KEA - Business Economics and IT
1st semester, Exam
Cross-disciplinary Project 2019

TDC shuns Huawei and selects Ericsson for 5G

- when outsourcing isn't just about Huawei or the "high-way"

We must conclude that there is an intense and bloody competition taking place within the Danish mobile market. (Director, Telecom Industry Association, Jacob Willer)

Huawei's marketing—and Chinese government propaganda—has built the impression that it's either Huawei or no way to 5G. The telecommunications firm declares itself the unparalleled leader in 5G as it attempts to secure commercial partnerships around the world, now boasting more than 50 contracts across some 30 countries. (Kanya & Sheppard 2019)

Alliances and partnerships are initially romantic in another sense: their formation rests largely on hopes and dreams—what might be possible if certain opportunities are pursued. Strategic and financial analyses contribute a level of confidence, but, like all new business ventures, collaborative relationships draw energy largely from the optimistic ambition of their creators. (R. M. Kanter 1994)

Danish telecom group TDC

When Allison Kirkby, President and CEO at TDC Group, through a press release announced that the leading Danish Telecom Company had chosen Swedish-based Ericsson to roll out their 5G platform, it indirectly sends the message that their six-year concurrent 4G partnership with Chinese Huawei had come to an end (TDC 2019; Ericsson 2019).

According to Kirkby, the final choice of provider was the result of “two bids and a tough negotiating process”.

Keen observers of the process may suggest that Ericsson revenged their loss to Huawei in 2013, being the chosen TDC mobile network partner since 2008. Back then the CEO of TDC Karsten Dilling revealed that Huawei was preferred due to being "a couple of steps further in guarantees”, ensuring that TDC´s network would offer the best user experience, the best coverage and the best operational performance on the market (Light Reading, Clark 2013).

Being awarded Denmarks best mobile network four years in a row, 2015-2018, by independent analytical bureaus, sends a signal that Huawei may have delivered on their promise. (TDC and Danish Technological Institute 2018).

Denmark’s growing hunger for data

The appetite for data is booming in the kingdom of Denmark. Danes insist on watching House of Cards on their mobile, even though they are at the beach, and far away from the nearest wifi connection. At home, they want high Internet speeds that allow both dad, mother and children to work, stream and play online games completely smoothly – and at the same time.

The numbers speak for themselves. According to the Danish Energy Agency's telecommunications statistics show that Danish consumers' hunger for fast broadband is rising exponentially and that they are using their mobile phones significantly more to access the Internet (Danish Energy Agency, 2016). Danes have also begun to adopt the fast broadband speeds, while prices for the cheapest mobile subscriptions fall (Danish Energy Agency, 2017).

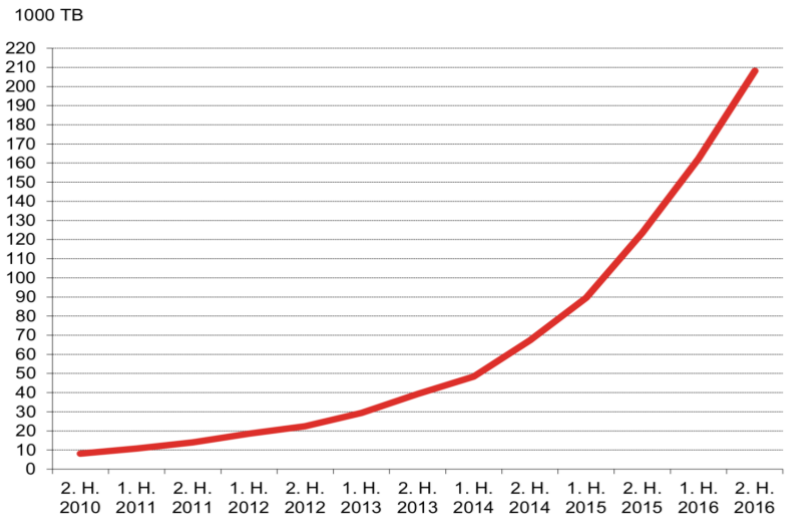


Figure 1 Wireless Data Traffic 2010-2016 (Danish Energy Agency 2016)

Intense rivalry in the Danish telecom industry

The telecom industry in Denmark is characterized by the existence of large players which dominate the market and benefit from economies of scale. This situation increases rivalry within the Danish market, which is less concentrated compared to other developed markets, preserving competition. Indeed, rivalry among players has been intense as price competition has eroded the Danish market value in recent years (MarketLine, 2017).

TDC is an inevitable player in the industry. The company offers among others landline telephony, landline broadband, mobility services, and pay television (Pay-TV) services. In addition, TDC offers hosting and system integration solutions to corporate customers. In order to differentiate itself, the operator aims at offering their customers the fastest experience in the country.

The fastest mobile network in Denmark

In 2014-2018, TDC achieved “Best in Test” as the fastest mobile network in Denmark (P3 Communication 2018; Technological Institute 2018). This accomplishment was the result of a comprehensive modernization of their landline and mobile network-initiated back in 2013.

In order to realize this task, TDC was looking for a world-leading partner and found a fit in Huawei. The Chinese company has been selected by TDC as a sole vendor to deploy the nationwide LTE network in Denmark and provide managed services over a six-year period (Press Release by Huawei, 2013).

As one thing leads to another, Huawei became a central partner in the upgrade of TDC’s cable network started in 2016 (Huawei, 2016). TDC is now addressing the challenge of fast broadband to the home and Huawei once again gained the provider’s trust: “The relationship with Huawei has become close”, says Carsten Bryder, chief technology officer of TDC (Bryder, 2016). In the same vein, the operator's chief procurement officer, Mohammad Asim, declared: "Huawei is a credible partner, reliable. It has focused on the partnership. Trust is key" (Ibid.).

Huawei is in Denmark for the long run. “As one of the world’s biggest network-initiated companies, I hope we can contribute to creating an even stronger tie between Danish and Chinese businesses, people and cultures. This is an important reason why I have decided to enter the board of Danish-Chinese Business Forum” says Jason Lan, CEO of Huawei Denmark.

The significance of Alliances and Partnerships

According to Child (2015, 270), “strategic alliances and other forms of interfirm cooperation have grown remarkably since the mid-1980s”. He refers to them as “one of the more

important new networking organizational forms", which also encompasses outsourcing and virtual value chains.

These alliances and other forms of inter-firm cooperation are partnerships where two or more companies collaborate in the medium – or long run, sharing resources like information, communication, technology and other capabilities as well as risk to achieve objectives that are mutually beneficial (Chron, 2016).

Mudambi and Tallman (2010) argue that the more the outsourced activities involve tacit, complex, high-value knowledge, and require considerable integration of tasks between client and vendor, the more appropriate it will be to govern the partnership through managerial controls and integrating mechanisms rather than relying primarily on contracts and other written agreements.

It could be argued that the collaboration between TDC and Huawei goes beyond mere outsourcing. While outsourcing involves defining the activities to be undertaken within a company in relation to those performed externally and managing the connections between them, partnerships or alliances between companies can involve both a sharing of ownership and management.
As outsourcing goes beyond just a cost-reducing strategy toward one that leverages the specialized competencies and knowledge of providers, strategic alliances become more and more a form of collaboration to consider.

The Assignment

You are required to make an inquiry into the strategic collaboration between TDC Group and Huawei, considering to what extent the outcome of their strategic intentions can explain the choice of Ericsson as a replacement.

The following tasks are the formal requirements for your project:

Accounting

On the basis of TDC Groups financial statements from 2013-2018, do an analysis of the group financial performance using ratios, key figures and relevant trend analysing tools that can explain their motivation behind the initial as well as the ongoing collaboration with Huawei.

- Interpretation of the financial performance should at least have a focus on
    a. Development in earnings, asset and debt development.
    b. Analysis of the past 5 years of development in cash position, defined as the relations between debt portfolio, current assets and current liabilities and cash position

Organization

- Identify and explain the type of strategic collaboration established between TDC Group and Huawei.
- Elaborate on and analyse the strategic intentions "drivers" underlying their collaboration.

Microeconomics

- Considering TDC Groups return to Ericsson as their 5G service provider, apply the theory of production and reflect upon the economic rationale behind TDC Group's collaboration with Huawei leading up to the replacement. Illustrate your findings using short and long-run supply curves.

IT assignment – a management platform for TDC

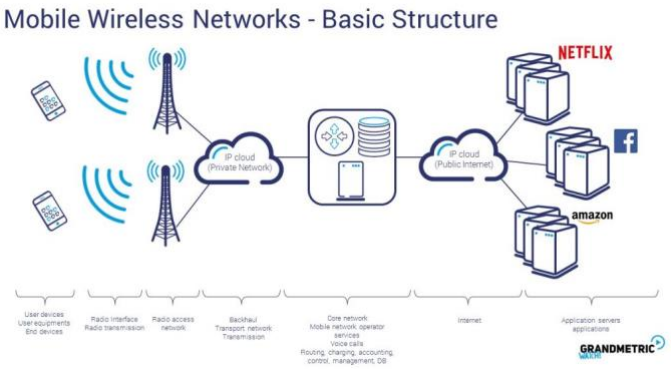
Background – technical assets and services

There is a large range of services offered by TDC[1] on the consumer market for both businesses and private customers. These services include, but are not limited to:

- The remaining telephone landlines and the internet connections offered through the DSL Network.
- The cable network for television, including Internet connections offered through Coaxial Cables.
- Connections offered via optical fibre.
- Mobile Network via LTE/4G and eventually 5G.

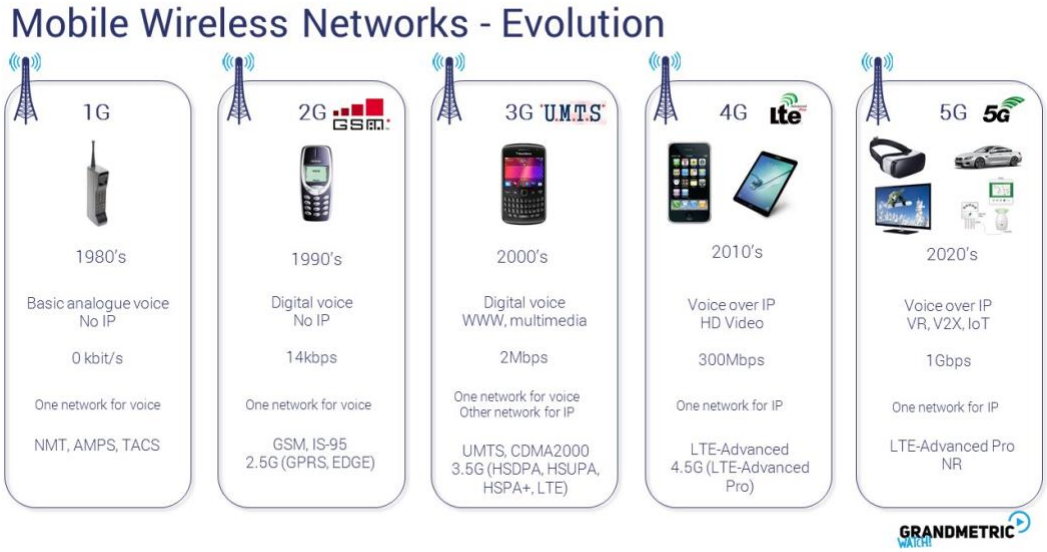
Many competitors provide similar internet services. However, few have as many networks as TDC. The company naturally has systems to monitor all the equipment required to connect a private home, or an office, to the main networks listed above, each sending in data in different formats. All of this must be managed. TDC has therefore hired your consultancy firm to specify a prototype for a management platform. The end goal is to gain better insight by developing an app for overall network management. But first, you must create a simple prototype. TDC wants you to build a software application that can monitor the overall status of their network and its performance. They have decided to limit the prototype's functionality to the mobile network, as it exists today and specific locations. The basic structure of a mobile phone network, in a simplified version, is depicted below.

1 https://tdc.dk/



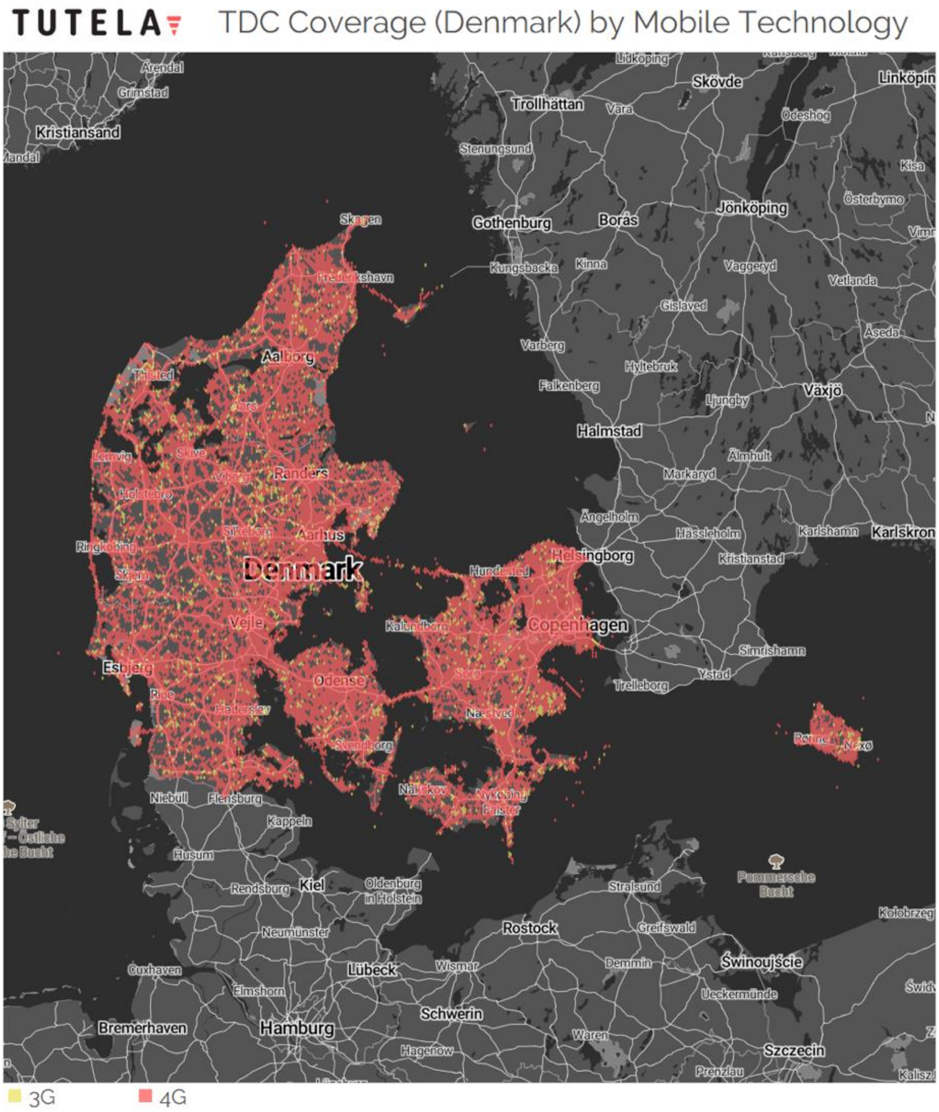
Picture from https://www.grandmetric.com/topic/2-introduction-to-wireless-systems/

Users, be it, consumers or employees, connect their mobile handsets to the private network (RAN) of their mobile network provider. Tasks such as billing and access control are performed here. In turn, the provider connects to the public internet, enabling the user to use any service, as streaming of music, television, movies, social media, and much more.
Just looking at the mobile phone and data market, we are faced with a complicated landscape in terms of the generations of mobile networks. From the early nineties, when the GSM standard piloted the era of digital mobile telephony, TDC (or predecessors) have been in the game of evolving standards, including EDGE, UMTS/3G, LTE/4G, and soon moving on to 5G.



Picture from https://www.grandmetric.com/topic/2-introduction-to-wireless-systems/

Coverage and speed are keys to competing on the market. This needs to be visualised, which most operators do on their websites. Below is a representation of such a coverage map, made interactive, so you can zoom in on a city/area, filter for specific technologies, etc.



TDC Network Coverage. More available at https://daekning.tdc.dk/tdcnetmap_ext_tile2/

SD Tasks – Planning and Scoping an App

Stakeholders: List all the stakeholders for a network management application.

Requirements: Identify and create a table of all basic functional and non-functional requirements for the prototype, to be released in December 2019. The requirements must be included in the main report.

As indicated above, the system should be ready to handle input from at least four feeding systems. Therefore, the prototype created should be scalable. Hence create another table of requirements identifying and stating the full system requirements, aimed to be developed during the first quarter of 2020, and will be ready for final release in Q4 of 2020. The system requirements table must be included in an appendix of your report.

UML: Draw a UML sequence diagram showing the process of connecting to the 4G network. As an extra task, include the process of making a phone call.

Based on the four internet connection options above, draw a class diagram(s) of subscribers and networks. As important as the diagram is the accompanying verbal description, in which you argue for names of your classes, super/subclasses, inheritance, methods.

SC Tasks – Coding an App

Python code: Create a script using Python 3.8.0 which presents a menu to the user. The script should generate a header, clearly indicating the purpose of the script, a menu indicating a list of activities the user can perform on a pre-given CSV File, including printing out filtered, grouped and sorted data.

Your report must contain a short but clear user instruction sheet. If you have a way for the user to specify the CSV file, this must be made clear. Similarly, if you assume a specific name and location of the file, this must be stated in the user instruction sheet, so the user is not confused and does not get any error messages.

Your report should contain a description of your code as well as argumentation for the way it was built.

Before – and during – the coding process, you must describe test scenarios, in line with the user manual. Make sure to specify prerequisites for running your script, like changing directory. And make sure to test it before the user does.

The app will be based on terminal/command prompt, invoked using "python3.8 yourscript.py" for mac users and "python yourscript.py" for windows users – which you must specifically tell the user. This also means you need to use the latest version of Python for executing your script.

The program: You must download the pre-generated CSV file provided to you as part of this exam. It contains 5G network download speed test readings of the TDC network from different geographical locations (the data was randomly generated by the teaching team and not by TDC).

1. Your program must be able to parse the CSV file (import the CSV file so that it can work with it).

2. Print the average download speed for Fanø for the combined months of August and September.

3. Create a plot of average download speed per month for Copenhagen and Ballerup municipalities in one graph.

4. Create a bar plot of the upload speed per month for Lolland.

When your script is invoked, a menu, like the one below, must be displayed:

> **—MENU—**
>
> **Enter a number to select the function you want to perform:**
>
> 1. Parse the CSV file.
>
> 2. Print average download speed for Fanø in August and September.
>
> 3. Plot monthly average download speed for Copenhagen and Ballerup.
>
> 4. Create a bar plot of the upload speed per date for Lolland Commune
>
> Press Q to quit

Your prototype must comply with the requirements for your app. You must also use functions in your script, and you may create classes. The code from your script must also be included in an appendix. All operations on the CSV file must only be performed through your Python program.

You must upload your Python file, named logically like your report. So "tdc.py" is NOT valid. Your code must be readable, logically structured, and properly commented.

Procedure

The assignment is a group hand-in made up of groups of 3-5 members.

The written assignment should be no less than 10 pages with a maximum of (10 + 5 * number of group members) pages, not incl. frontpage, table of contents and appendices.

- Example 1: a group of 3 can deliver between 10 and 10 + (5 * 3) = 25 pages, so the interval is between 10 and 25 pages.
- Example 2: a group of 5 can deliver between 10 and (10 + 5 * 5) = 35 pages, so the interval is between 10 and 35 pages.

A standard page is considered 2400 chars, figures 700 chars, margins at least 2 cm. with 1½ line spacing, font-size 12.

Suggested Report Structure

1. Title Page – (Title, date, names, supervisors, educational institution)
2. Abstract – (Outline the problem, methodology and results – approx. ½ page)
3. Table of Contents – (Remember index for chapters and appendix)
4. Introduction – (Intro, problem analysis, problem formulation as well as delimitations)
5. Methodology – (How has the overall goal of the project been achieved?)
6. Analysis – (Analysis, results)
7. Discussion – (Interpretation of the results)
8. Conclusion & Perspectives – (Most important results and answers the questions raised in the problem formulation)
9. Bibliography
10. Appendix
    a. Any python code goes here. Remember to reference the appendix appropriately in the relevant chapters (see 11.)
11. Include the description of your IT-solution as one or two separate chapters following your appendix. Relevant references should be placed within the Bibliography.

Exam Presentation

Thursday 5th December 2019, 08.30

Exam presentation in Space Shuttle

Deadline WISEflow

Thursday 19th December 2019 on Wiseflow, 10.00

Formal rules 1. semester - Excerpt from Curriculum for Business Economics and Information Technology, August 2018.

1. Semester exam (30ECTS)

A project process is carried out, in which the interdisciplinary work of all six subjects is to a greater or lesser degree brought into play.

The case assignment examines the learning objectives of the study program, described in the knowledge as well as the competences. At the end of the project, a report is submitted. The project assignment is solved in groups of 3-5 participants. Dispensation can only be granted by administration.

Examination

An individual oral exam consists of a presentation and examination by internal censorship. The examination grade is an overall assessment of the project assignment and the oral part of the exam.
The student will be examined in several subjects: Microeconomics, Accounting, Organization, Software Construction, Software Development and Communication. The examination must secure that the examination covers subjects that are not already dealt with in the report.

1. Group presentation based on the report: 15 minutes.
2. Individual examination: 15 minutes.
3. Discussion of performance and announcement of grade: 5 minutes.

If the student doesn't pass the 1. semester exam, there is a possibility for up to two additional examinations. Re-examinations will be completed shortly after the ordinary exam.

The overall grade of the 1. semester

The total grade for the 1. semester is the weighted average of:

- The grade for the module assignment SD-SC-ACC (weights 20%)
- The grade of the case assignment in the COMM-ORG-MI section (weights 20%)
- Grades for 1. semester exam (weights 60%)

The total grade is rounded to the nearest grade in the 7-point scale; however, it can't be rounded to grade 02.

The semester is passed when the student obtains at least the total grade 02. A passed test can't be taken again.
If the total test has passed, partial examinations with the grade 00 or -3 can't be taken again. Even if the total test is not passed, partial examinations with the grade 02 or above may not be taken again.

CEO of HuaWei refuses to stop using expression 'It's my way or the HuaWei'

JULY 5, 2018 *by* DAVE BARCLAY