



Emerging Technologies

Study Project Ohiaraha

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Introduction

In June 2007 a group of Electrical Engineering students goes on Study Tour to Canada. To be prepared for the tour research is being carried out by the participants into various aspects of the country and a number of companies. The research is divided in three parts namely the Macro, Meso and Micro research. The Macro research covers aspects such as culture, history, politics and economics. During the Meso research several economical sectors relevant to Electrical Engineering are studied. The results of both the Macro and Meso research form the content of the preliminary report.

The third and final part of the research is the Micro research. It covers the companies/universities which will be visited. This document describes how the Micro research of Study Project Ohariha will be carried out. In the end this Micro research combined with day reports will form the content of the final report.

Goals

The contents of the research can all be traced back to the goals for this project:

- Get to know a non-European country from 2 different points of view:
 - ① study of culture, climate, politics, geography, language, economy, social aspects, etcetera
 - ① study of activities in Electrical Engineering – the level of education, research and the ways they are implemented
- Learn some of the aspects of the work of an electrical engineer within a company in a non-European country
- Get to know people in companies, research institutes and universities, both in the Netherlands and abroad
- Gain some knowledge in the working area of Electrical Engineering

Theme '*Emerging Technologies*'

Once a new technology has been invented it goes through several stages of adoption. Considering a new technology as an innovation, Rogers [1995] has developed a theory for the diffusion of innovations. He defines an innovation as an idea, practice or object that is perceived as new by an individual or other unit of adoption. He distinguishes the following types of adopters of an innovation: innovators, early adopters, early majority, late majority, and laggards.

In its life cycle, initially a technology is brand new and it has not proven itself yet. The innovators start adopting it, followed by a small group of early adopters, who take the risk of adopting the technology for use in their products. When the applications of the technology appear to be successful, more and more companies will implement the new technology into their applications (products, processes), i.e. early majority and late majority. In the end every company will use it. At this point, the innovators and early adopters are usually already working on implementing the next (emerging) technology and in this way they try to stay ahead of their competitors.

The theme of this study project is emerging technologies, implying that we focus on the first stage of the adoption of technology. At the start of this stage the technology is brand new without any available products or processes and at the end of this stage there is a small number of applications of the technology (by innovators and early adopters), but it is not yet widespread. Examples of current emerging technologies that are in the beginning of the first stage of adoption are UltraWideBand, 3D-displays and fuel cell cars. Some examples of emerging technologies that are coming close to the end of the first stage of adoption are Blu-ray/HD-DVD, UMTS and E-paper.

Micro Assignment

The Micro research is final part of the Study Tour. Its goal is to gain more and specific knowledge about the adoption of Emerging Technologies. The results will be compared to the Macro and Meso research. Most of the Micro research is carried out during and after the Study Tour. In order to be prepared for the tour and to be able to ask relevant questions a small part is carried out before the tour. This preparation work will also help the companies to fine-tune their presentation to our needs.

Micro goals

- Formulate a description of the organization / company, what it is doing and in what sector(s) it is active.
- Identify key Emerging Technologies / developments for the organization.
- Compare the results with the Macro / Meso research and visits to other organizations.
- Give an answer to the research question.

Research question

What are important actors and factors that support or inhibit the adoption of Emerging Technologies in organizations and how do these findings compare with earlier results?

Setup

In groups you will write a report about a certain sector. The end result will be a report about the sector and the individual companies. You need to write a few chapters (1-4) about each company like what it is doing, how many employees and so on. Besides, there is an overall introduction, a discussion and a conclusion for the whole sector. The members of a group review each others work (within the group) and will make sure that the reports are properly formatted in Latex.

Context

The Micro assignment is part of the course 'International Study Tour Preparation' (188085) and the workload equals 4 ECTS for each student. If you like more ECTS, there is an option to get 5 ECTS if you perform an additional assignment.

Travel guide

The travel guide is the book which each of the participants will receive before the tour. It contains the travel schedule, information about cultural excursions and the company visits. In groups you need to provide texts about the visited companies, so that every participant gets an impression of the company. The table below contains a list of chapters and the length of each chapter of your text for the travel guide.

Chapter	words / pages
1. Introduction (for each organization and an overall introduction)	250 / ~0.5
2. Organization description (for each organization)	500 / 1
3. Relevant ETs / developments (for each organization)	500 / 1

Final report

The final report is published after the tour and contains reports of each company visit. The structure of this report is the same as for the text of the travel guide but with some additional chapters. Also note that the length of some chapters is different.

Chapter	words / pages
1. Introduction (for each organization and an overall introduction)	250 / ~0.5
2. Organization description (for each organization)	500 / 1
3. Relevant ETs / developments (for each organization)	1000 / 2
4. Macro and Meso aspects (for each organization)	750 / ~1.5
5. Discussion (overall)	500 / 1
6. Conclusion (overall)	500 / 1

Schedule

The Micro research will start on May 22nd with a lecture from dr. ir. S. de Boer. After that you will work on the assignment in groups. Before the tour you need to write some details about the company for the travel guide. You have about two weeks till June 4th to finish this. This is not much time but the report for the travel guide should not be much work.

During and after the tour you need to draft the report with information which you obtained during the visit. There will be time when traveling between cities and in the evening to work on the report. It is a lot easier to write things down when it is fresh in your memory. The final version should be finished at the end of August.

- May 22nd 2pm - introduction lecture in HogeKamp T4
- June 4th – DEADLINE Travel Guide text
- August 31 – deadline micro research report

Reporting guidelines

This chapter gives some information about how the reports should be written. As explained there will be two reports: one for the travel guide and one for the final report. There is a considerable overlap between the two as the final report includes the (modified) introduction of the organization concerned. Use the information below as a guideline. Select the relevant aspects but also be creative by adding things which are not mentioned below when it is appropriate. You may also add some pictures, graphs etc. For both texts write them in Latex with proper sections and subsections.

Travel Guide

The travel guide is one of the books which you will receive in advance to the Study Tour. It will contain travel information like our schedule, city information, cultural excursions and so on. Another part of the guide will cover the company visits. That part will contain what the company is doing, how many people are working there and so on. This part about the companies is what you will write first. Below are guidelines on what must be in it. Be creative and add other things when applicable.

Chapter 1: Introduction

Give a description about the organization. Do not repeat the Macro/Meso/Micro assignments but focus on points like:

- History of the company
- Recent developments (in the news due to e.g. takeovers, technological breakthroughs, ..)

Chapter 2: Organization description

In this chapter you will describe the organization. Take into account aspects which you think are relevant. At least pay attention to the following bullets:

- Company/organization size
- Organization structure
- Number of employees
- Turnover
- Location(s)
- Main operations
- Strategy
- Products
- Business culture
- Process description
- Main relationship with other organizations
- Position in the market
- The sector the company is in

Chapter 3: Relevant ETs / developments

This chapter describes the relevant Emerging Technologies / developments that the visited organization is concerned with. The list below gives some aspects to which you could pay attention. Also make some questions which you can ask during the visit.

- Which Emerging Technologies is the organization implementing?
- Which next Emerging Technologies is the organization working on?
- What does the company expect from current/future Emerging Technologies?
- Is the company an early or a slow adopter of new technologies?
- Is the company doing any fundamental research?
- How do Emerging Technologies influence products and R&D?
- Which major technologies have been developed by the company?
- What fields of Electrical Engineering does the company think will become important in the future?
- ...

Final Report

The report in the travel guide gives you an idea what each organization which you are about to visit is doing. After the visit you have learned a lot more about the company. The first part of the assignment for the final report is to correct and complete the text in the travel guide. Next, you extend it with additional chapters for which you obtained the information during the visit. Below is a list of suggestions of what should be in your report. It is a guideline, so adapt it to your own needs and add other aspects when relevant.

Chapter 1: Introduction

Give a description about the organization. Do not repeat the Macro/Meso/Micro assignments but focus on points like:

- History of the company
- Recent developments (in the news due to e.g. takeovers, technological breakthroughs, ..)

Chapter 2: Organization description

In this chapter you will describe the organization. The same has been done for the travel guide but that version might not have been complete. Try to complete it and take into account aspects which you think are relevant. At least pay attention to the following bullets:

- Company/organization size
- Organization structure
- Number of employees
- Turnover
- Location(s)
- Main operations
- Strategy
- Products
- Business culture
- Process description
- Main relationship with other organizations
- Position in the market
- The sector the company is in

Chapter 3: Relevant ETs / developments

In this chapter relevant Emerging Technologies / developments that the visited organization is concerned with are described. The list below gives some aspects to which you could pay attention. Try to find more yourself.

- Which Emerging Technologies is the organization implementing?
- Which next Emerging Technologies is the organization working on?
- What does the company expect from current/future Emerging Technologies?
- Is the company an early or a slow adopter of new technologies?
- Is the company doing any fundamental research?
- How do Emerging Technologies influence products and R&D?
- Which major technologies have been developed by the company?
- What fields of Electrical Engineering does the company think will become important in the future?
- ...

Chapter 4: Macro and Meso aspects

Derive relevant aspects of the Macro/Meso research and investigate how they influence on the organization and how the organization deals with them. Suggestions for relevant Macro/Meso aspects are given below.

Relevant Macro characteristics

- Political/Legal
 - ① Political system
 - ① Government stability
 - ① Present political issues (e.g. war on terror)
 - ① Legislation
- Economical
 - ① Trade agreements/barriers

- ① Financial indicators (e.g. inflation, exchange rate of CAD,..)
- ① Employment
- Socio-cultural
 - ① Cultural differences
 - ① Education
 - ① Emancipation
- Technological
 - ① Infrastructure (roads, electricity, telecom, ..)
 - ① Internet
- Historical
- Geographical
 - ① Climate
 - ① Demography

Relevant Meso characteristics

- Important Emerging Technologies and developments
- Porter's Diamond conditions
 - ① Demand
 - ① Factor conditions
 - ① Firm strategy, structure and rivalry
 - ① Relating and supporting industries
 - ① Government
 - ① Chance

Chapter 5: Discussion

In this chapter make a comparison with:

- other visited organizations: what are the differences and similarities between the visited organizations? Pay attention to chapter 4 and 5;
- results / expectations of the preliminary report (Macro, Meso).

Chapter 6: Conclusion

Give an answer to the research question based on the answers given in chapters 1-5.

References

Provide a list of references which you used for collecting the information.

Division: 31 - Manufacture of electrical machinery and apparatus n.e.c.

This Division is divided into the following Groups:

- 311 - Manufacture of electric motors, generators and transformers
- 312 - Manufacture of electricity distribution and control apparatus
- 313 - Manufacture of insulated wire and cable
- 314 - Manufacture of accumulators, primary cells and primary batteries
- 315 - Manufacture of electric lamps and lighting equipment
- 319 - Manufacture of other electrical equipment n.e.c.

Niagara Hydro
Hydrogen Village (??)

Division: 32 - Manufacture of radio, television and communication equipment and apparatus

This Division is divided into the following Groups:

- 321- Manufacture of electronic valves and tubes and other electronic components
- 322- Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
- 323 - Manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods

Genum
Arise
University of Waterloo
IBM Production Facility (??)

Division: 33 - Manufacture of medical, precision and optical instruments, watches and clocks

This Division is divided into the following Groups:

- 331 - Manufacture of medical appliances and instruments and appliances for measuring, checking, testing, navigating and other purposes, except optical instruments
- 332 - Manufacture of optical instruments and photographic equipment
- 333 - Manufacture of watches and clocks

Xerox
National Optics and Photonics Institute
IMAX
University of Toronto
McGill University

Division: 34/35 - Manufacture of motor vehicles, trailers and semi-trailers / Manufacture of other transport equipment

These divisions is divided into the following Groups:

- 341 - Manufacture of motor vehicles
- 342 - Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
- 343 - Manufacture of parts and accessories for motor vehicles and their engines
- 351 - Building and repairing of ships and boats

- 352 - Manufacture of railway and tramway locomotives and rolling stock
- 353 - Manufacture of aircraft and spacecraft
- 359 - Manufacture of transport equipment n.e.c.

Canadian Space Agency
Bombardier
Magna (partly top-secret)
Ford Production (??)

Division: 64 - Post and telecommunications

This Division is divided into the following Groups:

- 641 - Post and courier activities
- 642 - Telecommunications

Research in Motion
Université Laval
Breconridge (??)

Division: 73/80 - Research and development / Education

This Division is divided into the following Groups:

- 731 - Research and experimental development on natural sciences and engineering (NSE)
- 732 - Research and experimental development on social sciences and humanities (SSH)
- 801 - Primary education
- 802 - Secondary education
- 803 - Higher education
- 809 - Other education

In this division a comparison will be made between Canadian and Dutch universities/institutes.

University of Toronto
Universiteit Twente
Laggiss
ITC (Enschede)

Division 31	Arnout, Hylco
Division 32	Arjen, Bram, Bram, Gart
Division 33	Floris, Henri, Jet, Lars, Mariëlla
Division 34/35	Bart, Ellen, Martin, Pieter
Division 64	Boris, Danny, Joël
Division 78/80	Fleur, Hubert, Sjors