University Buildings and Research Parks

A Study of Their Origins, Design, and Use

Bengt Etzler

Great changes are afoot in the way we work. These changes spring from several concurrent factors. While the number employed in production industries is diminishing, the number in service fields and production of knowledge is expanding. The development of new products depends increasingly on research and development, and such information-intensive companies are the fastest expanding form of business. The rapid advancement of information technology is generating new conditions which affect the location, design, and use of the workplace. These conditions formed the background to four case studies of research parks and university buildings described and discussed in this paper.

The past decades have seen a continual reduction in the number of employees in blue-collar production industries and an increase in information-intensive jobs in the white-collar service sector. In spite of the changes, however, research and development on the design of the work environment in Sweden have long focused on industry and neglected working conditions in office environments. When, in 1990, I resumed my research on architecture and the working environment, I focused primarily on conditions in information-intensive businesses. Colleges and universities would seem to be among the most information-dependent organizations in society, and it was these I chose as the subject for a series of case studies.

A great many new college and university buildings were built during the expansion of higher education in Sweden in the 1960s and '70s. Many of these were immediately and sharply criticized by students and teachers for their lack of common space for social contact and circulation. Classrooms and departmental offices were often separated, which has been an obstacle to the development of a good university environment with close contacts between teachers, researchers, and students.

In the 1980s, a series of technology parks and research communities were built on Swedish campuses. This was a new phenomenon. The point of these projects was to give private businesses a chance at close contact with the creative research and development climate at institutions of higher learning, and to increase the exchange of ideas between academia and the private industry. Today there are about fifteen university-affiliated research parks in the country.

These research communities are the object of my study, taken together with some traditionally planned campus buildings from about 1970 for comparison. The expressed design goal of the parks was to create a stimulating environment which would encourage social contact and intellectual exchange among the organizations and individuals using them – just what seemed lacking in the more traditional campus facilities. Surprisingly enough, there has been little research conducted on university campuses and their architecture. In his 1994 book *Universitetet och staden* [*The University and the City*], Claes Caldenby states that he wrote the book quite simply because it did not yet exist. He found the area "important and exciting but strangely neglected." Caldenby's book is an informational overview of the subject developed with support from a reference group from Påbygget, an internal continuing education project in the architecture firm of White Coordinator.

The limited format of this article does not permit a thorough description of the individual case studies. Instead, I have chosen to highlight my *methodology* and an analysis chart developed during the project. The section entitled "Information Centers from a Historical Perspective" describes the growth and development of universities up to the research parks of today. I then summarize my comparison of the four cases with regard to the *processes involved in the realization of the facilities*, their *planning and architecture*, and their *design as workplaces*. The article concludes with a discussion of how developments in information technology might affect the planning and design of facilities for information-intensive work in the future.

Goals and Execution of the Project

This study examines the performance of four facilities for research and development work at the levels of area, building, and room cluster. The central issue I explore is the manner in which essential business and spatial requirements have been met in the design of the buildings: I attempt to establish the connection between the planning and design of the facilities and the research and development activities they house.

I have documented the development process for each facility, sought out the program requirements and intentions on which the planning and design of each is based, and evaluated the performance of each with regard to a few chosen activities. The basis of my research has been a series of interviews of key individuals representing four categories of players or users:

- the property management's building superintendent;
- representatives for the various organizations that use the buildings;
- the architects in charge of the project; and
- building users experienced in the planning of workspace, such as worker safety representatives.

Developing a Research Method

I have devoted a good deal of effort to developing a structure and method for my research, since the field is relatively new and uncharted. During the course of my work, I compiled a fairly comprehensive list of questions regarding user requirements and environmental factors.

I have found several qualities of the built environment which I judge to be essential to define "good architecture and a good working environment for research and development activities." These qualities have been described by ten statements about how places of work and their surrounding environments should be designed. For each statement I formulated questions as the basis for my interviews and information gathering. I documented my experiences from the four case studies in working reports, and analyzed and summarized the material in a final report to Byggforskningsrådet (The Swedish Council for Building Research) in December, 1995.

In this comparative analysis I grouped the ten statements and question areas into five categories as follows:

A. The planning process
   1. The process of realization for the facility

B. General planning
   2. Geographic localization
   3. Surroundings and immediate exterior environment

C. Architecture and facility planning
   4. Architectural design and the basic design concept
   5. Entrance conditions and internal circulation
   6. Common space and space for interaction

D. Workspace planning
   7. Placement of room clusters within the facility

8. Planning and design of room clusters
9. Design of individual workspaces.

E. Information technology equipment
10. Technical infrastructure and working tools

To facilitate a comparative analysis, I constructed an analysis chart in which a number of *user and activity requirements* clearly influential to the design of the environments have been categorized and taken up for further analysis. These requirements are seen in the left category of Figure 1, the Comparative Analysis Chart. Several examples of strategies for satisfying the requirements have been placed under each of three planning levels: the area, the building, and the room or room cluster level.

Some Shortcomings in the Design of University Facilities

In the case studies I conducted at institutions such as the University of Stockholm and the School of Architecture at the Royal Institute of Technology (KTH), it struck me that the planning and design of many university buildings reveals a considerable lack of understanding and feeling for the activities these facilities are intended to support. The two aforementioned complexes were planned and built around 1970, during a decade when many buildings for higher education were being built in Sweden[1]. Most of these were designed according to the space planning and building design ideology of the then Byggnadsstyrelsen, the Swedish governmental property management board,

	Planning Level of Scale		
Business and User Aspects	Area Level	Facility/ Building Level	Room/Room Cluster Level
User influence in planning	urban planning	project group	workspace group
Opportunities for social interaction	social life in the area	collective meeting points	contact points in room cluster
Privacy, concentration	protection from: noise, interruptions, and visual exposure		
Accessibility, integration	arrivals	entrance accessibility	integration and circulation
Ease of orientation, surveyability	urban axes	foyer, lobby signage	reception, openness
Inside-outside contact, nature	proximity to nature	entrances, windows	view out, daylighting
Architectural quality, symbolic expression	urban image	architectural expression	space design
Adaptability	supplementary development	building expandability	rearrangement, room switches
Effective use of space	density, degree of exploitation	floorplan efficiency	floor area per employee
Computers, telecommunications	fiberoptic Internet	computer networking	computer equipment

Fig. 1. Comparative Analysis Chart

A few aspects of facility planning and design dealt with in the paper are listed in the left column and their manifestation at each of three levels of scale identified.

an ideology which was based on the concept of *generality*. That ideology produced generic office buildings in which the various school departments were assigned a block of rooms in long, anonymous, double-loaded corridors.

In 1992 and 1993, as part of my research in the School of Architecture at KTH, Jan Ahlin and I led a series of discussions on the South Building (*Södra huset*), a huge facility on the University of Stockholm's Frescati campus. These discussions made it obvious that an organization's way of functioning and the results it can produce are profoundly affected by the design of its physical environment. An examination of the South Building with regard to the work environment of the organizations that use it reveals many problems that spring from the building's design:

- common spaces where teachers, researcher, and students can socialize are extremely small or nearly absent;
- offices are lined up on long, narrow corridors, and the individual departments lack visible spatial identity; and
- lecture rooms and offices for teachers and researchers are located on different floors, which presents a strong obstacle to fruitful social contact and the informal exchange of ideas.

New Types of Facilities for Research and Development Work

In the 1980s, a new kind of work environment, the research or technology park, was built in connection to a number of colleges and universities in Sweden. The idea behind these was to provide space for information-intensive businesses in a location that would generate a cross-fertilization of ideas between business and academia. The parks are typically developed by a foundation established by interested parties and designed to suit the particular conditions of each campus. Compared to the institutional generality of other campus buildings, research parks were developed in an era that allowed greater freedom to experiment and artistic license in architectural design.

Most of these facilities have an open plan to promote contact and cooperation among the occupants. The architectural standard for the shared space devoted to circulation and interaction is often high. The open gallery schemes which abound in research parks could be seen as merely the expression of an architectural trend of the 1980s; nonetheless they work well for the kind of activities housed in these buildings. I assumed that these facilities should offer a good opportunity to examine the relationship between a creative, information-rich enterprise and its surrounding physical environment.

Information Centers from a Historical Perspective

In order to provide a background for the current discussion on the spatial prerequisites for learning and research, I have taken a look back through history to find some traditional sites for the exchange of ideas and knowledge – to locate our cities' information centers through history. This account is based on several sources, among them Sverker Sörlin's 1994 book *De lärdas republik: Om vetenskapens internationella tendenser* [*The Republic of the Learned: International Tendencies in Academia*]. Sörlin's book was the result of a project called "The Europe of the Future" undertaken by the Swedish Institute for Future Studies. Another principle source has been Tore Frängsmyr's *Gubben gräver: Människor och miljöer i vetenskapens värld* [*Old Man Digging: People and Environments in the Academic World*], published in 1989 in connection with Vetenskapsakademin's 250 year anniversary celebration. For other works, see the list of sources at the end of the article.

The Birth of the First Universities

The University of Bologna, founded in 1088, is considered the world's oldest university. It became known early on for its teaching in Roman and canon law. The term "university" originally referred to a gathering of students who came to the city for a few years to study the law. The students gathered together in guilds to protect their common interests, such as resisting drastic rent increases. *Universitas*, meaning union or whole, came to be the term for these guilds or fraternities, primarily to signify their juridical and independent status. The students elected a leader they called *rector*[2], another title which became widely spread and which remains in use today.

In the 13th and 14th centuries, the university in Paris blossomed into the foremost in Europe. An important reason was the development of the scholastic method, a new and more uniform method of teaching. The teachers were now tied to specific

places by certain privileges. The city's teachers entered into an alliance and later the teachers' domiciliary rights within the institution were combined with those of the students. A papal bull of 1231 regulated the constitutional rights of *universitas magistrorum et scolarium*, a corporation of teachers and students together.

The Universities of Bologna and Paris were leading information centers which attracted students from all over Europe. Paris held for a long time a special status for Swedish students because of its clearly established framework for student exchange with cathedral schools in Sweden. New universities were successively established throughout Europe, among the first of which were Oxford (1214) and Cambridge (1229) in England. In German-speaking areas, the most accessible to Swedes, early universities were established in Heidelberg (1386), Prague (1348), and Leipzig (1409). In the 15th century, the primary destinations for Swedish students were first Prague, then Leipzig, Rostock (est. 1419), and Greifswald (1456).

Sweden's first university was founded in Uppsala in 1477 in the image of those in Bologna and Paris. The papal bull granting the right to establish the university prescribed that it be formed after the same principles as in Bologna. The university's charter, however, signed by the country's regent and the archbishop, named Paris as its model. Thus the university received a charter in spiritual matters from the pope and one in worldly affairs from the government.

The University Campus Takes Form

Another stage in the development of the university came with the establishment of the American college campus in the image of Oxford and Cambridge. The oldest buildings were often gathered around a courtyard or lawn and built of brick, after the English prototypes, in Gothic style. Examples are Harvard, founded as early as 1636, and Princeton, which opened in 1746. The central open space, originally called the yard, became known as the campus, a word which eventually came to refer to the entire university area.

After the American War of Independence, a number of new universities were established. During the19th century, the campus model was further developed and became the standard for universities in the United States and in many countries around the world. The typical campus was located just outside the city or on the edge of town. It was a kind of society in miniature, combining institutional buildings for education and research with housing and some degree of commercial development to provide the university with essential goods and services. The peripheral location sprang from the conception that higher education and research required detachment from the active life of the city, that the quest for knowledge required peace and quiet. Proximity to nature and recreational opportunities were an important aspect of the campus environment.

The Urban and the Suburban University

During the 19th century, an alternative to the campus plan was developed: the city university, whose institutional buildings were located in center of town. The forerunner in this direction was the Humboldt University in Berlin, founded in 1809, whose main building, formal and monumental, expressed the value society placed on knowledge and education at the time. It became the model for institutional buildings at most European universities and vocational colleges, such as the École Polytechniques, the École des Beaux-Arts, and the new Sorbonne in Paris.

Between the First and Second World Wars, many urban universities moved out to the suburbs due to the need for newer and larger building complexes. It was at this time that the international Cité Universitaire was built in Paris, and that modern architecture entered academia with Le Corbusier's 1930 dormitory for Swiss exchange students (the Pavillon Suisse) and his Maison Brezil from 1931.

In the 1960s, higher education and research expanded dramatically in many countries. The rapid growth of enrollment caused extreme overcrowding at colleges and universities. Overcrowding on urban campuses was another reason for relocation on the urban periphery, and many new universities were built in the suburbs from the start. This was the dawn of a new institutional form, the suburban university, built on untouched ground outside of town and planned to some extent as a campus environment. But the suburban universities in Europe lacked many of the qualities of the American campus: they were largely monofunctional areas with a minimal amount of housing, commercial services, and cultural and social life.

Research and Technology Parks: A New Form of Information Center

The latest in the development of information centers is the research village or technology park, which is based on American prototypes though examples are now found throughout the industrialized world. Building research communities became something of an international movement during the 1980s, and today there are fifteen such areas established in connection to colleges and universities in Sweden. They are now represented by Swedepark, an organization which promotes the exchange of experiences with the development and management of research communities.

The Stockholm Regional Planning and Traffic Department has financed a study of the establishment of one such facility, Novum Forskningspark, built in connection with Huddinge Hospital. The report, written by Kerstin Sahlin-Andersson and published in 1990, also describes the explosive growth of the research village trend. The American prototypes were an important source of inspiration for Swedish research communities, foremost among them Stanford Research Park in California's Silicon Valley. Great Britain was the first country in Europe to plan and build such facilities. The oldest and most well-known of these are Heriot-Watt in Edinburgh, the planning of which began as early as 1972, and the park at Trinity College, Cambridge. Also quick to take up the trend were the French, whose best known park is Sophia Antipolis, near Antibes. According to Salin-Andersson (1990), by the end of the '80s there were over 60 research parks in West Germany, approximately 25 in Great Britain, and over 30 in France. In northern Europe today there are said to be about 50. In 1986, the Association of University Related Research Parks (AURRP) was formed. Today the organization has about 300 members in 25 countries, with about half of its membership in North America.

Sahlin-Andersson (1990) describes the research park as follows:

> The term "research park" usually refers to an area in which several research oriented or high technological companies are gathered. The area is planned with a common profile, such as a particular field of work, a unifying name for the area, and/or a common architectural character to the buildings. These business areas are sited next to universities or other research institutions.

The various English language terms used to describe research parks overlap, with no clear distinctions related to physical differences: "science park," "research park," "technology park," "science center," "research center," and "innovation center." Some corresponding French terms are "*technopole*," "*parc technologique*," and "*parc tertiaire*." Swedish terms include "*teknikby*," "*forskarpark*," and "*forskningscentrum*."

The Swedish parks are innovatively and thoroughly designed as a rule, though certain basic schemes are repeated, such as open galleries and glassed-over streets and courtyards. The first and most widely known research park in Sweden is Idéon in Lund, created in the early 1980s. There are three such parks in the Stockholm area: Electrum in Kista, Novum in Huddinge, and Teknikhöjden, sited between KTH and the University of Stockholm in Frescati. The town of Luleå has a technology village called Aurorum.

Four Case Studies

At an early stage of this project, I studied two traditionally planned university buildings from about 1970: the South Building at the University of Stockholm in Frescati and the KTH School of Architecture at Östermalmsgatan 26 in Stockholm. Later I studied the development and design of two research parks, and evaluated them from the point of view of their users. These were Electrum in Kista, outside of Stockholm, and Aurorum in Luleå, both planned and built in the 1980s. Again I evaluated the working environments from a user perspective. My evaluations in each of these four cases are based on studies of the buildings' organization and design, my own on-site observations, and interviews with building occupants and representatives for the various organizations housed in them, and with others involved in the realization and management of the buildings.

I then analyzed the data from these studies and evaluated to what extent each of the four facilities meets a number of business and work environment requirements. One of the key aspects was *the opportunity for social contacts and informal encounters* offered by the building. Two other aspects, essential to the nature of research and yet difficult to achieve simultaneously, are *the need for contact and openness* and *the need for concentration and privacy*.

The South Building, University of Stockholm

Finished in 1970, the South Building in Frescati moved the University of Stockholm from urban sites in the vicinity of Odenplan out to a new suburban context. Following a pattern familiar in the European cultural tradition, the university had developed as a key element in the urban fabric. When Stockholm College was taken over by the state in 1960 and became the University of Stockholm, Byggnadsstyrelsen took responsibility for the planning and management of its buildings. After several years of study, it was decided that the university would be moved out north of the city to Frescati, and an architectural competition for the planning and design of the new facilities was held.

The South Building actually consists of six parallel eight-story volumes of generic office space. The spaces are designed with a high degree of generality and could house most any business offices.

The South Building in Frescati, University of Stockholm

KTH School of Architecture

The Royal Institute of Technology's new Architecture building was built at about the same time as the Frescati facilities. The School of Architecture had previously been part of KTH's consolidated urban campus just a stone's throw from Valhallavägen, one of the principle thoroughfares of the city. The new location was Östermalmsgatan 26, an attractive and convenient inner city site. But the potential of the site to enrich the urban environment was not fully exploited; a remodeling proposal from the end of the 1980s, for example, suggested renting out the

Royal Institute of Technology, KTH/ School of Architecture, Stockholm

Electrum Research Park in Kista, Stockholm

spaces along the street which today turn a blank concrete wall to the city.

The building's expression is reserved and forbidding. The main entrance, toward Danderydsplan, is raised one floor and somewhat difficult to access. The entrance facade gives no clear picture of the activity contained within. The back side, toward Engelbrektskyrkan, is more varied and interesting: the top three floors hold four large design studios each with views over the enormous church. The other side, toward Rådmansgatan and Östermalmsgatan, is given to offices accessible from the studios.

Electrum

The actual planning and design of Electrum Research Park in Kista began in 1983. The idea for the endeavor, however, had begun to grow several years earlier among various representatives of the state, the local government, and the business community. Electrum was a farsighted, conscious investment in the rapidly developing field of information technology. They anticipated a growing need for people well trained in the new field. In addition, the project aimed at augmenting research and development in information technology and providing an opportunity for cooperation between academia and business in advancing that field. The logical choice of a site for the new facility was Kista, a new suburb north of Stockholm where the majority of the Swedish computer industry is located.

The main building at Electrum is distinctly flavored by the time in which it was designed: the mid-1980s. The glassed-over street, a galleria cutting through the length of the building, is filled with light, creating an impression of openness and providing generously for socializing along the internal circulation system. The design is relatively general, based on a system in which groups of spaces are connected by circulation paths, and allows ample opportunity to divide off and rent out spaces of various sizes within the main building.

Aurorum

The origins of Aurorum Technology Park in Luleå are quite different from those of Electrum, which was a unique national investment with substantial government support. Aurorum developed in the manner of most of the technology parks and research communities built in Sweden in the 1980s, driven by private investors and occupied by businesses in the fields of computer and information technology.

Aurorum Technology Park in Luleå

The location of Aurorum near the University of Luleå was a given, since the university initiated the project. The park is made up of several different building volumes designed for businesses of varying size.

Evaluation and Comparative Analyses

I have conducted a series of comparative analyses of the performance of each of the four facilities based on a number of specified business and user requirements at area, building, and room cluster levels. Figure 2 is an evaluation of the four cases at the room cluster level. The facilities are rated on a scale from 1 to 5 in their satisfaction of the listed requirements, five darkened rings representing the maximum score. This graphic profile provides an overview and summary of the qualitative comparisons more thoroughly described in the research text.

Project Development and User Influence on the Design

The ability of facility users to influence the design of Electrum and Aurorum was an important reason for the success of those environments. In the cases of the South Building and the School of Architecture, on the other hand, user influence was either minimal or completely absent.

Architectural Planning and Design: spatial relationships, adaptability, and opportunities for social contact

In terms of general layout and architectural design, the two research parks have clearly proven to be better suited to the businesses they support than the two university buildings. The South

Business and user requirements	Evaluation of how the various requirements have been met by the design of the physical environment			
	Electrum	**Aurorum**	**South Bldg.**	**Architecture**
user influence in planning	●●●○○	●●●○○	●●○○○	●●○○○
opportunities for, social interaction	●●●●○	●●●●○	●○○○○	●○○○○
privacy, concentration	●●●○○	●●●○○	●●●○○	●●○○○
accessibility, integration	●●●●○	●●●●○	●●○○○	●●○○○
ease of orientation, surveyability	●●●○○	●●●○○	●●○○○	●●○○○
inside-outside contact, nature	●●●○○	●●●○○	●●○○○	●●○○○
architectural quality, symbolic expression	●●●●○	●●●●○	●●○○○	●●○○○
adaptability	●●●●○	●●●●○	●●●○○	●●●○○
effective use of space	●●●○○	●●●○○	●●●○○	●●○○○
computers, telecommunications	●●●●○	●●●●○	●●○○○	●●○○○

Fig. 2. Evaluation of the Four Case Studies at Room Cluster Level.

The facilities are rated on a scale from 1 to 5 in their satisfaction of the listed requirements, five darkened rings representing the maximum score. This graphic profile provides an overview and summary of the qualitative comparisons more thoroughly described in the research text

Building and the Architecture building, products of the early '70s, are representative of that era's preoccupation with a limited number of functional considerations and an undeveloped view of higher education, its particularities and its environmental requirements. These buildings reveal little or no concern for designing space to generate productive study and research environments. The designers clearly have failed to recognize the importance of architecture in providing for the development of contacts and collaboration.

In the South Building, the opportunities for interpersonal contact are poor even among people on the same corridor. These corridors are dimensioned and shaped primarily to allow efficient movement. In the School of Architecture, researchers' offices are spread over several floors and must be entered through the design studios, creating a disturbance. Hence the layout and design of space for research activities fail to adequately promote contact and collaboration among researchers.

The research parks Electrum and Aurorum are major improvements in this regard. Their internal circulation systems and common spaces were consciously designed to generate the conditions under which spontaneous and informal contacts can develop. The management of the research parks has also demonstrated that they are better prepared to adapt the buildings to changes in the business activities within them – that they are more sensitive to businesses' preferences for rearranging, adapting, or remodeling their space.

Workspace Design: opportunities for contact and privacy, accessibility, and ease of orientation

Having a room of one's own makes it easier to control and regulate one's work environment. By closing the door, a researcher can close out the unwanted impressions and disturbances that inhibit the concentration needed to analyze data or write an article or research report.

At the same time, the office cell carries with it a certain isolation and a barrier from one's group, which can have a negative impact on working methods and the collaboration within that group. For cooperation on projects, the larger, shared office has the advantage of allowing everyone to take part in the general current of information within the project group. Shared offices are therefor used where teamwork and information sharing are prioritized, as with newspaper editorial staff, management teams, advertising agencies, or architectural and engineering design firms.

In terms of opportunities for interpersonal contact, accessibility, and ease of orientation, I have judged the two research parks to be superior to the two university buildings. The corridors in the research facilities are shorter and in general each is used by a single work group, defining and uniting that thus simultaneously group. The individual offices are often glazed toward the corridors, allowing researchers to signal to their surroundings the degree of contact they currently desire.

Summary Analysis of Space Planning for Research and Design Activities

Research and design work is inherently characterized by requirements for openness, interpersonal contact, and cooperation which are fundamentally at odds with its equally important requirements for isolation, privacy, and independence. These requirements and the demands they place on the work environment can vary from one individual to another, and from one stage of a research effort to the next.

Thus there is no unequivocal solution to the conflict between contact and privacy: one must instead aim for a reasonable balance between the two. The physical environment must provide for both. One way of balancing these conflicting demands is to provide a variety of room schemes. One might, for example, introduce quiet zones within each cluster of rooms to be used for long or short periods of intense privacy and concentration. Another way of achieving a balance is to differentiate the use of space chronologically, as when individuals do the work that requires the most concentration in the peace and quiet of their homes. The latter solution has long been common among teachers and researchers. It is increasingly common in other information intensive professions for the tasks which require the most concentration to be done at home, a trend hastened by advancements in information technology which facilitate work at distance.

Another key problem is the difficulty of *designing spaces and buildings with consideration for technical and organiza-*

tional developments over time. Businesses change continually over time, bringing continual changes in the needs and desires for the work environment's size, integration, and technical equipment. Changes in spatial requirements can be met in various ways: through generality, flexibility, or in extreme cases by remodeling or moving the business to a more suitable space. Clearly, it is wise to make provisions from the outset which allow future changes to be made at a reasonable cost. The costs of such flexibility must be weighed against the costs of remodeling.

The Consequences of Developments in Information Technology for Workspace Planning

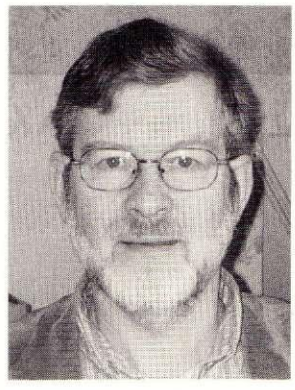
My study of technology parks and communities for research and development in the field of information technology has generated certain suggestions about the future of that field. The consequences of developments in information technology for the planning and design of workplaces is an area of research that urgently needs more attention.

We may assume that the kind of workplaces we have today will be replaced by more flexible schemes. Localized workplaces will be supplemented with various forms of work at a distance, with people working from new sites, including perhaps the home, vacation spots, the outdoors, business trips, or other temporary workplaces. But no matter where work is undertaken, it will always have a spatial element that must be addressed.

Developments in the field of information technology are advancing rapidly today, changing the conditions and providing new opportunities for accessing and transferring information. Electronic mail and other forms of telecommunication allow messages as well as substantial packages of information to be transferred from one person to another more or less independent of time and space. This means increased accessibility to information and, if used correctly, should also mean an increase in personal freedom and effectiveness. The fact that messages and information are transported more quickly and more safely allows us greater control over the time we spend working. Letters with simple questions can now be answered the same day even between countries or continents. This opens the door to new forms of cooperative endeavor in international networks, which should greatly benefit research and development work.

Developments in information technology can be expected to have profound and unexpected consequences for interpersonal contact and cooperation in the workplace, as well as for working methods and the work environment. But exactly how working environments and the design of the workplace will be affected is difficult to predict. Some workplaces will certainly absorb new technology without major physical changes. A great many of today's workplaces, however, if they are to exploit the opportunities presented by the new technologies to the fullest, will need to be adapted and developed at the same time changes are made in labor methods, forms, and organization.

If working environments are to support the businesses and activities they house, then there is today a great need for adapting the existing stock of workplaces and developing new strategies for workspace design, not least in the academic sector. The new design schemes developed for research parks over the past fifteen years are inspiring prototypes for the task ahead of us.



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Notes

1. A similar development was underway at that time in many industrialized countries, including Great Britain, Germany, and France.

2. *Translator's note.* The Swedish title *rektor* corresponds to the English headmaster, principal, chancellor, dean, or president.

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