CASE STUDY

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	Business	Information systems	Technology
Strategy			■
Organization			
Operation			

ICT-infrastructure at the Philips High Tech Campus

Different business units of three product divisions under one 'ICT roof'

ABSTRACT

This article focuses on the Philips High Tech Campus. From 2006 onwards, approximately 8,000 Philips employees will be working – predominantly on research and development – on this campus. The synergy between co-workers across business units is one of the key issues for the campus. ICT is therefore indispensable. The ICT infrastructure for data, voice and video forms the necessary foundation. This article zooms in on the ICT infrastructure on the campus, not only with respect to the content, but also takes a look at the process. From the start of the project it has been very clear that realisation of a common ICT infrastructure in an environment with various business units of diverse product divisions with strong control along the division axis, demands explicit attention and commitment from all concerned.

The introduction covers a few distinctive features of the campus, the goals that have been formulated by Philips for the campus, as well as a sketch of the main points of the ICT infrastructure project. Subsequently, section two covers in detail the role of ICT on the campus. Based on the dominant business trends within Philips, one can translate these into the core qualities of (the) ICT (infrastructure) on the campus and the manner in which this should be organised. As an illustration, two guiding principles of ICT on the campus have been explained in detail in section 3. The article ends reflecting on a number of process- specific and content-related aspects half way towards the realisation of the campus.

1. Introduction

1.1 Philips High Tech Campus

The preparations for the Philips High Tech Campus began end 1997 on the A2/A67 motorway in Eindhoven (see also www.philips.nl/hightechcampus). Mid 2001, the first inhabitants moved into the campus and it is expected that the last buildings will be delivered in 2006. Finally, 170,000 square metres of new construction will be divided between 25 buildings (comparable to 30 soccer fields), along with an additional 70,000 square metres of renovated buildings (6 buildings) and 15,000 square metres of facility buildings. The campus itself is approximately 92 hectares in area. On completion of the entire campus, approximately 600 million Euros will be invested.

1.2 Goals of the campus

Philips had visualized three goals for the development of the campus:

• The creation of a *stimulating environment for synergy and innovation*. Creativity of people is necessary for innovation. Philips will offer a

unique work environment for the best talent; a stimulating ambience that binds people and inspires to deliver – creative – maximum output. One way to achieve this is to create a transparent and flexible work environment wherein:

- communication and interaction is encouraged;
- multidisciplinary and multilateral project teams will be optimally relocated;
- a lot of attention will be spent on a good balance between work and relaxation. Hence, facilities will be created for sports, doing the daily shopping on campus and childcare;
- an excellent ICT infrastructure is being offered.
- Creation of stipulations for the permanent development of the organization. This means:
  - flexibility of buildings and construction material to create a capacity for further development;
  - use and renovation of existing facilities;
  - responsible embedding into the existing landscape and ecological structures;
  - connection to social structures;
  - building in permanent sources of water, energy and materials.
    Philips is investing approx. 50 million Euros for environmental measures: energy efficient buildings, cold/heat storage, sun panels, etc.
- Realisation of *efficient housing*. By concentrating a large part of the housing in one complex, an important contribution will be made to the efficiency of the housing: the scale leads to synergy advantages, the design leads to efficiently distributed buildings, which can be efficiently provided with facilities, which contributes to decrease in working costs.

1.3 Project organization and phasing
In spring 1999, an ICT Planning Team was formed with the mandate to realise the following results, corresponding to the goals of the campus:

- high tech and future-proof, common ICT infrastructure, which is capable of seamlessly facilitating the business specific ICT of the diverse business units;
- an active management organization for the ICT infrastructure that is responsible for management at operational, tactical as well as strategic levels.

The ICT Planning Team was broadly represented by delegates from a number of divisions, telephony management and Corporate IT, amongst others. Within the ICT Planning Team, a core team of five people were actively responsible for the requisite progress.

In the beginning, an ICT Sounding Board group was formed, with representatives of the approx. 15 business units from the various divisions, which included Philips Research, Philips Semiconductors and Philips Consumer Electronics.

The following phases are summarized below:

- The Definition Phase: the most important result was the creation of the scenario document with a vision of ICT on the campus, 'A scenario for the Philips High Tech Campus ICT-infrastructure' (April – August 1999).
- The Development Phase: the most important results were the creation of the set of requirements concerning parts of the ICT-infrastructure and contracts with vendors (September 1999 – mid 2000) and a business plan for the ICT-management organization (December 1999).
- The Implementation Phase where the different parts will be successively realised.
  Milestones up to this moment include: an in-house ICT-management organization (started on 1 January 2001 under the name Campus ICT) and the delivery of ICT-ready buildings (on 31 December 2002, 6 office buildings have been delivered, suitable for approx. 1,500 new inhabitants on the campus). In the spring of 2001, the project-oriented activities regarding realisation of the ICT-infrastructure have been brought under control of Campus ICT.

2. Vision of ICT on the campus

2.1 The process
With the content of the scenario document and the manner in which it has been created, a strong foundation has been laid for all the steps which are to follow in the process. There have been discussions – with representatives of the future inhabitants, with suppliers and with opinion leaders within Philips from various backgrounds. High tech campuses in Silicon Valley have been visited which included Cis-

co, Hewlett-Packard and Sun. The different viewpoints have been ordered in a number of sessions with the ICT Planning Team, discussed and set up. A summary of (intended) policies has been discussed with the ICT Sounding Board.

2.2 The role of ICT within Philips
In the interviews with the future inhabitants and opinion leaders, the current and the future business trends were usually the starting point of the conversation. These business trends mostly determine the focus for the set up of ICT. The following business trends – especially the one where ICT plays an important role – have been explicitly discussed:

1 *Multi-site development projects within Product Divisions*. Product development has become a global activity, sometimes following the 'follow-the-sun' principle. Take for example the development divisions with collaborating sites in Eindhoven, Bangalore and Sunnyvale.

2 *Cross Product Division projects*. Focusing on the need of the client, projects are executed with participation from multiple Product Divisions.

3 *Collaborative relationships with clients, suppliers and other business partners outside Philips*. Collaborative relationships are set up along electronic lines as well as at onsite locations of the business partners of Philips. Not only is there an intensive collaboration within Philips, there is already increasing interaction with parties outside the environment of Philips. A good example here would be the manufacturing of TV cabinets, the corresponding moulds, up to the delivery of the pre-mounted cabinets (speakers and wire frame), on the assembly line.

4 *The digitalisation of products and processes*, where the Internet, amongst others, plays an important role. Consider the action taken by Philips towards the end of the 90's to sell products to the end consumer through the Internet in the United States. However, one should also think about the functionality that has been added using electronic technology, for example to products in the consumer market. The 'intelligent' refrigerator is one such example. The refrigerator maintains the stock with scanning techniques and decides whether to order more. This refrigerator communicates with the supermarket in the neighbourhood to place an order.

These trends touch upon the aspect of communication in one way or another. Communication is taking place more and more and at increasing speeds, with an increasing number of and continuously changing parties. In other words, *it's all about communication*.

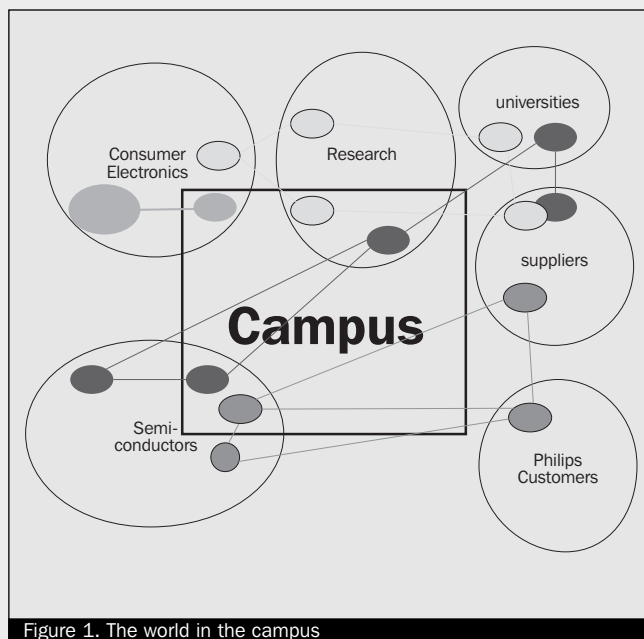Figure 1 displays the world within which Philips and the campus operate.

Figure 1. The world in the campus

This worldview caused the following associations with ICT in conversations: changing confederations of ICT-infrastructures, high capacity communication, adequate data security and any time – anywhere working. Moreover, it is clear that the campus, inclusive of the ICT aspect, must be explicitly organized in relation to and in agreement with the outside world within and outside Philips.

2.3 Core qualities of ICT on the campus
Based on the signalled business trends and the goals for the campus, the *ICT-infrastructure* on the campus, as well as the *ICT management organization* that is responsible for the management of the infrastructure, must satisfy certain core qualities. In the first instance, these core qualities have very high 'open door' content. The challenge lies in translating these core qualities, step by step in the subsequent

phases, into concrete and tangible services for the users of the campus.

### Core qualities ICT-infrastructure

The infrastructure is naturally characterised by high availability. As always, depending on the scale at which the primary processes are supported by ICT, the direct (and indirect) loss of ICT failure is greater.

Flexibility is another core quality of the ICT-infrastructure that manifests itself on the campus in different ways:

- The ICT-infrastructure should not stand in the way of the growth and shrinking of campus organizations. Therefore, this infrastructure should be *scalable*.
- Support for changing collaboration relationships with very short changeover times to synchronize the ICT-infrastructure of the campus with the ICT-infrastructure of the business partners.
- The dynamics of internal organizations – whereby organization units are bought, re-organised or sold – should not be obstructed.
- It should be a simple process to bring in new technology into the ICT-infrastructure (therefore, the ICT-infrastructure should be *future proof*).
- Users will be supported in their mobility, as there is *ICT-freedom of movement*. This not only means freedom of movement during the day during normal work hours, but also for transfer of locations.
- Except for certain general basic provisions, there is a choice for users when purchasing ICT-infrastructure services (*à la carte service*). Thereby, one can also think of different service levels for the same service.
- To accommodate requirements that deviate from the norm, in case business demands it. With this aspect of flexibility, one must proceed with caution. Of course, the standards chosen must not be undermined, as a result of which other aspects of flexibility are hampered.

The ICT-infrastructure is adequately *secure*. This implies that the integrity of data, as well as the protection against misuse, is secured during storage, processing as well as transport. This aspect is of utmost importance on the campus due to the concentration of Philips' intellectual property.
The ICT-infrastructure is *state-of-the-art*. This

implies that for set up of the ICT-infrastructure, one continues to use modern technologies according to the principle of 'latest proven technology'. The fact that this continues to take place, says a lot about the control processes; the building and maintenance of the High Tech Campus is a continuous process.
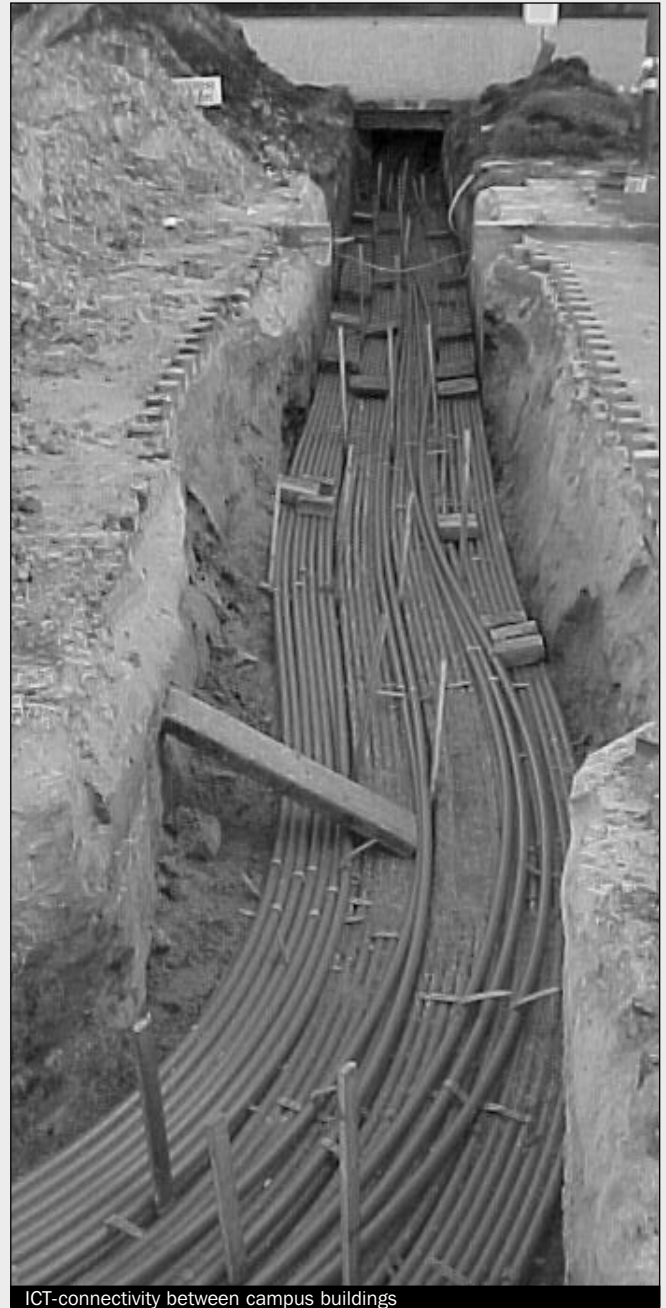
ICT-connectivity between campus buildings

State-of-the-art alone is not enough. The ICT-infrastructure should be *high tech*, so that the image of Philips as market leader in the area of technology as well as the high tech image of the campus is reinforced. High tech is an intangible, especially when concerned with the ICT-infrastructure. One of the interviewees has worded it appropriately as follows: "The first two days you marvel at the fact that ICT aids all work so smoothly, thereafter one takes it for granted." In fact, this also covers the *invisibility* of the infrastructure that makes the internal complexity invisible from its users. High tech reveals itself much more in the application of the underlying ICT-infrastructure that makes working and living on the campus a pleasure. The integration of the applications with other systems, such as access to buildings and the logistic infrastructure of the campus, reinforces that feeling.

Naturally, the ICT-infrastructure, from a total cost-of-ownership (TCO) perspective, should be *cost-effective* to set up, whereby the leverage of the campus with respect to purchase of goods and (management) services should be utilized to the maximum. Where feasible, umbrella contracts at Philips level can be utilized for this.

The above mentioned core qualities are not always compatible with each other. When translating a chosen scenario, a well-balanced consideration needs to take place to ensure that it agrees with the goals of the Philips High Tech Campus.

Core qualities of Campus ICT
Campus ICT, the management organization for the ICT-infrastructure on the campus, should set a *platform for interaction* with the campus organizations II and service offered. With its own responsibilities, the Campus ICT represents the business goals of the campus organizations. Terminology such as client-supplier relationship and *partnership* are spoken in the same breath.

The content of the services offered conforms to the market, in terms of the shape of the organization, the nature and content of the service offered, and the corresponding service levels, as well as the tariffs that are charged for the services.

The financial model being followed is *cost based*

whereby all costs are covered. Campus organizations therefore pay for the service offerings that they avail. For innovation with a 'high tech' character, common funding takes place.

2.5 Guiding principles
The above mentioned translates itself into the following guiding principles that are being followed from August 1999 onwards since the creation of the above mentioned scenario document:

1 *ICT exists for service to the business*. This means that the requirements of the business and the goals of the campus determine the direction of ICT on the campus. ICT is the 'enabling ICT highway', which facilitates the synergy of the business and excels in user-friendliness.

2 *Basic package of ICT-infrastructure services*. To facilitate freedom of movement and communication on the campus and to exploit high volume advantages, a basic package of ICT-infrastructure services is bought by all inhabitants. If that does not take place – then the campus is turned into a development area, at least as far as ICT is concerned. In that context, the basic package of ICT-infrastructure services is a geographical responsibility. The basic package includes, among others, a managed local network, telephony infrastructure and connection to the outside world.

3 *Plus package in ICT-infrastructure services*. To further exploit the high volume advantage offered by the campus, parts of the business will be offered a plus package for certain minimum sales. In case of software engineering, one can for example think of a toolset that consists of compilers, profilers and version control tools.

4 *Clear architecture and technology roadmap*. To ease the interfacing of and between the ICT-infrastructure of the campus and the business specific ICT, the ICT-management organization needs to be well versed with the development trend of the campus organizations. Moreover, the ICT management of the business must be familiar with the current and possible future additions of the campus ICT-infrastructure. These are recorded in a clear description of the architecture and technology roadmap. The technology roadmap talks about the development trend of Campus ICT for the coming years and will be approved by the Campus Management Board.

5 *Working according to standards*. With lightning

quick developments in ICT technology, it is not unimaginable that there are developments that are not mutually compatible or are even contradictory. In the end, to guarantee minimum disturbance to the business, it is necessary to introduce new technology as a managed process. For Philips as a whole, a minimum set of standards is necessary which is followed by all concerned. Standards are applicable at actual standardisation levels (for e.g. IEEE, ANSI, ISO), there are de-facto industry standards, standardized suppliers (e.g. Compaq and Dell), and there is standardisation of working methods or naming conventions (e.g. user names, server names or IP ranges). Those primary responsible for ICT standards within Philips is Corporate IT, and where applicable, the campus ought to adopt the Philips standards. The campus can use these to guarantee manageable basic and value packages.

6 *'Seamless' combination of campus ICT-infrastructure and business specific ICT.* Business specific ICT shall always exist, purely due to the specific characteristics and requirements of the different Product Divisions. The line between campus ICT-infrastructure and business specific ICT can, over a period of time, change, in mutual agreement between interested parties on the campus.

7 *There is a campus ICT-management organization.* Common ICT-services (the basic package as well as the value package) demand a common management. This management has taken the shape of the campus ICT-management organization, which is controlled by the Campus Management Board comprising – representatives of business units on the campus. The campus ICT-management organization will have an unambiguous (budgetary and financial) relation

Overview of the Philips High Tech Campus

to the management organization, which is to be installed for the campus.

8   *Transparent and cost based financing.* ICT-infrastructure services that are offered through the campus ICT-organization are financed in a transparent way for the purchasers. Potential central financing is thereby unambiguously processed. The ICT-organization operates by covering its own costs (in Philips jargon 'a self financing activity'). At the same time, the financial model offers adequate room for necessary innovation.

9   *Innovation is a continuous activity.* What is state-of-the-art today is outdated tomorrow and unsuitable for high tech activities. Hence, continuous innovation must be organized by the campus ICT-management organization. The campus should function as breeding ground for ideas, without putting the availability of the ICT-infrastructure in danger.

3. Detailing a couple of guiding principles

3.1 Basic package and Value packages

Basic Package
In order to optimally facilitate mobility and communication at the campus and to take advantage of the high volume, a Basic Package was defined for ICT-infrastructure services. This Basic Package is obligatory for all residents based on guaranteed service levels and agreed tariffs.

From the start of the project this Basic Package contains the following components:
• Campus LAN;
• Campus telephone infrastructure;
• Connections to the outside world (including Philips Global Network, Internet, Philips phone-network and dial-in services).
• Intelligent campus ICT-applications;
• Management and renewal of mentioned components.

The *campus LAN* was designed with the following main characteristics:
• A dedicated capacity of multiple 100 Mb/s for each workplace, using a structured cabling system based on UTP wiring within the building and fibre to the building. This capacity per workplace can be upgraded using faster network equipment, especially of importance to high power users like chip designers or for all kind of video experiments.
• Network redundancy, with redundant connection for each building, three network operating centres and redundant connection for the campus to the outside world.
• A flexible network structure is the basis for relocation at the campus.
• A future proof architecture, in which emerging technologies like Voice over IP or wireless LANs, can be integrated when appropriate. In the beginning, no wireless LAN technology was yet installed. In the mean time, now each building is, as a standard, equipped with wireless service and there are already approximately 100 active access points. The wireless service is complementary to the fixed network and supports mobility across the campus. With the installation of Voice over IP, the first tests were carried out. Because the functionality with regard to regular telephony still does not offer a substantial value addition, it is has been set up in a limited manner.

The *campus telephony-infrastructure* offers a connection for a fixed phone as part of the Basic Package. A mobile GSM-phone can be acquired in addition to a fixed subscription but is not part of the Basic Package. Because of the fact that all future developments indicated further growth of the GSM-functionality and installed base, no solutions for cordless telephony based on DECT were provided in the Basic Package at the start of the project in 1999. The developments in the area of mobile telephony related to business models for local mobile telephony are disappointing. This resulted in a balanced business case out of reach for the use of GSM for satisfying the on site mobile communication needs, over and above off site communication. The need for mobile communication remained, mainly due to the flexible office concept and in most situations working with a number of persons in the same room. Therefore, from 2002 onwards, buildings were provided with a DECT-infrastructure, where the fact, that approximately 30% of the population has a 'company' GSM-phone, also was taken into consideration.

The *connections to the outside world* will be provided with sufficient capacity, which can be increased to match future needs.

The *intelligent campus ICT-applications* includes those ICT-applications which:
• are not specific to a business;
• contribute to the high tech image of the campus;
• obviously will gain from central organization.
One of the applications in this framework that has been realised in the meantime, concerns the video broadcast of, among others, lectures that are given on the campus by internal and external speakers.

The *management* of the Basic Package will be carried out by the Campus ICT. *Renewal* of the Basic Package is included in the tariffs.

Value Packages
The initiatives to work together on various ICT issues within the Product Divisions and across Product Divisions at the end of the 90s have been discussed during the various interviews. The formation of the campus strengthened this trend; a trend adhered to by the Value Packages. The campus ICT-management organization would at least facilitate the initiatives to co-operate on the field of ICT. Furthermore, at a certain minimum volume, these facilities will, if desired, be translated into a Value Package. A Value Package can be defined as an unequivocal described ICT-service, with a guaranteed service level and an in advance agreed tariff, and is optionally available to the campus organizations.

Examples of operation Value Packages are:
• The use of central computer rooms where m^2 of conditioned rooms can be rented.
• The use of central set of so called 'handy applications', consisting of telephony directory, public transport travel information, travel planner, dictionaries, etc.

Value Packages under construction include installation, support and maintenance (life cycle management) of an Office-work station. This sounds like a relatively simple value package. However, with this value package, the dividing line between responsibility of the local ICT-organization and Campus ICT was more difficult to identify, not only in technical aspects, but also organizational. It therefore demands a considerable amount of preparation to set up an unambiguous service.

The composition of the Value Packages will be dynamic. Popular Value Packages could possibly be added to the Basic Package. Moreover, it is to be expected that the number of Value Packages will increase in time. In order to prevent the campus ICT-management organization from having to deal with too much at once, the support for migration of organizations to the campus, the Basic Package and a limited set of Value Packages will take priority.

3.2 Campus ICT
Common ICT services (the basic package as well as the value packages) demand a common management. This management is handled by an organization, namely Campus ICT that is controlled by the Campus Management Board, comprising of repre-
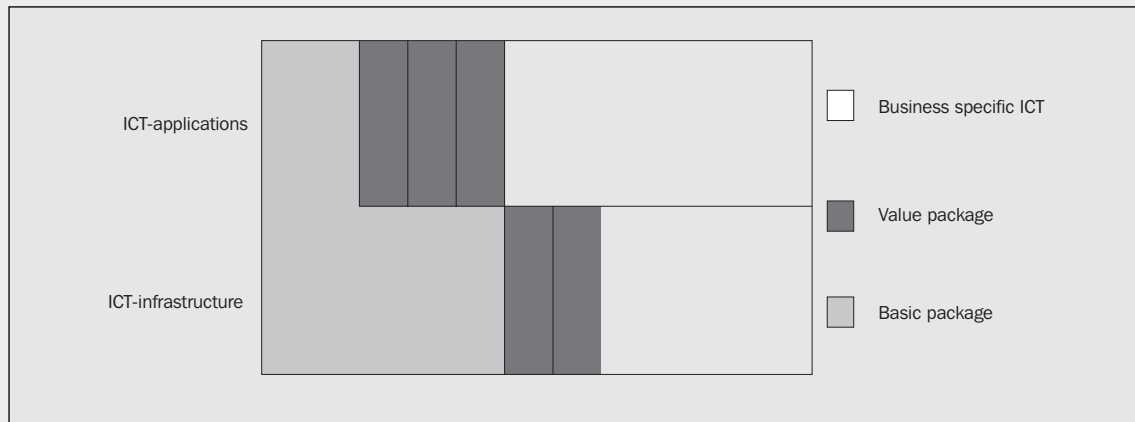

Figure 2. Basic package, Value packages and business specific ICT in perspective

sentatives from parts of the business on the campus. By bringing this management under the auspices of only one organization, and by involving the employees of this organization from the beginning of the project, planning, realisation and management are short circuited, so changes can be made quickly when required.

The basis for the construction of the Campus ICT is laid with a 'business plan ICT-management 'organization' that was delivered in December 1999. This business plan describes the objective of the organization, the service package and the target group, the area of management, the setting up of the organization and the financial translation. A number of elements are highlighted below.

The objectives of Campus ICT are:
• To maintain, control, renovate and innovate the ICT-infrastructure and the services offered (basic package and value packages) in order to guarantee the agreed service levels to the campus organizations.
• To implement and offer new, desired services by user organizations, paying attention to the technical, organizational and financial possibilities.

In this setting a close collaboration is necessary between Campus ICT, responsible for basic package and value packages and campus organizations, who are responsible for business specific ICT (see also Figure 2).
For the remaining duration of the project up to 2006, the project-oriented part, including guiding of the migration project of users, is also brought under the umbrella of Campus ICT. As the campus grows, the balance between the various main activities shifts, whereby as the installed base increases, the innovation and management function shall demand more capacity.

When choosing between doing in-house and outsourcing, attention is paid to the content of the various services that are being offered. Starting point thereby is that the operational management should be outsourced as far as possible. For tactical and strategic management, each offered service is studied to understand where the balance between doing in-house and outsourcing can lie. The issues that are thereby highlighted, is the technology, the com-

plexity, the measure of anticipation on the market and the proficiency of the diverse contractors. To summarize, the trend for doing in-house and outsourcing for every service from the basic package has been given in figure 3.

From figure 3 one can conclude that the management of campus LAN is done largely by its own employees. For connections to the outside world, the management structure which Corporate IT has set up is adhered to. For telephony, contact is sought with the outsourced telephony service for Philips in the Eindhoven region. Finally, intelligent campus ICT-applications mostly take place in-house.

Campus ICT has the following starting point for financial housekeeping:

• Campus ICT is exploited on a not-for-profit basis (cost based so to speak).
• The service offered has an optimal price-performance ratio, and the service is offered to the campus organizations based on market conforming conditions.

In principle, all components from the TCO-model are activated and write-offs are translated into running costs that are to be recovered from the tariffs. The total running costs are to be covered through cost based tariffs. The chosen tariff structure for this tariff is simple, and conforms as far as possible to the existing tariff structures and is uniform for all purchasers.

The parties on the campus consider it important

Service	Operational management	Tactical management	Strategic management
Campus LAN			
Connections to the outside world			
Campus telephone infrastructure			
Intelligent campus ICT-applications			

: outsourced service

Figure 3. Doing in-house versus outsourcing for rendering of service of the basic package

that they should continue to avail a state-of-the-art ICT infrastructure. This implies that a continuous innovation process takes place, which focuses on research of new ICT technology and where a value addition is found, to integrate that with the existing infrastructure. This innovation path is separately budgeted and is financed by the campus parties.

4. Reflection

In the mean times, 4,000 employees (2,500 that already work there and 1,500 new) make use of the service offerings of Campus ICT on the campus. In the coming years, 4,000 will be added. This is a good moment for reflection.

- *A solid foundation for collaboration*. ICT on the campus has been created from the grass roots. In the project approach, direct communication, influence and agreements with the future inhabitants, has been the focus point from the very beginning. The ICT Sounding Board with staff with ICT responsibilities for the 15 business units played and plays the central role here with approximately one meeting every two months. The client-supplier relationship, with Campus ICT in the role of a supplier evolved into a partnership before the first client was signed up. This, once again, implies the willingness to invest time in each other. Trust will develop in a business relationship, if you concentrate on facilitating migrations to the campus, so they occur without disruption. The trend is carried forward with requests to deliver more value packages and to take over a larger part of the ICT-service offerings for business units on the campus. A trend, that connects more or less seamlessly to a movement recently set in motion Philips-wide, to arrive at (more) shared services centres, also in the field of ICT.
- *Seamless connection of project and management*. The core team of the ICT Planning Team comprised of five persons, three co-workers of Philips and two externals. The knowledge and experience, concerning technology, as well as specific Philips-circumstances, organization and work methods, complemented each other very well. One of the Philips co-workers, more or less naturally and completely accepted by the future customers, has grown into the role of the manager of Campus ICT. At the moment when the first

inhabitants moved into the campus, the project was brought under Campus ICT that had been set up in the meantime with approximately 10 employees, with relative ease.

- *Open communication as management style*. In an R&D environment, open communication takes place mostly on the basis of equality. With the ICT Planning Team and within Campus ICT this approach is continued, within as well as outside the team. This is of importance within the team to ensure that everyone can reflect critically from the point of view of their own domain on the connection of things, especially in a corporate environment where the dynamics only increase. It also provides an insight into the reasons for choices and decisions. Belonging and team feeling definitely existed. In communication outside the team, the team has contributed to opening a debate on the difference in view points and conflicting interests.
- *Flexibility and wired infrastructure*. In buildings that must be utilised for flexible and for changing functions, the place of (ICT-) cabling is an issue. Through the roof, the (fixed) outside walls or through the floor. A solution through the floor has been selected, with removable and transferable floor tiles. After the first building, this solution was improved upon, but is not yet optimal. Exchange of ideas with other large sites has not yet led to the ideal solution.
- *The construction of a High Tech Campus is a continuous process*. The duration of the realisation of the campus demands that the 'end result' to be achieved must also be adjusted during the construction. In fact, there is no 'end result'. The chosen technological starting points have made this possible up to now, without the need to talk of disinvestments. The examples named for this purpose concern wireless LANs, introduction of DECT and pilots with Voice over IP.

About the authors

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