

GRADUATION PLAN

ARCHITECTURAL ENGINEERING

Name: Robert-Jan Altena

Student number: 4813952

Email: R.Altena-1@student.tudelft.nl

Main tutors: Annebregje Snijders,

Research Mentor: Thaleia Konstantinou

STUDIO

Argumentation of choice of the studio

My fascination has always been engineering. Getting needed result by combining static and movable component's. Architecture should not be static and if we like it or not changes over time, like life. It is nearly impossible to accurately predict the future. The only certainty is uncertainty and that should be part of the design brief. Change can be driven by engineering. The integration of engineering within the architectural design most of time follows the design till the middle of the design process. The question is, where does architecture stop and engineering begin? Now that we see our buildings more and more as installations, on the level of internal climate, this line is blurred even more. Engineering on the other hand does certainly not mean high-tech. The engineering starting point, together with transforming the existing, is for me the reason I chose the 'Second Life'-studio. For me engineering should be supported by architecture and not the other way around. Architecture should be the connecting factor and in my opinion Architectural Engineering can give this process and therefore these results.

Title of the graduation project

Space efficiency, active adaptation, futureproof, energy neutral, multifunctional, circular

SEARCHING FOR THE POSED PROBLEM

THE BOUNDARIES OF SPACE EFFICIENCY

In 2008 The Hague was one of the densely populated cities in the Netherlands with 5.571 inhabitants per square kilometer which is 7 times more than the national average (Werkgroep Binnenstedelijk Bouwen, 2010, p. 133). The Hague needs to grow with 25,000 new dwellings and 500,000 square meters of office space. The chance that this will be solved by creating new buildings, horizontally or vertically, is evident. which results in a massive surge of building materials and stress on an already dense city. But another answer lies in the use of the existing building stock (Gemeente Den Haag).

In the time of urbanisation and densification we need to maximise our existing building stock to get the most out of our buildings, to be able to handle the increase of inhabitants. For this to happen we need to see *“See architecture as a living thing that behaves like an organism. Rather than a forced fit design”*; John Habraken (2013). We built structures that could last for a hundred years, infills that last for 20 years but the effectiveness is not taken into account. This 100 year structure is only used for 8 hours, and is closed in the weekends. That’s only an effective use of less than 30 percent and a waste of space. A flexible approach to our environment is now necessary for a wide range of reasons: 24-hour work patterns based in the home; changing family size and groupings; ecological issues that are questioning the desirability of commuting; lifestyle issues that envisage a more fulfilling personal life; and the possibility of remote working due to communications technology (Kronenburg, 2007, p. 92).

This research is focussed on the Bruggebouw-Oost in the centre of The Hague. This building, constructed in the 90’s at this moment is vacant. This part of the building stock has, most of the time, a flexible design but poor energetic qualities. The desire is to exploit this strength and design a building that can change itself to the demand of the context. These functions then strengthen each other on business and energetic level. Especially interesting is how to design adaptive architecture. The research is focused on concepts and programs regarding multifunctionality and space efficiency. The design phase is focused on the transforming and upgrading the current building to house the new program. Hereby the research is more focused on adaptable architecture and it’s program, coming out of the context. The design is more focused on implementation of the program and upgrading the building and surroundings into the future.

OBJECTIVE

The objective is to bring new life and a new position to the Bruggebouw-Oost in The Hague. This new position within a quickly changing context where the building is made future proof. By seeing the building as a facilitator of different activities the building will be a main attraction for inhabitants, neighbours and visitors. This active adaptive, physical changing personality is needed to fill the program and find a solution against the waste of space. The building is a testing case for active adaption within a multifunctional program that needs to be part of the public realm.

Next to this main goal there are specific demands regarding energy neutrality and circularity coming from the government. An ‘always on’ design reduces the waste of energy because the function is never off. Next to that, adaptability will result in the reversibility of materials which stimulates the circular goal. The desire is to search for a way that these goals, set by the government, are mainly accomplished by the concept of an active adaptive building. To what extent could this concept fulfill this?

DESIGN ASSIGNMENT

Design question

The overall design question is to give the Bruggebouw-Oost a second life and a new position in the city center. This by creating a **future proof building** by the combination of functions and its ability to change over time. This program needs to be flexible and composed out of **different functions**. The ambition is to search for a way it could benefit to become an energy neutral and circular building, this is in view of the rules the government set for the built environment in 2050.



How to circular transform the Bruggebouw-Oost, **into an adaptive building that maximizes the usage of space** and that is energy neutral?

Before answering this main design question a couple of sub-questions are needed. For the analysis:

- How does the building function in its context and what should it do in the future?
- What is the current building composed of themed by architecture, climate and construction?
- What materials are present in the current building and what are their circular properties?

For the design phase:

- What climate concept fits with adaptable architecture and how is it translated in the building?
- What are the technical difficulties with the implementation of the program?
- How does the new program, and concept translate to the architecture of the building?

Thematic Research Question

The research is focused on **adaptable architecture** and the program that comes forth out of this criteria. The program will arise out of the context and will drive the design process. So the research is focused on the **program and the thematic fascination**. It will give the design outlines, program and combination of functions for the overall design. The relation between the design and research is formed by a Program of Requirements that is the main document for the design rules. The main research question is:



How to design an active adaptive building within an existing structure by maximizing the efficiency of space?

Before answering this main research question a couple of sub-questions are needed.

1. What are contemporary theme's concerning multifunctional building?
2. What is the effective use of spaces and functions looking at active use?
3. What program will stimulate the maximum use of a building and which relation doe they have?
4. What kind of adaptable architecture and their guidelines?

METHODOLOGIES

Research

Context analysis

A multifunctional program is a reflection of its context (Robert Schmidt III, 2016). To see what is needed and to understand relations the context is analysed. This research had, as a result, a wide database of the actual use of buildings, instead of just aiming for the opening hours. This creates the ability to link activities and specifically adapt to the demand. Different activities are researched to see the actual usage. This context means the city centre and then specifically the 'Haagse Loper' area.

Literature studies

Literature study is needed to understand contemporary concepts about multifunctionality and adaptive architecture. Search terms were: Flexible architecture, adaptable architecture, multifunctional program.

Program-mapping

The proposed program needs to have overlap. To understand and draw these relations programmatic mapping is needed. This will create the physical linkage that is possible to implement into the existing floorplans and sections. This will all be integrated in the Program of Requirements that is, together with the design analysis the main product.

Design

Analysis on building and context

This project will be integrated in an existing building; The Bruggebouw, in The Hague. One of the main goals is to transform to a circular building. Understanding the current building on comfort, construction and architectural level to see the strengths and weaknesses of the current situation and where alterations are possible. Next to that it is important to understand the context and it's future. This will answer the position of the building in the city of the future, information sought in municipality or governmental documents.

Literature studies

With the Program of Requirements in mind, additional literature study is needed to integrate the concept in the existing building. First studies around 'energy neutral buildings' and 'transforming office building' is needed to start off the design process.

Case studies

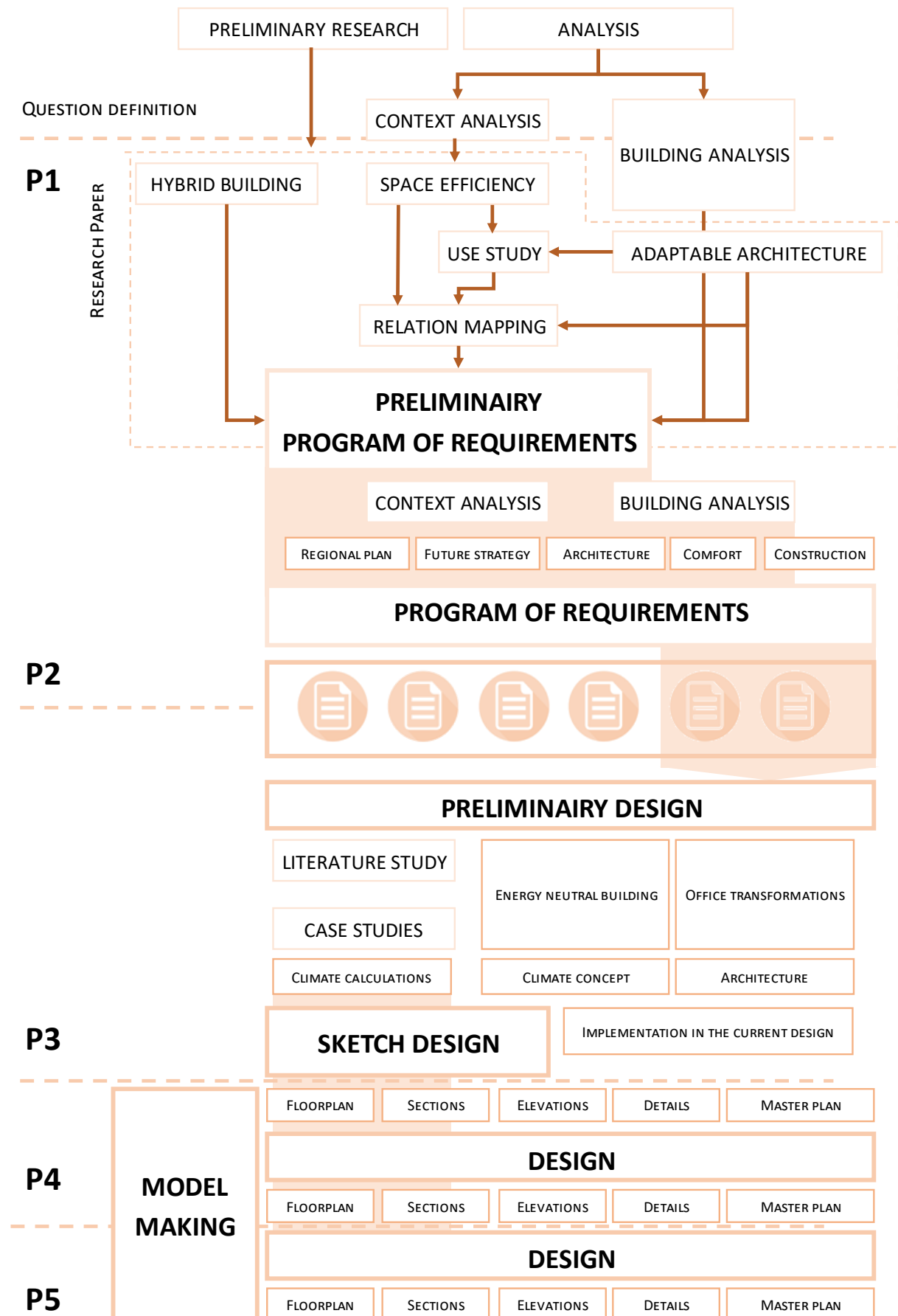
These case studies are needed to understand the transformation of office buildings. Research will focus on transformations and energy neutral office buildings. This research will be done in combination with the literature studies and will swing back and forward.

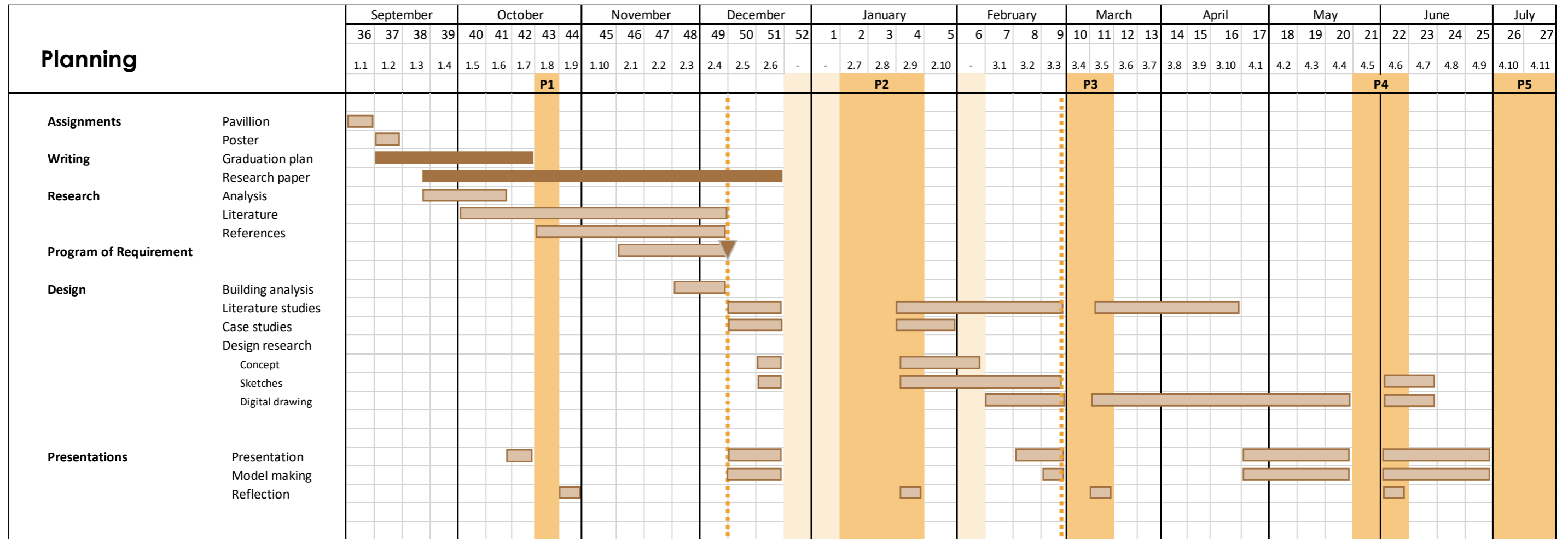
Research by design

This part will combine all the precious research and will consist out of four phases. Designing from sketching towards technical drawings.

Phase 1	Phase 2	Phase 3	Phase 4
Concepts sketching	Implementation	Detailed model	Detailed model
Modeling volumes		Technical drawings	Technical drawings
			Masterplan

APPROACH





REFLECTION

What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)?

The track of Architecture does not see many transformation projects. This is a missed opportunity seen on an ethic level and seen the governmental circularity goals. There is a lot to get within the existing stock. Upgrading it to the full potential, something the existing stock mostly not reach.

The studio 'Second Life' especially focusses on the 'not so desirable buildings' of the existing stock. The value for this kind of buildings is poor and most of the time they will not last long. This is a waste in form of material waste and energy consumption. Focussing on this upgrading with questionable projects 'Second Life' distinguish itself within the master AUBS.

What is the relevance of your graduation work in the larger social, professional and scientific framework.

The question within this paper is of the utmost importance. Certainly now, with the nitrogen crisis , low tech, less impactful solutions are needed to cope with the rise in housing needs. Connecting and creating these cities within a city also needs to take on the introverts of the western civilisation creating a more harmonious nation. The relevance in this research lies in the urge of the problems surrounding it. There is a huge demand, a huge waste of valuable space and a big part of the building stock that is not ready for the future. It is problematic to tear all these buildings down to use the site. It is especially difficult to say this in light of new regulation that urges on the circular economy and energy neutrality of the existing stock. To explore the ways to reduce waste of space and thereby waste of energy would be a big solution for city centres that need to expand. That is, only, if the hypothesis of energy reduction of certain function combinations is true and it values against the problems that arise out if these implementations.

BIBLIOGRAFIE

- Aurora Fernandez Per, J. M. (2011). *This Is Hybrid*. Vitoria-Gasteiz: a+t architecture publishers.
- Bouwbesluit online*. (2012). Opgehaald van BRIS: www.bouwbesluitonline.nl
- Chiddick, P. D. (2006). *Promoting space efficiency in building design*. Lincoln: University of Lincoln.
- De Drager; A film about architect John Habraken* (2013). [Film].
- Fenton, J. (1985). *Hybrid buildings*. New York: Princeton Architectural Books.
- Gemeente Den Haag. (sd). *CID Agenda 2040: Kansen voor nieuw Den Haag*. 's Gravenzande: Drukkerij van Deventer.
- Jongeneel, C. (2018, Oktober). *Gevraagd: een miljoen woningen, maar welke?* Opgehaald van Delft integraal: <https://www.tudelft.nl/delft-integraal/articles/gevraagd-een-miljoen-woningen-maar-welke/>
- Kronenburg, R. (2007). *Flexible architecture*. London: Laurence King Publishing.
- M. Hek, J. K. (2004). *Herbestemmingswijzer; Herbestemmen van bestaand vastgoed*. Delft: Publikatiebureau Bouwkunde.
- Rijksoverheid. (2016). *Nederland circular in 2050*. Den Haag: Ministerie van Infrastructuur en Milieu.
- Rijksoverheid. (2018). *Green Citydeal; EnergieRijk Den Haag*. Den Haag: Rijksoverheid.
- Rijksvastgoedbedrijf. (2019). *Routekaart stelsel Kantoren*. Den Haag: Rijksoverheid.
- Robert Schmidt III, S. A. (2016). *Adaptable Architecture; theory and practice*. New York: Routledge.
- Torsing, R. (2019, Oktober 7). Het Bruggebouw-Oost. (R. A. S. Brouwer, Interviewer)
- Voordt, D. v. (2007). *Transformatie van kantoorgebouwen; Thema's, actoren, instrumenten en projecten*. Rotterdam: Uitgeverij 010.
- Werkgroep Binnenstedelijk Bouwen. (2010). *Prachtig Compact NL*. Den Haag: Atelier Rijksbouwmeester.
- Yin, R. K. (2018). *Case Study Research and Applications*. United States of America: Sage Publications.