

Eindtoets Theorie van Innovatiesystemen

cursuscode: RW1NTIS

NW&I, bachelor jaar 1, jaargang 2003-2004

5 november 2003,

Educatorium Gamma

12.30 – 14.30 uur

dr.ir. H. van Lente

prof.dr.ir. R. Smits

Het tentamen bestaat uit 4 open vragen.
De vragen tellen in de beoordeling even zwaar mee.
Gebruik bij de beantwoording niet meer dan één A4 per vraag.
Noteer op elk antwoordvel je naam en studentnummer.
Gelieve het drukwerk voor het tentamen te controleren op volledigheid.

1. Modellen van innovatie

- a. Welke drie fasen worden onderscheiden in het Abernathy-Utterback model? Karakteriseer de fasen aan de hand van het soort innovatie, het type bedrijven, type concurrentie en de rol van R&D.
- b. Keith Pavitt heeft een indeling voorgesteld van bedrijven aan de hand van hun innovatieve activiteiten. Bespreek hoe de innovatiestrategie in de categorieën 'information intensive' en 'science-based' zal verschillen. Geef aan welke vormen van samenwerking meer en minder voor de hand zullen liggen voor deze twee categorieën.
- c. Wat is het 'sailing ship' effect? Licht het toe aan een voorbeeld anders dan het zeilschip.

2. Nikolai Kondratiev

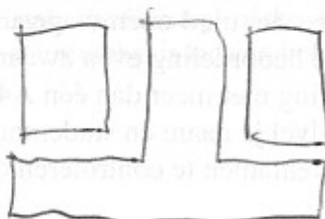
- a. Kondratiev formuleerde in de jaren '20 van de vorige eeuw een theorie van lange golven in de economie; Freeman en Perez hebben deze verder uitgewerkt. Bespreek welke golven onderscheiden kunnen worden en bespreek drie kenmerken waarin ze zich van elkaar onderscheiden.
- b. Wat bedoelen Freeman en Perez met het begrip 'techno-economisch paradigma'?
- c. Bespreek welke delen van het innovatiesysteem in de verschillende golven zijn opgebouwd.

3. Radicale innovaties

- a. Beargumenteer waarom email gezien kan worden als een radicale innovatie.

Schumpeter betoogt dat radicale innovaties enerzijds gepaard gaan met *creatieve destructie*, d.w.z. de afbraak van organisaties (waaronder gevestigde bedrijven), instituties en hun onderlinge relaties en anderzijds met *Neue Kombinationen*, d.w.z. de opbouw van nieuwe organisaties en instituties.

- b. Beschrijf aan de hand van de vier onderdelen van het innovatiesysteem welke organisaties, instituties en onderlinge relaties het slachtoffer werden (of dreigen te worden) van de opkomst van email.
- c. Beschrijf aan de hand van de vier onderdelen van het innovatiesysteem welke *Neue Kombinationen* gevormd zijn of worden.
- d. Is er bij de opkomst van email ook sprake van een 'Sailing Ship'-effect? (BONUS)



4. Samenwerking

In 1989 gingen Philips, Thomson en Siemens samenwerken aan de ontwikkeling van een hoogtechnologisch 'integrated circuit', de zogenaamde 'chip'. De bedoeling was dat ze door deze samenwerking in 1996 de Japanners en Koreanen van de eerste plaats op de wereldmarkt als producenten van de 'key-factor' (zie Freeman & Perez) van de laatste 'lange golf' zouden hebben verdreven. In de bijlage wordt meer informatie gegeven over dit zogenoemde Jessi-project en over Philips.

- a. Wat voor soort samenwerking gingen Philips, Thomson en Siemens aan in het Jessi project? Beargumenteer je antwoord.
- b. Welke voor- en nadelen zitten er voor Philips aan deze samenwerking? Noem van beide twee voorbeelden.

Tidd c.s. bespreken een aantal organisatorische en technologische factoren die samenwerking kunnen bevorderen dan wel tegenwerken.

- c. Welke organisatorische factor en welke technologische factor bevorderde de deelname van Philips aan deze samenwerking.

JESSI

Convergence With a Smile

by Dick Greene, Manager of SEMI's Market Statistics Department

Europe, one must say, has come a long way in solid state electronics in the past decade. Oh, there were fits as well as starts, but it looks like Europe has found its way in the semiconductor [halfgeleiders waaronder IC's, RS] industry.

In 1988, the top three European suppliers, Siemens, Philips and SGS Thomson, had pretty much lost their way in the semiconductor industry. European-owned semiconductor plants were cranking out dated devices with dated processes. Capital investment was not keeping up, and nary a toe was in the water for competitive microprocessor and DRAM [geheugens, RS] products to be made by European producers. The continent's share of world markets was slipping gently down, eventually to a bottom of about 8 percent. Then along came JESSI.

The European community, aware that semiconductors were to be the critical driver of the dawning information age, formed JESSI, the Joint European Submicron Silicon Initiative, in 1989 to develop and specify the processes, materials and equipment necessary to produce semiconductors with geometries of 0.3 microns and below, (i.e., to be world class semiconductor competitors by 1996).

Over the past seven years, JESSI's development budget has been about \$400 million a year, with 70 percent derived from the 77 companies that are members of SEMI and the rest from national governments and the European Community. Much progress was made as a result of JESSI-sponsored programs.

European semiconductor producers also took the initiative to do a few other things that helped them to catch the more aggressive members of the world semiconductor community. For example, Siemens formed development partnerships with IBM on 64 Mbit DRAM process technology, and with IBM and Toshiba on 256 Mbit DRAM process technology. This surely helped Siemens close the process technology gap. Philips also got together with IBM, signing an agreement to share ownership and costs of an IBM plant in Boeblingen, Germany.

During the time that the European Community was developing a roadmap [stappenplan, RS] for JESSI activities, many concluded that design emphasis for European producers should be dedicated to circuits for their telecommunications and consumer markets and ASIC devices that would give end equipment products an edge, rather than using all resources to attack the DRAM and microprocessor markets that everybody else in the world felt would lead to the end of the rainbow. It's not clear to me that Siemens ever bought into this theory. They are chasing DRAMs and microprocessors pretty hard. Philips and SGS Thomson certainly did. As a result of pushing R&D developments toward the niches, European producers have established a leadership position in telecommunications chips for cellular and personal telephones, and for most digital and analog consumer products.

Over Philips



ISBN 90 6168 354 8
Uitgeverij Sun, Nijmegen, 1991
Prijs fl. 19,90
www.bol.com

Auteur: Marcel Metze

Short Circuit [Kortsluiting, RS]: How Philips wasted its talents.

In his book *Short Circuit*, freelance journalist Marcel Metze describes the gradual desintegration of Philips. The Dutch multinational is one of the few electronics companies in the western hemisphere that survived Japanese competition. Not without severe injuries, though. In 1990, profitability collapsed, president Cor van der Klugt had to resign and the new CEO Jan Timmer announced large personnel reductions. As Metze makes clear, the reasons for these dramatic events are deeply rooted in the history of Philips.

During the decades in which the Japanese started to conquer the world with their cheap radios, television sets and hifi equipment, Philips failed to adapt to the changing market. The company remained what it was: an empire of factories, research laboratories and sales offices in about sixty countries, in the hands of an elite of sovereign local managers whose main objective seemed to be to frustrate control from their headquarters. At the same time the company's home base, the provincial town of Eindhoven in The Netherlands, became the scene of backstabbing, excessive careerism and nepotism.

Metze pictures this process of disintegration in graphic terms and does not hesitate to draw parallels with the fall of the Roman Empire. As a result, *Short Circuit* is a book with great appeal. At various moments, it reads like an impressionistic novel, even though its main quality is that it provides a thorough and profound analysis of the problems of the largest industrial company in the Netherlands. Metze's study does not restrict itself to gossip about the individual weaknesses of the managing directors and the power games they engaged in. The book also examines in detail the strengths and weaknesses of Philips' strategic policy, products, market approach, organizational structure, financial control and management philosophy.

The book is based on solid research. The current members of the board of management and the Supervisory board refused to meet Metze, but apart from them, there are few key figures in the Philips organization he did not interview.

Metze describes Philips' numerous failures during the seventies and eighties and analyzes them one by one. He describes the twenty five years' struggle for life of the computer division which has cost an estimated six to seven billion guilders, the development of the 1 Megabit memory chip which also cost billions, the failure of the V-2000 video recorder and he explains why the company never managed to make any serious amount of money on the compact disc, even though it invented the CD-principle itself.

The author's intention was to discover the structural shortcomings behind these incidents. He came across a large number, of which the most important was the lack of strategic determination in the Philips leadership. In 1970, the board of management decided that the company should be a global competitor in virtually every sector in the electronics business: chips, computers, telecommunications, medical systems, television sets, coffee-making machines, you name it. During the following years it became clear that this extreme diversification didn't work, but none of the successive presidents managed to make the necessary fundamental choices and by 1990 the company was still scattering its shrinking resources over the entire spectrum of electronic activities.

The development of a central strategy was frustrated heavily by the enormous independence of the so-called national organizations in the countries in which Philips is active. Even before the Second World War, Philips already was an extremely internationalised organization with branches throughout the

world. These branches - the national organisations or NOs - had their own local production and sales facilities and thus formed the centres from which the company expanded. In those years, as well as during the first decades after the war, many national markets were still tightly shut. As a result, the national organizations had to operate on a basis of self-sufficiency and developed a high degree of autonomy towards the head office.

After 1970, though, this decentralised structure became an obstacle. Japanese companies started to conquer the world with products, assembled on large-scale production sites and sold worldwide under a single brand name. But Philips continued to operate as a holding of small, independent, national companies.

The national autonomy took particularly excessive forms in the United States. The Philips organization there accounted for no less than thirty per cent of the total turnover of the company, but openly ignored the directives from Eindhoven. The American Philips branch was the only one that did not contribute to the company's overhead and research expenses, which cost other branches between fifteen and twenty per cent of their turnover. It paid dividends only in exceptional cases, while at the same time it received 'dotations' of hundreds of millions of guilders from Eindhoven in order to finance company takeovers.

Less than twenty per cent of the American turnover was sold under the Philips label. In 1980 Philips came with its V-2000 video recorder. The US managing director, Pieter Vink, refused to sell it; Philips USA was already distributing the Matsushita VHS recorder.

The independence of the national organizations made the implementation of a worldwide strategy virtually impossible. To a large extent, the national managing directors were able to do what they liked up to the end of the 1980s.

The character of Philips' leaders constituted a third structural weakness in the company. The CEO's of the 1970s, Van Riemsdijk and Rodenburg, were unable to bring about any real changes. Great hopes were invested in Wisse Dekker when he was appointed in 1982, but he was not able to do much about Philips' problems either. The first person who did have an impact was CEO Cor van der Klugt. Immediately after his appointment in 1986, he succeeded in bringing the American branch back under Dutch control. With this move he laid the foundation for the worldwide dismantling of the national organizations. To achieve this, Van der Klugt engaged in a sort of power play which was not very common in Philips. But although his strong-arm tactics were effective for curbing national autonomy, it was soon apparent that they also contained destructive elements. Convinced of the urgency to make the company more profitable and to stimulate organizational and cultural change, Van der Klugt started to fight everything and everyone. Short Circuit contains wonderful anecdotes about the manic power games of this 'lone wolf'. When a division manager tried to sound him out about a decision, and told him that he had already spoken to board-members Hubée and Van Houten, the president responded in a bad-tempered fashion: 'That's totally wrong. Hubée is a shit, and Van Houten doesn't know what he's talking about. Moreover, that's how you create a clique within the board of management, and it just means trouble for me. As long as they disagree, I can do what I like.'

Metze identifies several other structural shortcomings in the Philips empire: the bureaucratic and weakened style of management, the counter-productive system of promotions and rewards, the poor communication between the technical and commercial departments, and many, many others. Today, Philips' technical potential is still very great, and the company has enormous commercial qualities. Still, Metze concludes his analysis in a minor key. He does not see the present CEO Jan Timmer as the saviour many people believe him to be. Instead of resolving problems, Timmer seems to have burdened the company with one problem more: an atmosphere of depression and melancholy. The author concludes his text with a rather apocalyptic reference to the Romans: 'If Timmer wants to prevent Philips from following in the footsteps of the Roman Empire marching to its Fall, he will have to inject the most important element that is lacking in his Centurion Operation: inspiration.'