings, smart environments and internet of things) and bring the evidence of added value of these concepts for the users and decision-makers.

Furthermore, I have been working for the Real Estate team in the corporate company, where I had an opportunity to see the problems faced by the practitioners on everyday basis. The research proposals from the SREM studio give opportunity to work on solving those problems, which also attracted me personally.

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<th>Graduation project</th>
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<td><strong>Title of the graduation project</strong></td>
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<td><strong>Goal</strong></td>
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<td><strong>Location</strong></td>
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<td><strong>The posed problem,</strong></td>
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additional focus on how the decisions within organizations are made. Understanding which information is needed and how it can be presented to support the decision-makers is crucial. The rapidly advancing technology, computing possibilities and automation has created new concepts (like smart buildings, smart environments and internet of things) which have a great potential of improving the performance of RE portfolio organization, allowing tracking the information on portfolios more frequently and in detail. The proper use of data and its resources can bring a lot of added value to the companies.

Making decision on the asset location is a crucial matter that requires analysis of vast amount of the data. The real estate portfolio is very static and making an inaccurate judgment concerning location is difficult or even impossible to reverse. It brings serious consequences, related with extra costs and impacting the business operation. For this reason, the location decisions in particular have a huge effect on establishing and maintaining a competitive.

The choice of location depends on various preferences stated within the company. The deviation between those preferences and the actual characteristics of particular location pose a number of risks. As a result, creating the match between the real estate portfolio, the business strategy and the preferences of the stakeholders involved in all business functions is of great importance.

There is a number of determinants for the location of offices, varying from urban environmental features, land-use policies, infrastructure characteristics, appropriate building availability, economic and market conditions or employment locations and other. All of them, combined, define the location.

The process of finding a suitable location for a given organization, have been discussed in the literature exhaustively and there is a number of theoretical approaches towards site selection are widely available. Authors, profoundly explained the main theories and point out the references to the site-selection activities. However, it seems that applicable tools supporting those actions seem to be a scarcity as operational versions have never been fully developed.

The location theories are usually based on economic principles, like for example minimizing the distance for stakeholders, maximizing companies’ profit, or locating in hubs to profit from clustering. This historical, classical approach influenced the general understanding of the organization of space. On the other hand, the hard numbers connected with this theory were very restrictive and were not the only factors influencing the firm’s location decisions. Other concepts emerge, introducing behavioral impacts reflected in preferences, motives, attitudes, limited information, evaluations and other, enriching the solely economic principles.

When the behavioral factors are taken into consideration, the preference statement becomes a significant issue. It can be based on limited or biased information. The decision makers very often determine own criteria that define choices which were or could be satisfactory according to their knowledge. These behavioral approaches are also a subject of criticism in the literature, suggesting that they do not incorporate firm’s characteristics, structure and organization. In addition, location decisions should be made and evaluated in the context of a more general business model, as location is just one component of a business strategy.

Here the problem arises: how to find a suitable location for a company if the stated requirements towards the characteristics of that location might not
thoroughly express the organizations requirements, considering its general business strategy. Despite conducting an extensive research, no existing tool, gathering the vast body of experts’ knowledge from the literature and practice, has been identified. As a result this study aims at creating an expert tool that could support stakeholders within the companies with delineating location choice sets in search for appropriate office space. It will allow examination of the location preferences under several aspects influencing the site selection, which might have been omitted in standard procedures.

<table>
<thead>
<tr>
<th>research questions and</th>
<th>Following the problems identified, the research questions are defined:</th>
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<tr>
<td><strong>Main research question</strong></td>
<td>How can an expert tool improve the (re)location decision-making in large multinational companies?</td>
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<tr>
<td><strong>Research sub-questions</strong></td>
<td>The main question touches upon three relevant topics: the process of (re)location decision, an expert tool, and the improvement of decision making in large multinational companies. This results in definition of following sub-questions:</td>
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<tr>
<td>1. What is the current body of knowledge on the (re)location decision-making (LDM) and expert tools connected to it?</td>
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<tr>
<td>1. a. What frameworks and models are used in LDM?</td>
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<td>1. b. What are the criteria and objectives used in LDM processes?</td>
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<td>1. c. What can be improved in location decision making according to various authors?</td>
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<td>2. How to develop a successful expert tool?</td>
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<td>3. How can the expert tool be linked with other decision supportive models used in a particular case?</td>
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<tr>
<td>3. a. Should the expert tool be an integrated part of the decision supportive models?</td>
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| design assignment in which these result. | Creation of the expert tool for location decision-making. |

**Process**

**Method description**

**Type of study**
The main question in this research includes a design problem- it requires a design of an artefact in order to get to a solution to the stated problem (Barendse, et.al., 2012). It is operation-related and strives for improvement of the current situation. The research is going to be an explorative one.

The aim is to develop an expert system tool, through gathering the knowledge from extensive literature research, working with practitioners, conducting workshops, interviews and observing professionals during case study. A user-friendly system will be created, which will gather the expert knowledge and help stakeholders prepare an input for the decision-making process. The tool will structure information from users which can serve as an input used for already developed decision supporting models. The tool itself will be developed, tested and evaluated during a pilot study at one specific company. Subsequently, it will be send out to a number of various multinational companies, willing to test it, in order to get a feedback on universality and usefulness.

**Approach**
The research started with the literature study and exploration of the current body of knowledge, which
provides a framework for further study. As a result, the analysis of existing approaches, models and tools, scientific literature and their findings will be conducted. Subsequently the data will be analyzed through a matrix and a framework for the expert tool will be built. This will be enriched by the information gathered during the internship, where I will be working on a project related to the defined problem. In addition, the interviews with stakeholders connected to the case study will be conducted in order to gather an input from potential end-users. The collected knowledge will be stored and structured, to be subsequently displayed with the user-interface module.

The plan is to develop the tool with the use of two modelling programs:

- Tetra SDM, which will be used by me for a structuring the data, format of the tool and have more of supportive use;
- Excel Visual Basic for Applications that will allow creation of a visually attractive tool for users.

The internship: study case

The pilot study is conducted at FedEx/TNT during an internship. It provides a relevant insight into the real-life practice. After the acquisition of the TNT Express by the FedEx company, the European division of merged firms requires application of significant organizational changes. As a result of business decisions, the organization is planning on relocating, combining and redesigning some parts of its current real estate office portfolio. The goal is to unify the department structure, relocate and shrink the real estate footprint and occupied spaces, following the restructuring of the business organization and its centralization. Being aware of the importance of every decision made, the real estate team is looking for a structured and rational way of conducting the location decision-making process, where various stakeholders are involved (from 11 departments, represented in an integration team).

Methodology

The main question of this research will be answered following a four-step research structure.

1. First part is focused on the development of the main concepts. In this part the main research gap is explored. The research problem, objective and question were formulated. At the same time the current body of knowledge on the topic is analyzed.
2. The second and third part relates to building of the expert tool. During this step main input for the development of the tool (location criteria) is gathered and structured. The input will be based on the information from literature and internship. At the same time the interviews and workshop at the graduation company are going to be conducted, enriching the research with information from practitioners. The expert tool will be improved in an iterative way basing on the feedback.
3. In the third part the tool prototype will be sent out to be tested by the professionals in terms of usefulness and accuracy. The feedback will be used to evaluate and possibly improve the outcome.
4. The last part refers to the synthesis, where the tool will be validated and lessons learned will be drawn. With these steps the main question and all the supportive sub-questions of this research will be answered.

Literature and general practical preference

The literature research is done to provide a backbone structure for the entire research it covers the following topics organized in subchapters in the report:

1. Process of location and re-location decision making in real estate:
   a. Location and re-location theories
   b. The (re)location motives and decision-making frameworks
   c. Relocation issue
   d. The organizational characteristics
   e. Multi-criteria group decision making problem
   f. The Preference-based Accommodation Strategy design approach (PAS)
   g. Stakeholder engagement
   h. Various perspectives of stakeholders on real estate issues
   i. Transparency issues
2. Firm location factors
   a. Adding value through Real Estate and driving forces
   b. Influences on location factors
   c. Defining location evaluation criteria
   d. The importance of defining the proper location criteria
3. The expert tool
   a. What is an expert system
   b. The expert system methodologies
   c. From expert system to expert tool
   d. Decision Support Systems (DSS) and expert tools
   e. Verification and validation of an expert systems

The literature research will allow answering majority of sub-questions. In addition, while working at the graduation company (TNT, recently acquired by FedEx), the practitioners which are the integration team will be consulted. This will provide data on their experience and current point of view on the location decision-making, enriching the data that will be used for developing the expert tool.

Reflection

Relevance

Position within the graduation laboratory

The graduation project is a part of the Smart Real Estate Management (SREM), one of the subjects from Management in Built Environment (MBE) track. The subject is directly related to the Real Estate Management course, organized during the MBE master track program. It corresponds to ‘the smart environment’ research problems from the scientific side and the end users involvement from the Sociological point of view. Although the graduation subject was not linked to the ‘problem solving’ issue (according to the MBE Graduation Subject handbook, posted in September 2017), this particular research is closely related to it.

At the start of the research process, the focus lay on the location decision-making process in big corporate firms, loosely related to smart tools, but focusing on CREM problems. Area of research fits within proposed ones, relating to office real estate portfolio and research problem relates to proposed question of smart tool improving real estate decision-making and integrating user preferences into a smart tool. The end-result of this research project relates to smart tools topic, as the outcome will provide decision-makers with tool allowing collection of the data (from users) to support decision making on the portfolio level.

Relevance of the research topic

The focus of the laboratory lies on ‘exploring the use of the smart tools in practice – at European universities and companies in other industries worldwide’. This implies that a focal point should be on the aiding public or private organizations with a research outcome that will allow added value to the organization.

The proposed research outcome, the expert tool for location decision making, targets at overcoming the problem of the lengthy and complex process, which is usually impeded by imperfect information. The connection of this graduation research project to a graduation internship can enhance the relevance of the outcomes even more, since it will be developed, tested and applied to the current, existing challenge relevant for the graduation company.

Time planning

The planning of the research is as follows:

Start - P2

During the period before the P1 (31st October 2017), an explorative literature review was be conducted. This type of literature review was concluded with the definition of main research direction. Afterwards a period started whereby a more systematic approach was used to review the existing literature. In the meantime the graduation company was found and I got familiar with the project that is taking place in the FedEx/ TNT. Until the end of November the hours spent at the company were limited due to the ongoing courses and exams at university and participation in a competition. In the first month of the graduation internship, the focus laid on the definition of case study, development of the theoretical framework through the systematic literature review and writing the report for P2 presentation (held on the 18th of January 2018). With the beginning of December the internship became more important, when I started spending 2-3 days a week at the FedEx/TNT office for data collection and participation in the workshops to gathering first input for tool.

P2 – P4

For the P2 the systematic literature review was finished in first version, with a plan to improve and adapt it if necessary in coming weeks. The case study must be further defined. With the beginning of February, I am going to start gathering and structuring the data for building the tool. At the same time, I will continue learning how to work with the Excel Visual Basis program. With the beginning of February I am planning to conduct individual
interviews with stakeholders from FedEx/TNT, followed by workshops. By the end of March I hope to have at least a series of 3 interviews and 2 workshops conducted. According to the schedule the P3 presentation is going to take place in week 3.8 or 3.9 (between 3.04.2018 and 13.04.2018). After that presentation, the tool prototype should be ready to be sent out and tested by in the field. Getting feedback from various professionals will be of a great value. Until the P4 presentation, the work on the tool and final report will continue. The goal is to have processed the outcomes of all the activities into a report prepared for the P4 presentation (held between 22.05.2018 and 31.05.2018).

Other obligations to the university, that will occur at this period are:

- The exam from Real Estate Valuation course on 30.01.2018
- The submission of the ‘Operations research methods’ course, which is strictly related to the graduation topic. I am planning to submit it around the P3 presentation date, when the expert tool will be developed.

**P4 – P5**

The aim is to have the majority of the conclusions and recommendations ready for P4, so that in the period between P4 and P5 the practical outcome of this research will be developed. Next to this, by having as much developed tool, conclusions and recommendations ready during P4, the mentors can provide feedback on as much outcomes as possible and there is enough time enhance the quality of the report.

*Figure 7.01. First sketch of timeline*