Design Criteria of Technology Development Zones
A Case Study in İzmir Technology Development Zone

By

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ABSTRACT

Technology and information make up the most important means of strength in today's competition for world leadership in economy and politics. With know-how in production, countries obtain a hedge in competition.

The concept of 'Science Park', 'Research Park' or 'Technopark' represents different meanings for the organizing committees and managers, and the size and requirements of countries. Whatever the meaning, contrary to 'Industrial Parks' or 'Free Zones', 'Technology Development Zones' carries a totally different definition, with its high value contribution to the national economy through Research and Development (R&D), and supports universities in education and research facilities and rapid knowledge transfer to industry.

Despite its economic instability, Turkey has obtained a strong position in the world economy as a developing country. The global economic scenario and Turkey's industrial development show an increase in the R&D functions within firms that want to achieve a competitive position in global markets as well as in the requirement for innovative developments. Technology Development Zones have an attribute that provides an effective platform for interaction between universities and industrial organizations.

The aim of this research is to determine design principles of Technology Development Zones defined with The Law numbered 4691, by a contemporary point of view; and to design Izmir Technology Development Zone with respect to these principles.

For this purpose, the subject was approached from two different points of view: one being the definitions and legal differences in understanding and defining the concept, the other being requirements and capacities that are being investigated by surveying the existing examples. Although, the case-study area effects national economy in general, more emphasis will be given on industry- university relationship in Izmir because of its location, a pre-research investigating the site on all viewpoints was done for utilizing the site's potential in max level.

ÖZ

Ülkeler arasında ekonomik ve siyasal güç yarışının en önemli kozlarından birini teknoloji ve bilgi oluşturmaktadır. Günümüzde bu rekabetin yoğunlaşması üretim bilgisine sahip olan ülkeleri avantajlı kılmaktadır.

"Bilim Parkı", "Araştırma Parkı" ya da "Teknopark" kavramları, kuruluşu organize edenlere, yönetenlere ve ülkelerin ihtiyaçlarına ve büyüklüklerine göre farklı olabilir. Anlamı ne olursa olsun, ülke ekonomisine Ar&Ge ile yüksek katkıda bulunması, üniversitelerin eğitim, öğretim ve araştırma faaliyetlerini desteklemesi ve sanayiye hızlı bilgi akışı sağlaması gibi hususlar "Teknoloji Geliştirme Bölgeleri"ni "Organize Sanayi Bölgeleri"nden ya da "Serbest Bölgeler"den çok farklı kılmaktadır.

Ekonomik istikrarsızlığına rağmen, Türkiye gelişmekte olan bir ülke olarak dünya ekonomisinde güçlü bir yere sahiptir. Global ekonomik senaryo ve Türkiye'nin endüstriyel gelişmesi, yeniliklerin gelişmesi ihtiyacıyla birlikte global pazardaki rekabet ortamına ulaşmak isteyen firmalar içindeki Ar-Ge fonksiyonlarının artışını göstermektedir. Teknoloji Geliştirme Bölgeleri, üniversiteler ve sanayi kuruluşları arasındaki etkiyi sağlayan güçlü bir platform niteliğindedir.

Bu tezin konusu, 4691 sayılı kanunla birlikte yasal olarak tanımlanan Teknoloji Geliştirme Bölgelerinin tasarım kriterlerinin güncel bir bakış açısıyla saptanması ve bunun ışığında İzmir Teknoloji Geliştirme Bölgesi'nin tasarlanmasıdır.

Bunun için öncelikle kavramı anlamak ve tanımlayabilmek adına biri tanımlar, diğeri yasal farklılıklar olmak üzere iki açıdan yaklaşılmış, bir yandan da mevcut örnekler incelenerek gereksinim ve kapasite irdelenmiştir. Örnek olarak seçilen bölge genel anlamda ülke ekonomisine etki edecek olsa da, konumu nedeniyle İzmir'deki sanayi- üniversite işbirliği ağırlıkta olacağından bölge potansiyelini maksimum düzeyde değerlendirebilmek için her açıdan bölgeyi irdeleyen bir ön araştırma yapılmıştır.

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ABBREVIATIONS

TUBITAK : The Scientific and Technical Research Center of Turkey

MAM : Marmara Research Center (MRC)

KOSGEB : Small and Medium Industry Development Organization (SMIDO)

METU : Middle East Technical University (ODTÜ)

IZTECH : Izmir Institute of Technology (İYTE)

EBSO : Aegean Region Chamber of Industry

DPT : Government Planning Organization

OECD : Organization for Economic Co-operation and Development

TGB : Technology Development Zone (TDZ)

CHAPTER 1

INTRODUCTION

Technological inventions increase the amounts of production in addition to its quality, while decreasing costs, leading to begin completely new work areas and thus playing an important role in increasing the richness of nations. So, developed countries realize and use all kinds of technological inventions and development policies, supports and encouragements to reach the ultimate goal. Technoparks have appeared as a solution to the money-earning problem in the free competition race. By means of covered improvements in recent years and The Law of Technology Development Zones, Turkey also takes place in this race.

1.1. Aim of the Study

The study aims to summarize and reconsider the concept of technoparks under the title of ‘technology development zone’ put forth by The Law, and to build up an urban design project for Izmir Technology Development Zone.

1.2. Methodology

Literature survey is carried out to provide theoretical background about the definition and explanation of technology development zones. While defining the concept, related laws in Turkey are scrutinized to point out the distinction. In addition to accustomed sources like books, articles, periodical and academic publications, web sites are strongly used for the purpose of getting contemporary information from experienced examples. Also interviews with professionals in industrial sector are used to get information about working conditions and requirements. Finally, field survey is done for the related site, including all the natural and environmental features.

Theoretical and empirical analysis are used in getting information about concept and case study, statistical analysis is used in evaluation of collected data; and comparative analysis is used to assess optimum design criteria on the way of attaining the final decisions.

CHAPTER 2

CONCEPT OF TECHNOLOGY DEVELOPMENT ZONE

Technological developments experienced after the World War II caused economical, social and political changes, commercializing creative ideas, developing industries that favor change and making entrepreneurships and little associations more important means of improvement. This new process starts with the foundation of Stanford Research Park in North California, USA, in 1952, and new research and development areas based on university-industry cooperation began to be constituted all over the world. These areas are expressed as, technopark, technology park, research park, science park, technopole, technopolis, high-technology workplace, science center, innovation center or other synonymous and similar terms.

Also in Turkey by passing the Law of Technology Development Zones (4691 - 26.06.2001), government has an important role in the acceleration of national improvement by being a support and a guide for the firms that build up and produce new technologies which expand competitive power in international arena, for and universities and research institutions and establishments that aim to support improvement by working with industry in coordination. At the same time, the Law removes terminology confusion by classifying the areas as “Technology Development Zone”.

2.1. Definitions

Since the development of technoparks in the world, some national associations – like UKSPA (United Kingdom Science Parks Association) - or international associations like IASP (International Association of Science Parks) or AURRP (Association of University Related Research Parks) have appeared with aim to support each other by getting together. These associations and, researchers as well have made their own classifications and definitions about technoparks.

In this part, the definitions of these classifications will take place in general, and technoparks located in Turkey will there of be mentioned as ‘technology development zone’ and other organizations as ‘technopark’ without any discrimination.

2.1.1. Research Park

Research Parks are organizations that support production with science-origin technology by building close relationship with big firms that have projects based on basic research or young firms based on new technology, and establishing good relations with a university or research institute. In organizations of this kind, prototyping is permitted, but serious production and marketing are forbidden. Administration unit can be very selective. [1] They have workshop, laboratory and office functions within Worthington’s classification that there should be joint ventures between the private sector and third party education establishment, although they do not necessarily need to be sponsored or founded by the latter organization. [2]

2.1.2. Science Park

Science Park is a site made up of R&D foundations or high-tech firms built as beautiful scattered buildings in an area which has a beautiful sight, and which has relations with a neighboring university. R&D foundations and firms having the right qualities must thus be related to universities, on the basis of scientific and technological development. [3] Science Parks provide accommodation for both start-up and medium sized establishments, generally in a ‘green field’ setting, where small-scale manufacturing can take place. Currie argues that Research Parks differ from Science Parks in the sense that they prohibit all manufacture, except for the production of prototypes. [4]

As a more current definition, IASP International Board defines Science Park as of 6 February 2002 as, an organization managed by specialized professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To enable these goals to be met, a Science Park stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets; it facilitates the creation and growth of innovation-based companies

through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities. [5]

2.1.3. Business Park

Business Park, involve high quality, low density environments with accommodations intended for commercial firms requiring a prestigious image and high caliber workforce. They do not require a link with an academic institution but need to be essentially attractive to a mixture of manufacturing, sales, support and professional service functions. [2] Also Eul's definition of a Business Park is a development, which provides high quality accommodation in which a wider variety of activities such as manufacture, showrooms, distribution, etc can take place. According to this definition, the Business Park does not necessarily have to be linked to an institution of higher education or have tenants that are exclusively in high technology industries. [4]

2.1.4. Technopolis / Technopole

Technopolis can be defined as zones equipped with universities, research institutes and industrial units located on an area that include all urban services. It's seen that they consider technology transfer priority in contrast to improvement of small and medium sized firms. Technopole is getting together private and public research institutes, education centers and innovator industries. [1] Technopolis has evolved over time as the designation for new science and high-tech cities. [6]

2.1.5. Innovation Center

Innovation Centers are programs; organized to provide various supporting services by getting close to universities in order to raise and improve new high technology firms. Being newly established and based on high technology is the main selection criterion for firms to be included in innovation centers. [1] Also for Curie, Innovation Centers are small developments that provide start-up and small businesses with facilities that will enable them to develop ideas until they are matured enough. Medium-sized or larger businesses are excluded from this facility. [4]

2.1.6. Technology Development Zone

'With its academic, economic and social structure, the site becomes a whole – or a technopark – where the firms use high technology or direct themselves toward it, develop technology or software, try to turn a technological invention into a commercial product, method or service by making good use of the possibilities of a particular university or another university, institute of technology or R&D center or an institute nearby the same university' [7].

2.2. Application of Technology Development Zones in Turkey

In 1980's, external deficit-development model was preferred Turkey. Then, industrial structure was aimed to reach a compatible level in international markets. As the result of politics applied, the ratio of production industry showed an increase in 1981-1997. The export structure changed on a large scale, and the ratio of industrial products reached to 80%. From now on, Turkey has a wide domestic market; many industrial firms have production in various fields, educated employees and outward oriented experience. The importance of producing R&D- based technological products must also be considered while entering high- value-added industries [8].

In Turkey, progress about technology started with the foundation of MAM (Marmara Research Center) - the first industry-aimed research establishment founded in 1972 by TUBITAK. University-industry cooperation gained importance with the foundation of METU-KOSGEB Technology Development Center in 1992, and Technology Development Center within the structure of MAM in 1993. On the other hand, government introduced legislation for the purpose of improving industrial investments.

In this part of the study, the legislation about technology and industry and process of technology development zones will be dwelled on.

2.2.1. Legal Framework

The governments of developed counties are gradually shifting their incentives towards R&D projects. This way society is able to produce high value goods and export them to protect its currency's value against those of other nations.

Also in Turkey, government provides investors with several incentives through legislation. The legislation related to technoparks is 'The 4691 Law of Technology Development Zones'. In order to show the difference, other laws about industry must be mentioned.

Table 2.1 The Laws about Industry in Turkey

Statue	Number	Date of Acceptance	The Official Gazette	
			Date	Number
Serbest Bölgeler Kanunu *The Law of Free Zones*	3218	06.06.1985	15.06.1985	18785
Küçük ve Orta Ölçekli Sanayi Geliştirme ve İdaresi Başkanlığı Kurulması Hakkında Kanun *The Law about Establishment of Small and Medium-Size Industry Development Organization*	3624	12.04.1990	20.04.1990	20498
Serbest Bölgeler Uygulama Yönetmeliği *The Regulation of Application of Free Zones*			10.03.1993	21520
Organize Sanayi Bölgeleri Kanunu *The Law of Industrial Parks*	4562	12.04.2000	15.04.2000	24021
Organize Sanayi Bölgeleri Yerseçimi Yönetmeliği *The Regulation of Location Criteria of Industrial Parks*			21.05.2001	24408
Teknoloji Geliştirme Bölgeleri Kanunu *The Law of Technology Development Zones*	4691	26.06.2001	06.07.2001	24454
Endüstri Bölgeleri Kanunu *The Law of Industrial Zones*	4737	09.01.2002	01.07.2004	25509
Endüstri Bölgeleri Yönetmeliği *The Regulation of Industrial Zones*			02.08.2002	24834
Organize Sanayi Bölgeleri Uygulama Yönetmeliği *The Regulation of Application of Industrial Parks*			01.04.2002 08.01.2003	24713 24987

Source: http:// www.sanayi.gov.tr

2.2.1.1. The Law of Free Zones

A Free Zone is an area inside a country's borders but is considered to be outside the customs area. The purpose of a free zone is to encourage export by offering special incentives for commercial and industrial activities. [9]

The objectives of The Law are,

- to increase the investment and production for exportation
- to accelerate the entry of foreign capital and technology
- to assure the input requirements of the economy by inexpensive and regular ways
- to get more benefit from external financial and commercial opportunities

The Council of Ministers is authorized about designation of locations and boundaries to be established and managed of Free Zones. Required lots and foundations in the area declared can be obtained by expropriation.

In Free Zones, all of the permissions and authorizations about land using, planning, founding and using of the constructions and foundations are given and controlled by Zone Directorship. [10]

Free Zones are assumed to be outside of customs boundary. In these zones, tax, expenditure, customs and other decisions about regulations governing foreign exchange are not put into practice.

Operator establishments and user enterprises can benefit from incentives designated by The Council of Ministers during investment and production process.

Establishing, up keeping and repairing, improving of Free Zones, building related research, education and social facilities, and also building or shipping and harbor services are in Operator Establishment's responsibility.

'Founding and Improving Free Zones Fund' was established with presence of The Central Bank of Turkish Republic in order for encouraging users and purchasers from Turkey. Sources of the fund are,

- Charges in return to activity authorization and permission for certificate
- Fees with 0,5% ratio of prices of goods brought in or sent out
- Payments written in contracts prepared by Operator Establishment
- Other incomes

Prime Ministry High Inspection Committee controls the Fund.

2.2.1.2. The Law about Establishment of Small- and Medium-Size Industry Development Organization

KOSGEB is an organization that has the main purpose of setting up incubators, especially with a high technology focus and common utility workshop for small- and medium-size industries, which couldn't assure themselves. [11]

The objectives of The Law are: to increase the margin and efficiency of small- and medium-size industries on meeting economical and social requirements of the country; to raise their competitive power and level and to realize the integration in industry in a way that they should be convenient to economical improvements.

According to The Law, obligations of the organization are,

- to facilitate the establishment of technology centers, technoparks, consultation centers, institutes and similar units and to supported and put into practice R&D activities in industry
- to let enterprises benefit from science and technology infrastructure of universities and research institutions and strengthen relationship between industry and university
- to reach existing technological information, to produce new ones and to make them widespread in order to raise the level of technology
- to set up established technology centers and technoparks by benefiting from facilities of universities and research centers
- to set up or to help establish specialization centers that will realize technical support programs and projects about modernization, production, administration, marketing, information and technological adaptation in order to bring enterprises back to the comprehension of planned administration and modern and contemporary management level
- to construct consultation centers that actively serve about knowledge of material, design, prototyping, production types, maintenance and repair planning, etc. so as to diversify industrial product and to improve supplier relationship, and that help enterprises for producing at international level and being more contemporary enterprises

- to establish or to help establish workshops and laboratories about material testing and analyzing, and providing physical measurement laboratories for common use by enterprises
- to establish practical technical training centers to educate specialists that work in service centers, to prepare informal education programs and to determine and ensure training requirements of enterprises
- to help enterprises get strong with regard to knowledge and ability about investments, production, administration and planning
- to find solutions for marketing problems of enterprises, for raising them on compatible level in national and international markets and for organizing consultation services in the best way about their problems

For the purpose of realization of the objectives of The Law, The Fund of Developing and Supporting Small- and Medium-size Industry was founded by presence of The Central Bank command of chairmanship. The sources of The Fund are:

- Transfer appropriations that will be added to budget of The Ministry of Industry and Trade
- Subscriptions - 0,1% - from profits of enterprises that benefit from services of the organization
- Subscriptions - 3% - from their annual profits of Türkiye Halk Bankası, Türkiye Kalkınma Bankası, T.C Ziraat Bankası, Etibank, Sümerbank, Türkiye Vakıflar Bankası, Türkiye İhracat Kredi Bankası
- Transfers - 1% - from loans provided for establishing Small Industrial Sites and Industrial Parks
- Subscriptions - 2% - from their annual income of Turkish Tradesman and Craftsman Confederation, Union of Turkish Trade, Industry, Merchant Chambers and Commercial Stock Exchange, Central Union of Turkish Tradesman and Craftsman Guaranteeing Cooperation Unions'
- Subscriptions - 0,1% - from their annual income of Union of Turkish Engineers and Architects Chambers
- Transfer with annually approbation of The Council of Ministers from privatization and Housing Estate Fund, Importation and Exportation Funds
- Transfer - 5% - from Developing and Supporting Fund
- Transfer - 2% - from Defense Industry Supporting Fund

- Service charges
- Donations and aids
- All kinds of credits ensured from external (like European Housing Fund) or internal sources

All kinds of counts and operations of The Fund are controlled by Prime Ministry High Inspection Committee.

Research Centers, Institutes, Technology Centers and Technoparks benefit from:

- Incentives applied for investments in First Degree Priority on Improvement Zones
- Sale or exceptions from income tax, foundation tax or customs duty for their production, purchasing or importation of material, laboratory and workshop equipment, raw material and required equipment for R&D activities and incomes gained from R&D activities
- Low-interest credits, donations and other incentives

2.2.1.3. The Law of Industrial Parks

The objective of The Law that came into force on April 15, 2000 is to regulate the establishment, construction and administration principles of Industrial Parks. [12]

Industrial Parks are established on the areas approved in accordance with The Regulation of Location Criteria of Industrial Parks with consent of The Ministry of Industry and Trade. [13] After becoming definite location in at most one year, planning of the area outside the industrial park boundary had to be prepared by The Ministry of Public Works or related municipality.

Incase location is on civil land, these lands can be purchased by industrial parks, and if location is on private ownership, these lands can be purchased or expropriated.

Local development plans and plan changes within the industrial park are prepared by industrial parks and approved by The Ministry of Industry and Trade.

Authorizations and permissions about planning, constructing and using of buildings and foundations according to local development plan (which was put into effect before) are given and controlled by Industrial Park. [14]

Industrial Parks, which have own wastewater purification system, do not pay municipality a fee for wastewater.

Expenditure of common areas for participants is paid from Industrial Park's budget. Also remaining areas were not transferred to participants and roads and recreation areas inside are in the possession of Industrial Park.

Founding and operating of required infrastructures and general services such as communication, electricity, water, natural gas and sewer systems, purification systems, roads and sports facilities, purchasing them from public and private establishments and distributing or selling them are only in the authority and responsibility of Industrial Parks. However pre-purification systems must be constructed in order to decrease waste standards to the capacity of common purification systems.

Enterprises inside Industrial Park are obliged to meet their infrastructure requirements from Industrial Park's systems. Furthermore they cannot transfer their right to use common infrastructure allowance to another.

Revenues of Industrial Parks are,

- Participation fees given by participating foundations and organizations in entrepreneur committee
- Subscription fee, shares and payments for services given by participants which have or will have building site or which are or will be operating in Industrial Park
- Certification and visa prices for projects of new enterprises and purchasing prices for bids for the contract of Industrial Park's infrastructure and social facilities
- Administrating fees
- Incomes from using water, electricity, natural gas, social facilities, purification systems, etc.
- Incomes from purchasing building sites
- Donations
- Rent and service incomes from common properties
- Bank interests
- Default fines
- Advertisement incomes

2.2.1.4. The Law of Technology Development Zones

The objectives of The Law are, [7]

- to produce technological information to help national industry to succeed in getting international competitiveness and to gain a structure aimed at exportation by providing relationship between universities, research institutions and establishments and production sector
- to build up innovation on product and production methods
- to raise the quality and standard of the product
- to increase productivity
- to decrease production cost
- to make technological information commercial
- to support technology intensive production and entrepreneurship
- to provide adaptation of small- and medium sized enterprises with new and high technologies
- to create investment possibilities in technology intensive zones by taking into consideration the decisions of The Science and Technology High Committee
- to create employment opportunities to researchers and skilled people
- to encourage technology transferring
- to provide technological infrastructure that accelerates entry of foreign capital that brings high technology

Technology Development Zones are established with positive opinion of Evaluation Committee, of which the participation is determined in The Law, proposal of The Ministry of Industry and Trade, and decision of The Council of Ministers.

It is a requisite that university or institute of technology or R&D center or institutions are present in the location of the Zone or related city, and existence of enough R&D and industrial potential are basic conditions for the founding of a Zone.

Required lots in the area can be obtained by expropriation. Lands inside the Zone can be granted from University by Administrator Firm without ownership transferring. This is also valid for public foundations and establishments. [15]

Development and parcelation plans of The Zone are prepared by Administrator Firm and approved by The Ministry of Industry and Trade.

Authorizations and permissions about land use, planning, constructing and using of buildings and foundations are given and controlled by Administrator Firm according to development plan in effect. Also expenditures for land assurance, planning and projecting, construction of infrastructure and superstructure belong to Administrator Firm.

Lands designated for Technology Development Zone cannot be used for different aim by no means whatsoever.

Administrator Firm is exempted from all kinds of taxes and expenditure related to applying of The Law.

Technology Development Zones, which have their own wastewater purification system, do not pay municipality a fee for wastewater.

Profits gained by taxpayers inside the Zone from production based on software and R&D are exempted from profit and corporation taxes for a period of 5 years from the start of the operation. The Council of Ministers can extend this time period up to 10 years for particular technological areas and products.

Salaries of researchers, software and R&D personnel are exempted from all kinds of taxes for 10 years from founding date of The Zone.

The total of donations and support by sponsors by taxpayers to people, foundations and establishments doing R&D operations in the Zone are discounted from corporation taxes.

Administrator Firm is obligated to:

- manage wastewater, wastewater infrastructure system, solid waste, soil pollution, noise and air pollution, hazardous medical waste, radioactive material and hazardous chemicals and take preventive measures about fire prevention and fire extinguishing system
- insure all of the buildings rented by entrepreneurs against fire and natural hazards
- obtain required cleaning, electricity, drinking and running water, natural gas and fuel oil, heating and air conditioning, distribution network, sewer system, waste water, transportation network, noise and data communication, internet and other services, take measures to maintain them uninterruptedly, determine working conditions, quote prices, do all kinds of maintenance and repairing and determine damages to infrastructure and superstructure and to provide compensation

- obtain and keep fire equipment ready
- buildup and coordinate relationship about using facilities and accumulation of knowledge between university or R&D center or institutes and entrepreneurs
- determine entrepreneurs' or third persons' facilities that are contrary to The Law and warn them to rectify or depart them

In addition to basic usage of land in The Zone according to the objectives of the Law, Administrator Firm can also build, manage or rent required buildings and foundations in order to create economic, social and cultural infrastructure with a mere limit of 30% of construction allowance.

Expenditures about land assurance, infrastructure and administration office can be paid by appropriation in the budget of The Ministry of Industry and Trade for the purpose of help. This appropriation is for the purpose of help and complimentary.

2.2.1.5. The Law of Industrial Zones

The objectives of The Law are, [16]

- to improve national economy and technology transferring
- to raise production and employment
- to encourage investments
- to orient Turkish workers Turkey towards depositing their savings in Turkey
- to raise the flow in ratio of foreign capital into Turkey

The Council of Ministers sets up Industrial Zones according to suggestion of The Ministry of Industry and Trade in the area designated by Industrial Zone Coordination Committee, of which the participation is determined by the Law.

Lands and lots in private ownership can be obtained by expropriation with appropriation in the budget of The Ministry of Industry and Trade. Then lands and lots obtained are transferred to national treasury.

Someone is assigned by The Ministry of Industry and Trade to prepare preliminary studies, maps, plans and projects about infrastructure of the Zone, and is approved by related associations.

Administration and management of Industrial Zones are carried out by the commission made up of the mayor of related municipality and representatives of

ministries and establishments, which are members of Industrial and Coordination Committee. [17]

Lands designated for Industrial Zones cannot be used for different aims by no means whatsoever.

The Council of Ministers is authorized for all kinds of incentives, application types and quantities, and for new entrepreneurs in Industrial Zones.

2.2.2. Official Technology Development Zones

After being published in the No: 24454 Official Gazette on July 6, 2001, and being put into force, 'The Law of Technology Development Zones- No: 4691' Technology Development Zones below were approved:

Table 2.2 Official Technology Development Zones of Turkey

Name of Technology Development Zone	The Official Gazette		Total Area (m^2)	Charter Committee Members
	Date	Number		
TUBITAK-MAM TEKNOPARKI *TUBITAK MARMARA RESEARCH CENTER TECHNOPARK*	According to provisional decisions of The Law and clarified in 40th article of Application Regulations of Technology Development Zones, ODTU-TEKNOKENT and TUBITAK-MAM TEKNOPARK are technoparks approved by The Ministry of Industry and Trade before the date of enforcement of The Law. These technoparks are accepted as Technology Development Zones as of July 6, 2001 and profit from all exemptions and supports provided by The Law.		560.000	TUBITAK Marmara Research Center
ODTU TEKNOKENTİ *METU TECHNOPOLIS*			800.539	METU TECHNOPOLIS Founding Committee

Cont. on next page

Table 2.2 Cont

Name of Technology Development Zone	The Official Gazette		Total Area (m^2)	Charter Committee Members
	Date	Number		
ANKARA TGB *ANKARA TDZ*	12.11.2002	24394	372.863	Bilkent University Tepe Insaat San. JSC Meteksan Kagit Karton San. ve Tic. JSC Meteksan Matb. ve Tek. San ve Tic. JSC Tepe Altyapı Inş. JSC Tepe Tekn.Servis JSC Meteksan Sistem JSC
GOSB TEKNOPARK TGB *GEBZE INDUSTRIAL PARK TDZ*	12.11.2002	24394	124.287	Gebze Industrial Park Sabancı University Kocaeli Association of Manufacturers Gebze Association of Trade Kocaeli University
ITU ARI TEKNOKENT TGB *ITU TECHNOPOLIS TDZ*	10.01.2003 10.06.2003	24989 25134	TDZ 1: 1.832.815 TDZ 2: 106.000 1.938.815 + 49.722 1.988.537	Istanbul Technical University ITU Improvement Waqf Arı Teknokent JSC ITU Waqf Istanbul Association of Manufacturers
HACETTEPE UNIVERSITESI TEKNOLOJI GELIŞTIRME BÖLGESI *HACETTEPE UNIVERSITY TDZ*	10.01.2003	24989	TDZ 1: 417.221 TDZ 2: 1.154.769 1.571.990	Hacettepe University Ankara University Hacettepe Education Research and Service Waqf Hacettepe University Faculty of Engineering Waqf Hacettepe Science Center Society Gama Endüstri Tesisleri İmalat ve Montaj JSC

Cont. on next page

Table 2.2 Cont

Name of Technology Development Zone	The Official Gazette		Total Area (m^2)	Charter Committee Members
	Date	Number		
İZMİR TGB *IZMIR TDZ*	12.11.2002 08.08.2003	24394 25193	2.184.000 + 6.400 2.248.000	Balçova Termal Turizm ve Özel Eğitim Öğretim İşletmeleri Ltd.Co. Enda Enerji Holding JSC Vestel Elektronik JSC Konsan Bilgi ve Teknoloji Üretimi San ve Tic. JSC Ünibel Özel Eğitim ve Bilgi Teknolojileri San ve Tic JSC Alataş Alaçatı İmar İnş. San ve Tic. JSC İzmir Teknopark Ticaret JSC Izmir Institute of Technology Ege University Dokuz Eylül University Izmir Economy University Aegean Zone Association of Manufacturers Izmir Assoc. of Trade Izmir Bourse of Trade Aegean Union Of Exporters Izmir Union of Tradesman And Craftsman Chambers Aegean Manufacturers and Businessmen Society Izmir Manufacturers and Businessmen Society Aegean Yng B.men Society Aegean Technology and Success Waqf
KOCAELİ ÜNİVERSİTESİ TGB *KOCAELI UNIVERSITY TDZ*	10.04.2003	25075	200.000	Kocaeli University

Cont. on next page

Table 2.2 Cont

Name of Technology Development Zone	The Official Gazette		Total Area (m^2)	Charter Committee Members
	Date	Number		
ESKİŞEHİR TGB *ESKISEHIR TDZ*	10.04.2003	25075	503.147	Anadolu University Osmangazi University Eskisehir Association of Manufacturers Eskisehir Industrial Park Anadolu Teknoloji Parkı San ve Tic JSC
YILDIZ TEKNİK ÜNİVERSİTESİ TGB *YILDIZ TECHNICAL UNIVERSITY TDZ*	10.04.2003	25075	103.129	Yıldız Technical University Yıldız Technical University Waqf MEGATEK Meslek Eğitimi ve Araştırma JSC
İSTANBUL ÜNİVERSİTESİ TGB *ISTANBUL UNIVERSITY TDZ*	08.08.2003	25193	716.842	Istanbul University
SELÇUK ÜNİVERSİTESİ TGB *SELCUK UNIVERSITY TDZ*	08.08.2003	25193	TDZ1:461.932,61 TDZ2:2.513,59 464.446,2	Selcuk University
BATI AKDENİZ TEKNOKENTİ TGB *WEST MEDITERRANEAN TECHNOPOLIS TDZ*	Accepted in Evaluation Committee Meeting in 24.02.2004		TDZ1:387.169,17 TDZ2:120.986,02 TDZ3:1.312.712 1.820.867,19	Mediterranean University
ERCİYES ÜNİVERSİTESİ TGB *ERCIYES UNIVERSITY TDZ*	Accepted in Evaluation Committee Meeting in 24.02.2004		TDZ1:156.368,05 TDZ2:120.681,42 277.050,47	Erciyes University
TRABZON TGB *TRABZON TDZ*	Accepted in Evaluation Committee Meeting in 24.02.2004		18.396	Black Sea Technical University

Source: http:// www.sanayi.gov.tr (17.03.2004)

CHAPTER 3

TECHNOPARK EXAMPLES IN THE WORLD

There are many successful examples of technoparks, named as the milestones of the 21st century in the world today. Technoparks allow the circulation of information and technology among the creative and innovative brains, and this plays an important role in the development of countries.

For the purpose of getting keys of producing a technopark, 34 examples from the world have been chosen and examined in terms of establishment, location, zone, and functional and economic information as shown in Table 3.1. Retrieval of information involved in choosing is as important as the relationship among university, industry and government, which is the main factor, because, technoparks' own data resource was used through cyber environment, instead of research carried by academicians. Technoparks throughout the world are evaluated as parts of the global world, not country-by-country. Surely, there can be differences in terms of general characteristics of countries in which they are located, like economy, industrial politics and even climate. For the purpose of providing this variety, examples from developed countries like USA, Canada or France, owing to being innovators of technopark concept, were investigated together with examples from countries making use of technoparks for development, such as South Africa or India.

However, some of data can be evaluated numerically and attain minimum, maximum or average values, some others are aimed to express general opinion. By evaluating each other or with characteristics of Izmir Technology Development Zone, all of the data about technopark examples in the world are taken as starting point while designing the case study area.

TECHNOPARK NAME	ESTABLISHMENT	
	PARTNERSHIP/ASSOCIATE MEMBERS	PROCESS OF IMPLEMENTATION
METU TECHNOPOLIS Ankara, TURKEY 1995	METU KOSGEB (established in 1992) and Government	(1987-1995) Feasibility studies & concept design Stage1 - 18.000 m^2 closed area 2005 Stage2 -103.000 m^2 closed area 2010 Stage3 -150.000m^2 closed area 2015 Stage4 -200.000 m^2 closed area 2020
STIRLING UNIVERSITY INNOVATION PARK SCOTLAND		
ELVINGSTON SCIENCE CENTER Edinburgh, SCOTLAND	Leel East Lothian Council Nadier University Simpson Research Ltd.	
KERALA TECHNOPARK Thiruvananthapuram, INDIA	Government & Private Participation	
CZECH TECHNOLOGY PARK Brno, CZECH REPUBLIC	City of Brno British Multinational Company P&O Brno University of Technology	
TASMANIAN TECHNOPARK Hobart, AUSTRALIA 1988	ADVISORY GROUP: Representatives of Several Technopark Tenants The University of Tasmania The Intellince Software Incubator Department of Economic Development	Started with 2 companies-30 employees (now 20 companies-500 employees) and strategic planning began in 2003

TECHNOPARK NAME	ESTABLISHMENT	
	PARTNERSHIP/ASSOCIATE MEMBERS	PROCESS OF IMPLEMENTATION
TECHNOLOGY PARK UNIVERSITY OF NEBRASKA Lincoln, Nebraska, USA	University of Nebraska The Public / Private Sector University of Nebraska Foundation	
KYOTO RESEARCH PARK Kyoto, JAPAN 1987	Established in 1987 as a 100% subsidiary of Osaka Gas. Co. Ltd.	
SOPHIA ANTIPOLIS FRANCE 1969	The Alpes Maritimes Department The State The PACA Region	
PURDUE RESEARCH PARK West Lafayette, INDIA 1961	Purdue University Purdue Research Foundation	Opened in 1961 The Purdue Research Foundation founded the park's incubator in 1993
TECHNOLOGY PARK WESTERN AUSTRALIA Penth, AUSTRALIA 1985	Department of Industry and Technology City of Perth Town of Victoria Park	
CRANFIELD UNIVERSITY TECHNOLOGY PARK ENGLAND 1990		

TECHNOPARK NAME	ESTABLISHMENT	
	PARTNERSHIP/ASSOCIATE MEMBERS	PROCESS OF IMPLEMENTATION
CENTRAL FLORIDA RESEARCH PARK Florida, USA		
TRI-CITIES SCIENCE AND TECHNOLOGY PARK Washington, USA 1990		
TSUKUBA SCIENCE CITY Tsukuba City, JAPAN 1980	The University of Tsukuba Government	Land is prepared by Housing & Urban Development Corporation for a state project (1963) 43 National Research & Educational Institutions has been developed (1980)
UNIVERSITY PARK Southern Illinois, USA	Ameritech University	
INNOVATION PARK Tallahassee, Florida, USA		
UNIVERSITY OF COLORADO RESEARCH PARK Denver, Colorado, USA		

TECHNOPARK NAME	ESTABLISHMENT	
	PARTNERSHIP/ASSOCIATE MEMBERS	PROCESS OF IMPLEMENTATION
RESEARCH TRIANGLE PARK North Carolina, USA 1958	Duke University University of North Carolina North Carolina State University	Park developed in the 1950s University Research Park in Charlotte was born in the 1960s
THE MILWAUKEE COUNTY RESEARCH PARK Wisconsin, USA 1987	The Milwaukee County Research Park Corporation(MCRPC)	
PIEDMONT TRIAD RESEARCH PARK North Carolina, USA 1902	R. J. Reynolds Tobacco Company Wake Forest University Health Sciences	
LAVAL SCIENCE & HIGH TECHNOLOGY RESEARCH PARK Quebec, CANADA 1991	Laval Technopole INRS Quebec Government City Laval (Biotech city)	
THE TECHNOPARK SAINT LAUREN St. Lauren, Quebec, CANADA		
AUSTRALIAN TECHNOLOGY PARK EVELEIGH New South Wales, AUSTRALIA		

TECHNOPARK NAME	ESTABLISHMENT	
	PARTNERSHIP/ASSOCIATE MEMBERS	PROCESS OF IMPLEMENTATION
KAZUSA ACADEMIA PARK Kisaruzu City, JAPAN 1990	Agreed with Sophia Antipolis Science Park in 1996	PHASE 1 : (1987-1995) 278 ha R&D PHASE 2 : Not finished; (educational, cultural, academic, recreational, urban services) planned development zones
AREA SCIENCE PARK Trieste, ITALY 1981	Local Administrators Two Regional Universities Some of the major regional and national research organizations Various organizations for the encouragement and co-ordination of technological innovation	Firstly the numberof cranes and groving buildings in the present campus Secondly the exponential growth since 1982 in the number of scientists, technicians and administartors Thirdly the age of the employees which peaks in the range 25-29 years
NATIONAL TECHNOLOGY PARK Limerick, IRELAND 1984	University of Limerick Shannon Development IDA The Limerick Institute of Technology	The park engages in a marketing program
OTANIEMI TECHNOLOGY PARK Helsinki, FINLAND 1987	Local Research Centers International Technology Oriented Companies & Science Parks	Spinno BDC Incubator established in 1991
ARIZONA S.U. RESEARCH PARK USA		
MIAMI VALLEY RESEARCH PARK Dayton, Ohio, USA 1980	Central State University Sinclair Community College The University Of Dayton Wright State University	POD 1 : 2 above ground POD 2, 3, 4 : 3 above ground POD 5 : 2 above ground, 1 under ground

TECHNOPARK NAME	ESTABLISHMENT	
	PARTNERSHIP/ASSOCIATE MEMBERS	PROCESS OF IMPLEMENTATION
CUMMINGS RESEARCH PARK Huntsville, Alabama, USA 1962	Began as a Public/ Private Initiative: The City of Huntsville University of Alabama Teledyne Brown Engineering (The State of Alabama and The Chamber of Commerce of Huntsville are now partners)	Established 1962 1973 - 1982 Land purchased by city of Huntsville
INNOVATION PARK AT PENN STATE Pennsylvania, USA 1986	Penn State Faculty expertise and research centers works to foster University Industry Partnership	
MILILANI TECHNOLOGY PARK Hawaii, USA 1987		Ground was broken in 1987 The first building was opened in 1989
TECHNOPARK STELLENBOSCH Cape Town, SOUTH AFRICA 1985	The University of Cape Town The University of Stellenbosch The University of the Western Cape Cape Technikon Peninsula Technikon	

	LOCATION INFORMATION			ZONE INFORMATION			
RANKING	DISTANCE FROM CITY CENTER	DISTANCE FROM ASSOCIATED UNIVERSITY	DISTANCE FROM AIRPORT	TOTAL AREA	TOTAL DEVELOPED AREA	TOTAL FLOOR AREA	LOT SIZES
The first technopark in Turkey				80 ha	40 ha	200.000 m^2	
	48 km to Glasgow, 64 km to Edinburgh		56 km	5,6 ha			
	24 km to Edinburgh						
				63 ha (%20-25 of space in the other well known parks in India)		139.350 m^2	
One of the world's leading science and business park	3 km	adjacent	10 km	120 ha	60 ha	190.000 m^2 when completed (Present: zone A 5ha - Zone B 5.5 ha= 11 ha)	
	15 km		20 km	5 ha			

	LOCATION INFORMATION			ZONE INFORMATION			
RANKING	DISTANCE FROM CITY CENTER	DISTANCE FROM ASSOCIATED UNIVERSITY	DISTANCE FROM AIRPORT	TOTAL AREA	TOTAL DEVELOPED AREA	TOTAL FLOOR AREA	LOT SIZES
	adjacent	4.8 km	4.8 km	52 ha			
Japan's leading business incubator and an international center for high-tech R&D and served as a gate way for overseas companies	in city center		50 km to Osaka Airport 75 km to Kansai Airport 150 km to Tokyo Airport				
				2300 ha			
Largest university affiliated incubation complex in the country		3.2 km		263 ha			9.000 m^2 to 29.000 m^2
	6 km	adjacent		42 ha			
	15 km to Bedford 45 min to London (rail)			40 ha			

	LOCATION INFORMATION			ZONE INFORMATION			
RANKING	DISTANCE FROM CITY CENTER	DISTANCE FROM ASSOCIATED UNIVERSITY	DISTANCE FROM AIRPORT	TOTAL AREA	TOTAL DEVELOPED AREA	TOTAL FLOOR AREA	LOT SIZES
"Like office park"		adjacent		415 ha		20.250 m^2 C.F.R.P (510.660 Main campus)	
One of the top 10 research parks			airport is in the campus	1.619 ha		315.860 m^2	
Expected to become a world leader in science and technology				2.700 ha			
	25 km		30 km	134 ha	63 ha	92.900 m^2	4.000 m^2 to 22.000 m^2
			4.8 km	84 ha		74.400 m^2	
Nations leading scientific centers	30 km	close to main campus	15 km		65 ha	390.000 m^2	12.000m^2 - 110.300 m^2

	LOCATION INFORMATION			ZONE INFORMATION			
RANKING	DISTANCE FROM CITY CENTER	DISTANCE FROM ASSOCIATED UNIVERSITY	DISTANCE FROM AIRPORT	TOTAL AREA	TOTAL DEVELOPED AREA	TOTAL FLOOR AREA	LOT SIZES
The largest in USA			20 km	2.833 ha			
	10 km		15 km	71 ha		min 69.800 m^2	4.000 m^2 - 80.000 m^2
Biotechnology corridor				72 ha			
First rate business partners	close to downtown Laval			min 100 ha			
Second largest park							

	LOCATION INFORMATION			ZONE INFORMATION			
RANKING	DISTANCE FROM CITY CENTER	DISTANCE FROM ASSOCIATED UNIVERSITY	DISTANCE FROM AIRPORT	TOTAL AREA	TOTAL DEVELOPED AREA	TOTAL FLOOR AREA	LOT SIZES
World's first DNA research institute is in the park	15 km		60 km	1.000 ha	333 ha		2 to 11 ha
One of the leading multisectorial science parks in Europe	10 km	adjacent	40 km	55 ha			
First digitally networked technology park	4.8 km		30 km	263 ha		139.350 m^2	
				0,4 ha			
			20 km	128 ha			
				505 ha (120 ha currently developed)	121 ha	167.220 m^2 (14 buildings completed)	

	LOCATION INFORMATION			ZONE INFORMATION			
RANKING	DISTANCE FROM CITY CENTER	DISTANCE FROM ASSOCIATED UNIVERSITY	DISTANCE FROM AIRPORT	TOTAL AREA	TOTAL DEVELOPED AREA	TOTAL FLOOR AREA	LOT SIZES
2nd Largest Research Park in USA 4th largest Science Park in the world 1997 most outstanding science park in the world	15 km	10 km	10 km	1.550 ha	1.189 ha	790.500 m^2	Available any size, ranging upward from 2 ha
					47,8 ha		
Only fee simple high-tech Business Park in Hawaii	25 km to downtown Honolulu		20 km	min 40 ha			16.000 m^2 - 20.000 m^2
	50 km	4 km	35 km	55 ha	30 ha		

FUNCTIONAL INFORMATION		
FACILITIES / BUILDINGS	**SERVICES/AMENITIES**	**RESEARCH FIELDS**
1) R & D Software Houses Innovation Centers Technology Development Center **2)SOCIAL FACILITIES** Science & Technology Museum: 50.000 m^2 **3) ADMINISTRATION** Multi-Storey Office Buildings Management Center	*** Incentives for the tenants provided by government** *** Services provided by Management Company**	**Software** **Electronics** **Information Technology** **Defense and Security Technologies**
	*** Access to University's IT Services Department** *** Security Surveillance** *** Building Maintenance** *** Software Activities**	**Software**
	*** Advanced Telecommunications** *** Infrastructure** *** Integral Conference Facilities** *** Disabled Access and Facilities** *** 24 Hour Access and Security** *** Car Parking** *** Category 5 Cabling** *** R&D Activity**	**Electronic Optic Technology Consultance** **Knowledge Based Industry**
	*** Club** *** Guest House** *** Common Security** *** Law and Order Conditions** *** HR Availability** *** Regulatory Framework** *** Communication Links** *** Libraries**	**IT** **Communication** **Entertainment**
1) R & D = 28.380 m^2 **Offices** **Research and Industrial Accommodation** **2) HI - TECH PRODUCTION = 16.200 m^2**	**Representative Business Premises for** *** Production** *** Assembly** *** Research** *** Technical Development** *** Office Functions**	**IT Technologies** **Hardware** **Software** **Engineering and Logistic Support** **Computer Services** **Electronic Optics** **Telecommunication** **Energy Supply Industries** **Electron Beam Microscopes** **Construction and Project Management** **Automotive** **Tribology** **Material Engineering**
CONFERENCE CENTER = (app) 1.200 m^2	*** Providing Advice** *** Developing Business Ideas** *** Business and Strategic Planning** *** Management** *** Networking** *** Car Parking** *** Catering** *** External Security**	**Radio Communications** **Remote Sensing** **Electronics** **Export Marketing of Software** **(Visitors of the expo 2003: agriculture, aquaculture, marine industry, IT research and services)**

		FUNCTIONAL INFORMATION
FACILITIES / BUILDINGS	**SERVICES/AMENITIES**	**RESEARCH FIELDS**
1) R & D = 8.437 m^2 **Technical Place = 2.862 m^2** **Technical Development Center = 5.575 m^2** **2) EDUCATION = 1.450 m^2**	*** Bordered with bike/jog paths** *** Golf Course** *** City Rail System** *** The Historic Haymarket area of shops and restaurants** *** Commercial Center** *** Marketing Assistance** *** Education** *** Sales** *** Finance** *** On site fiber optics** *** Office facilities**	**(Offices not only educational and research institutes as well as professional, training, research, scientific or engineering associations)** **NASA** **Remote Sensing Technologies** **Software** **Rehabilitation** **Engineering** **Multi Media Products**
1) CONFERENCE FACILITIES = 1.690 m^2 **2) EDUCATION** **Advanced Software Techniques and Mechatronics Research Institutions**	*** Incorporation Support** *** Visa Application Support** *** Consulting Services** *** Coordination of venture capital and public subsidies** *** Multimedia Outsourcing Network** *** Document Translation** *** Office Support** *** Rental Apartments**	**Optics to Pharmaceuticals to Internet** **New Media and IT (%45 of the tenants)** **Environmental Technologies** **Social Welfare** **Edutainment** **Life Science and Food** **Construction** **Textile** **Transport Equipment** **Mechatronics**
150 ha Residential Area **1500 ha Green Belt**		**Biotechnology** **Health Sciences** **Agrochemistry** **Geoscience** **Education and Training** **Computer Science** **Information Technologies**
R & D = 18.240 m^2 **Incubators** **Innovation Center** **Offices**	*** Purdue Employees Federal Credit Union** *** Purdue Gateways** *** Program Services** *** Laboratory Facilities** *** Building Security** *** Basic Utilities and Janitorial Services** *** Shared Office Concept** *** Flexible Leases and** *** Attractive Rental Rates**	**Engineering** **Industrial Technologies** **Information Technologies** **Life Sciences** **Media_ telecommunications** **Advanced Manufacturing** **Agribusiness**
CONFERENCE CENTER = (app) 1.800 m^2		**Resources/Energy_%2** **Information/Technology_%28** **Environmental/ Pharmaceuticals_%10** **Services_%21**
	*** Substantial Servicing** *** Infrastructure Work Ready** *** Current Access to Junction 13 of the M1**	**Aerospace** **Advanced Materials** **Manufacturing** **Precision** **Engineering**

		FUNCTIONAL INFORMATION
FACILITIES / BUILDINGS	**SERVICES/AMENITIES**	**RESEARCH FIELDS**
1) RECREATION = 7.897 m^2 **2) R & D** **3) MANUFACTURING (industrial)** **4) COMMERCIAL** **Hotels**	*** Recreation Membership** ($30.00 per month) * **Parking Decals** *** Library Cards are purchased** *** Fiber Optic Telecommunications** *** Natural Gas**	**Training Systems** **Medical Equipment** **Behavioral Sciences** **Cancer Research** **Electric Power Generation** **Wireless Communications**
1) R & D **Business Incubator Center** **Research Development Center** **2) SOCIAL FACILITIES** **Restaurant**	*** Digital Infrastructure** *** Utilizing Fiberoptics** *** Voice and Video Transmission** *** Telecommunication Needs**	**Environmental Clean up and Restoration** **Medical Technology** **Energy** **Advanced Materials** **Life Sciences**
1) EDUCATION CENTER = 3.590.000 m^2 **Education National Research** **2) TSUKUBA EXPO CENTER** **3) R & D**	*** Infrastructure** *** Multi-purpose Parks** *** Condominiums** *** Public Facilities** *** Central Heating** *** Air conditioning** *** Vacuum Refuse Collection Pipe Line and** *** CATV System** *** Tsukuba Juku** (a study group)	**Scientific and technological research to relieve congestion of facilities in Tokyo**
1) HEALTH CARE **Dental Implant Clinic** **2) R & D** **Office of Technology & Communication**	*** Street Lighting** *** Entry Signage** *** Landscaping** *** Buried Utilities (water, sewer)** *** Data Communication Services** *** Video Services** *** Distance Education** *** Fiber optic** *** Meeting rooms** *** Food Service** *** 30 ha Lake and Recreation Facility** *** 483 Full Time Faculty Members**	**Engineering** **Science** **Business** **Nursing** **Dental Medicine**
R & D = 30.000 m^2 **Structural Analysis Laboratory** **Seafood Test Kitchen** **Mining Reclamation Laboratory**		
1) R & D = 173.723 m^2 **Offices** **Laboratories** **Research Facilities**	*** University Libraries** (contain 5 million items and more than 20.000 periodicals and journals) *** Technical Support** *** Cultural and Recreational Opportunities** *** Well Planned Infrastructure** *** Computer & Network**	**Biotechnology** **Superconductivity** **Information Technologies** **Telecommunication** **Environmental and Space Sciences**

FUNCTIONAL INFORMATION		
FACILITIES / BUILDINGS	**SERVICES/AMENITIES**	**RESEARCH FIELDS**
		Biotechnology **Biopharmaceutical** **Chemical** **Information Technologies** **Materials Science** **Telecommunications** **Environmental Sciences Instrumentation** **Microelectronics** **Public Health** **Statistics**
1) R & D = 31.062 m^2 **2) ADMINISTRATION = 19.974 m^2** **3) SOCIAL FACILITIES = 5.945 m^2** **4) HEALTH CARE = 12.820 m^2** *(on 6 ha land)*	*** Foreign Trade Zone** *** University Partners** (Marquette University Medical College of Wisconsin Milwaukee School of Engineering University Of Wisconsin) *** Funding Provided by** **Tax Incremental Financing** *** Conference Rooms** *** Network** *** Library**	**Medical and Biotechnology %25** **Information %60** **Electronic Equipment** **Engineering** **Materials** **Other Technologies %15**
Multistorey Buildings (more than 20 tenants)		**Biotechnology** **Pharmaceutical Sciences** **Medical Devices** **Business Service** **Information Technology**
1) R & D = 16.150 m^2 **Biotechnology Development Center = 11.150 m^2** **New Economy & Information Technologies Development Center = 5.000 m^2** **Quebec Biotechnologies Innovation Center**	*** Research Equipment and Centers** *** Business Incubator** *** Conference Rooms** *** Walking Rails** *** Metro Access** *** A few min away from Recreational** *** Residential and Commercial Areas** *** North American Free Trade Agreement** *** Telecommunications**	**Biotechnology** **Pharmaceutical Sector** **Human Health**
	*** Multipurpose Sports Track** *** Express Bus in Technopark** *** Ultramodern Hotel** *** Restaurant** *** Complete Sports Centers** *** Banking Services** *** Daycare Centers**	**Information** **Telecommunication Technologies** **Pharmaceutical Industry** **Biotechnologies** **Aerospace Industry**
Biomedical Building **National Innovation Center** **International Business Center** **Conference Center** **Locomotive Workshop** **Theatre**		

FUNCTIONAL INFORMATION		
FACILITIES / BUILDINGS	**SERVICES/AMENITIES**	**RESEARCH FIELDS**
1) PUBLIC R & D = 400.000 m^2 DNA Research Institution = 190.000 m^2 Science Center = 30.000 m^2 Public R & D = 18 m^2 **2) PRIVATE R & D**	**All Services (Parking, Infrastructure) are paid**	**Biotechnology** **Telecommunication** **New Raw Materials** **Pharmaceutical** **Automotive** **Physical and Chemical Research**
Modular and Functional Spaces = 91.000 m^2 **Offices**		**Environment** **Biotechnologies & Diagnostics** **Chemistry & Biochemistry** **Physics, Aerospace & New Materials** **Informatics and Multimedia** **Specialized Services** **Telecommunications** **Biomedical Technologies**
1) ADMINISTRATION = 51.959 m^2 Plassey Enterprise = 46.836 m^2 Hamilton House = 4.180 m^2 Rose house = 743 m^2 **2) R & D = 8.929 m^2**	*** Business & Technological Infrastructure Service Unit** *** Adult & Continuous Education** *** Technology & Enterprises Development** *** A Special Seed Fund** *** Alumni Association** *** Network** *** Sport Facilities** *** Leisure Walks** *** A Broadband Fiber optic**	**Complex Systems** **Enterpreunership** **European Studies** **Materials and Surface Science** **Music and Dance** **Teacher Education**
1) R & D Spinno Incubator Innopoli High Tech Center **2) ADMINISTRATION**	*** Spinno Training** *** Growth & Internationalization** *** Spinno Club Encourage Network Between Companies** *** Mentoring Advisory Programme** *** Incubator Activities**	**Management** **Marketing Consulting** **Financing** **Project Administration**
1) R & D **2) RECREATIONAL** **3) BUSINESS ENVIRONMENT**		
1) OFFICE = 44.000 m^2 **2) MANUFACTURING = 11.000 m^2**		**Engineering** **Architecture** **Education** **Technology Consulting** **Business**

FUNCTIONAL INFORMATION		
FACILITIES / BUILDINGS	**SERVICES/AMENITIES**	**RESEARCH FIELDS**
COMMERCIAL CENTER = 400.000 m^2 A new business class hotel Restaurants Multitenant Office Buildings Residential Units	**Infrastructure**	**Education** **Technology** **Small Business** **Research** **Higher Education (9800 enrolled students)** **Government and Military**
1) R & D = 30.000 m^2 **2) COMMERCIAL** **3) ADMINISTRATION** **4) SOCIAL FACILITIES**	*** Pennsylvania Technical Assistance Program** *** Conference Facilities** *** Child Care Facility for Innovation Park Employees**	**Science** **Engineering** **Technology** **Business**
1) EDUCATION = 4.924 m^2 **2) R & D = 4.366 m^2** **Mililani Service Center with 130 employees**	*** Fiber Optic Company** *** Foreign Trade Zone** *** Ethernet Computer Network** *** Enterprise Zone Status** *** Daycare Center on Premises** *** Financial Institution** *** Laboratories** *** Clinics** *** Office Buildings** *** Minor Repair** *** Schools** *** Storage** *** Warehousing and Distribution** *** Television Studios** *** Administrative Functions**	
1) R & D (Innovation Center)		

			ECONOMIC		
RESEARCH DEPARTMENTS IN THE ASSOCIATED UNIVERSITY	BASIC ACTIVITIES IN ASSOCIATED CITY	EVENTS	TOTAL NUMBER OF FIRMS	QUALIFIED EMPLOYEES	GRADUATES
Engineering Science Management Built Environment	The Capital of Turkey		500	4,000	
			40		
		* Film, Music and Dance Festivals * Typical Modern Pursuits	60	6.000 employees (5.000 IT professionals)	
Mechanical Engineering Civil Engineering Electronics Engineering Chemical Engineering Architecture	Brno is at the heart of the Europe and operates the economies of Central and Eastern Europe		More than 13 (Including Siemens, IBM, FEI, SGI, Lexmark and Invensys)		
	Aquaculture Agriculture	Technopark Expo 2003	21		

			ECONOMIC		
RESEARCH DEPARTMENTS IN THE ASSOCIATED UNIVERSITY	BASIC ACTIVITIES IN ASSOCIATED CITY	EVENTS	TOTAL NUMBER OF FIRMS	QUALIFIED EMPLOYEES	GRADUATES
			20	500	
	Cultural	* International Conferences and Large Events * Fair 2003 * China-Japan Venture Forum	177		
		There are many annual events organized as 1st, 2nd, 3rd and 4th trimesters	1260	15000 engineers 500 researchers	
			90	2,500	
	Mining Marine Manufacturing Agriculture Information Technologies Tourism International Trade Export Culture			625 people engaged to the park	2,500
Engineering Applied Science Manufacturing Management				5.000 manager engineers	1.500 master and doctoral students

			ECONOMIC		
RESEARCH DEPARTMENTS IN THE ASSOCIATED UNIVERSITY	BASIC ACTIVITIES IN ASSOCIATED CITY	EVENTS	TOTAL NUMBER OF FIRMS	QUALIFIED EMPLOYEES	GRADUATES
Hearing / Speech Clinic Archaeology Digital Information Processing Lab State Comptrollers Office UCF Foundation Defense Transition Services International Studies University Telemarketing Arts and Science Business Administration Education Engineering College of Health School of Optics Public Affairs	**Tourism**		**85**	**8,500**	**400**
Energy			**130**	**12.000 professionals**	
		Science & Tech. Expo 85, Science week, Science festivals	**300** (59 educational and research institutes 241 private and national)	**13.000 researchers**	
					11
Science Meteorology Architecture IT			**30**	**1500**	
	Festivals: The Colorado Shakespeare The Gilbert and Sullivan Colorado Music Dance		**50 res. Inst. 900 res. Investigations**	**700**	

			ECONOMIC		
RESEARCH DEPARTMENTS IN THE ASSOCIATED UNIVERSITY	BASIC ACTIVITIES IN ASSOCIATED CITY	EVENTS	TOTAL NUMBER OF FIRMS	QUALIFIED EMPLOYEES	GRADUATES
			131 (100 research and dev.), % 99.4 of employees work for R & D	% 50 of the employees work for mul. Nat. Corpo. , % 40 of employers have less than 10 employees	Total 45.00; Full time 38.500
		monthly business seminars, presentations by experts	over 70	2,300	
The Department of Physiology and Pharmacology and Physician Assistant Program	Manufacturing		150	600 employees	
Human Health & Microbiology	High-tech manufacturing processes Autoroute 25 industrial park 2520 industries and 1062 manufacturers		80	A market of 3.3 million people and 130 million consumers	
	Industrial and Cultural Metropolis		17		

			ECONOMIC		
RESEARCH DEPARTMENTS IN THE ASSOCIATED UNIVERSITY	**BASIC ACTIVITIES IN ASSOCIATED CITY**	**EVENTS**	**TOTAL NUMBER OF FIRMS**	**QUALIFIED EMPLOYEES**	**GRADUATES**
			70 (current)	**1.600 (current)**	
Business **Education** **Engineering** **Informatics & Electronics** **Humanities Science** (Uni. of Limerick) **Science & Information Technologies** **Electrical & Electronic Engineering** **Communications** **Mechanical Engineering** **Management Studies** **Built Environment** **Art & Design**	**Sporting capital of Ireland**		**80**	**3,000**	**(2000 undergraduate over 1000 employees annually)**
			80		
Architecture **Business** **Chemistry** **Communication** **Education** **Environmental Studies** **Law** **Public Affairs**			**30**	**2000**	
	Near to suburban Communities		**45**	**3,800**	

			ECONOMIC		
RESEARCH DEPARTMENTS IN THE ASSOCIATED UNIVERSITY	BASIC ACTIVITIES IN ASSOCIATED CITY	EVENTS	TOTAL NUMBER OF FIRMS	QUALIFIED EMPLOYEES	GRADUATES
			220	22,500	
		Seminars "The First Step"	More than 40 ventures are growing in Incubators		
	35.000 Residents High Quality Life Style 6 Recreation Centers		70	65.000 work force in related city	
	University Town: Education Touristical Cultural Conferences Sports				

: INFORMATION			WEB ADDRESSES
LAND ACQUISITION (long lease or purchase)	INVESTMENTS & EXPENDITURES	ANNUAL OUTPUT	
	4 billion $ annual endorsement (200 million $ annual budget for R&D)	800 million $ annual exportation	http://www.metutech.metu.edu.tr
			http://www.innovation.stir.ac.uk
			http://www.elvingston.co.uk
	Annual endorstments:Rs.225 cores	annual exportation: Rs 110 cores	http://www.teknopark.org
purchase or lease			http://www.technologypark.cz
	The companies exporting to 46 count.	annual Growth rate of 30 per cent	http://www.development.tas.gov.au/technopark

: INFORMATION			WEB ADDRESSES
LAND ACQUISITION (long lease or purchase)	**INVESTMENTS & EXPENDITURES**	**ANNUAL OUTPUT**	
lease			http://www.unebtechpark.com
privately owned			http://www.krp.co.jp
			http://www.sophia-antipolis.net
Long-term leasing			http://www.purdueresearchpark.com
			http://techpkwa.curtin.edu.au
			http://www.cranfieldtechnologypark.co.uk

INFORMATION			WEB ADDRESSES
LAND ACQUISITION (long lease or purchase)	**INVESTMENTS & EXPENDITURES**	**ANNUAL OUTPUT**	
Lease/ purchase			http://www.cfrp.org
			http://nighthak.tricity.wsu.edu/scitechpark
			http://www.info-tsukuba.org
Long-term leasing	**3.1 million$ invested to the park by the State Illinois for 92.900 m2 building space**		http://www.siue.edu/UNIVERSITYPARK
			http://www.innovation_park.com
Long term lease			http://fm.colorado.edu/researchpark/

INFORMATION			WEB ADDRESSES
LAND ACQUISITION (long lease or purchase)	**INVESTMENTS & EXPENDITURES**	**ANNUAL OUTPUT**	
	2 billion $, Dev. surpasses 177 ha and average salary of an employee is $ 56.000		http://www.rtp.org
purchase or long-term lease	**$2.8 million infrastructure,$ 10 million United Healthcare**		http://www.mcrpc.org
	25 million $		www.ptrp.org
		$ 100 billion	http://www.lavaltechnopole.qc.ca/
	$700 million	**$1.100 G**	http://www.technoparc.com
			http://www.atp.com.au

: INFORMATION			WEB ADDRESSES
LAND ACQUISITION (long lease or purchase)	**INVESTMENTS & EXPENDITURES**	**ANNUAL OUTPUT**	
Rental	**9.75 billion Jpy is the capital of Kazusa Academia Park Co. Ltd**		http://www.pref.chiba.jp/business/kazusa
			http://www.area.trieste.it
			http://www.shannon-dev.ie/Business/National_Technology_Park_Limerick
			http://www.otech.fi/otech/OtaniemiTechnologyPark.html
			http://researchpark.asu.edu
	Capital investment in Park development of $250 million		http://www.theresearchpark.com

INFORMATION			WEB ADDRESSES
LAND ACQUISITION (long lease or purchase)	**INVESTMENTS & EXPENDITURES**	**ANNUAL OUTPUT**	
Purchased by City of Huntsville			http://www.hsvchamber.org/crp
	$ 75 million budget	**total 220 invention/268 patent application**	http://innovationpark.psu.edu
			http://www.mililanitechpark.com
			http://www.technopark.co.za

3.1. Establishment

For general research of the study, technoparks, which have university-industry-government relationship, are investigated. Technoparks in private ownership like 'Vestel City' are kept outside of the research. As a consequence, technoparks in the table associated by one or more university and supported by government and/or partnerships from private sector.

When technoparks' process of implementation is studied, it's seen that phasing is programmed in order to be more feasible. For example, 'Kazusa Akademia Park' is planned as two phases. Mostly, R&D facilities are situated in first phase, which is completed and cultural, academic and recreational activities are situated in second phase, which some part of planning studies were started. [42] Similarity, 'Mililani Technology Park' has two phases in order to develop infrastructure in two stages. [50] Convenience of phasing can be seen from these examples.

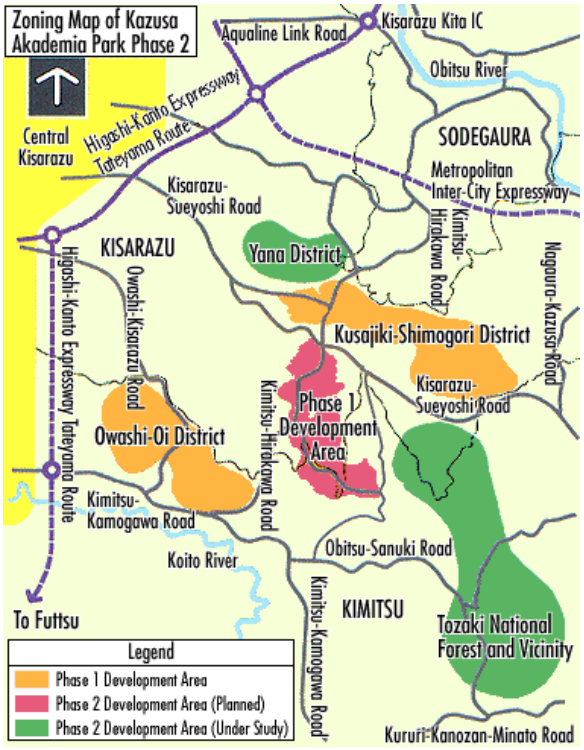


Figure 3.1 Phases of Kazusa Akademia Park [42]

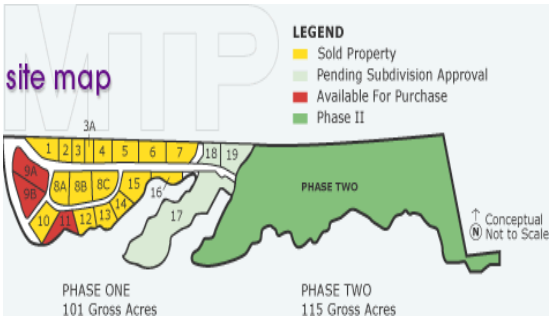


Figure 3.2 Phases of Mililani Technology Park[50]

3.2. Location Information

When distances of technoparks from main centers are scrutinized, it can be seen (also shown in the graph below) that,

21% of technoparks is 0-9 km, 18% of them 10-19 km, 15% of them 20-50 km, 3% of them over 50 km far from city center, and 44% of them -15 out of 34 - do not have data about the distance from city center. It appears that, being close to city center is not so important on condition that it should not be over 50 km.

Data about 10 technoparks could be reached and all of them were maximum 10 km far from campus area, meaning that most of them are much closer to the campus area they are related with.

There are technoparks very close to or over 50 km far from the nearest airport, but 26% of them are 20-50 km far from an airport. Whether or not they are close can be explained with the distance between airports and central areas.

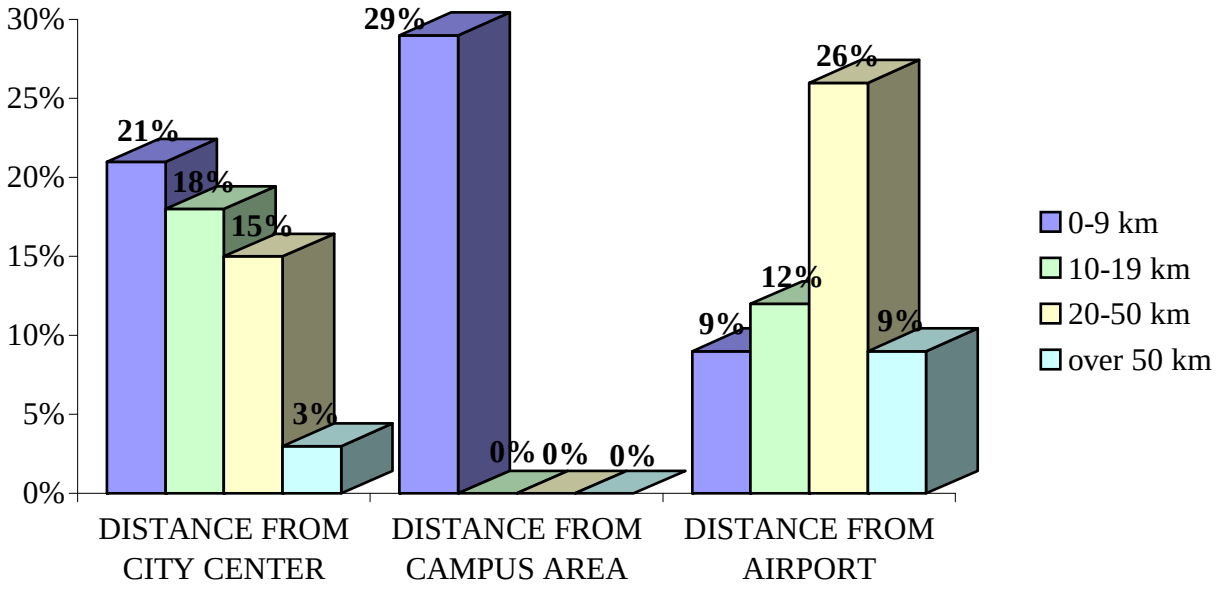


Figure 3.3 Graph of Location Information

3.3. Zone Information

Technoparks that take shape according to the environment they present have sizes in between traditional campus environment and big technology parks. For example French technopark movement, which aims to accelerate local economic improvement, leads to bigger technoparks in comparison with English ones that aim to create competition and solve unemployment problem. Also the same characteristics of English technoparks in respect to shape and size are observed in Scandinavian countries. Conversely, Japan technopolises have similarities with French technopoles. A new life style has been set up for engineers and researchers who live with their families, outside of accustomed urban life, in technology cities. As for the ones in USA, there are many research and technology parks that can be examples of various foundation and finance models of technoparks. It has been observed that in developing countries, aims of national improvement and local industrialization have priorities, and new centers have been trying to transfer technology and modify them to meet the requirements of their countries. Common characteristic of main parks is creation of centers of charm by large green areas and modern architectural buildings in order to attract the attention of entrepreneurs and researchers [1]

Total areas of technoparks range from 0,4 ha to 2.833 ha as shown in Figure 3.7. For example, Tsukuba Science City is constituted in order to relieve the overcrowded condition in Tokyo and contribute to a well-balanced development of the Tokyo Metropolitan Area, and also aims to promote science and technology and become the center of advanced research and higher education base for national institutes and the University of Tsukuba. The Research and Education District covers about 2,700ha in the center of Tsukuba Science City, where national research and educational institutes, urban area, residential area, and parks are functionally located in accordance with the master plan. The Suburban District covers about 25,700ha, where systematic urbanization is promoted; the natural and rural environment is preserved, and private research institutes are located as planned. An area designated for urbanization along the New Joban Train Line is scheduled to be developed. [32]

Figure 3.4 Metropolitan Area Map of Tsukuba [32]

Figure 3.5 Tokyo Loop Line and Research & Education District Comparative Map [32]

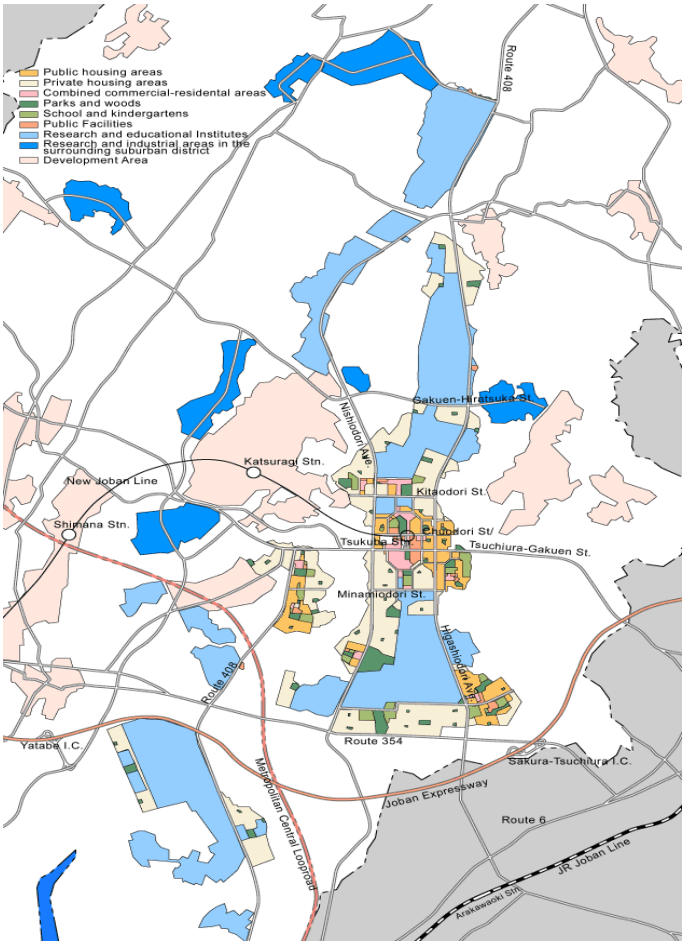


Figure 3.6 Tsukuba Science City Complete Plan Diagram [32]

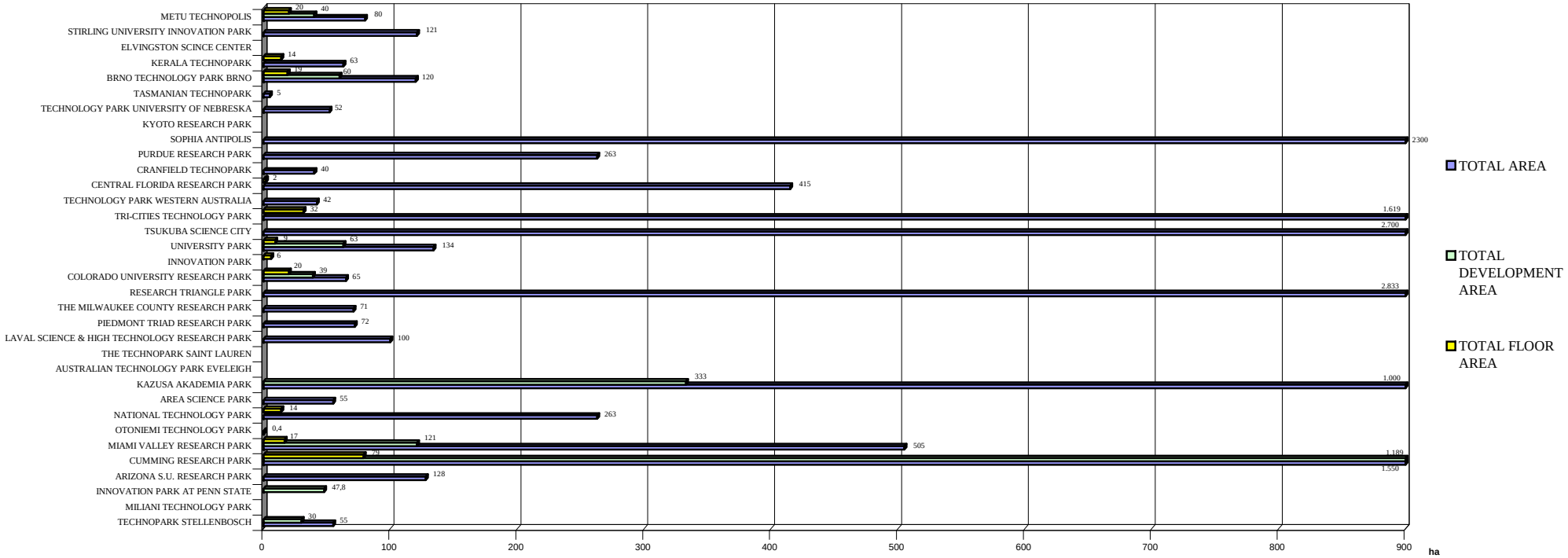


Figure 3.7 Zone Information of Technoparks

Percentage distribution of Total Floor Area / Total Area and ratio of Total Development Area / Total Area is shown with the Figure 3.8 and, construction Ratios of some technoparks are shown in Table 3.2. Surely, these ratios depend on sizes of total areas, but the average ratio of Total Development Area / Total Area can be said 53%, and the average construction ratio to be 0,30.

Table 3.2 Construction Ratios of Some Technoparks

NAME OF TECHNOPARK	TOTAL AREA	TOTAL FLOOR AREA	CONSTRUCTION RATIO
University Park Southern Illinois	134 ha	93 000 m^2	0,07
Miami Valley Research Park	505 ha (120 ha completed)	167 400 m^2 (completed)	0,14
Purdue Research Park	(Ratio is obtained from building capacities and sizes of sale lots)		0,30
University of Colorado Research Park	(Ratio is obtained from given average density)		0,31
Mililani Technology Park	(Ratio is obtained from given design standards of technopark)		0,40
Zone A of Czech Technology Park	5 ha	28 380 m^2	0,57

Table 3.3 Lot Sizes of Some Technoparks

NAME OF TECHNOPARK	TOTAL AREA	LOT SIZES
University Park Southern Illinois	134 ha	4 000 m^2 – 22 000 m^2
The Milwaukee County Research Park	71 ha	4 000 m^2 – 80 000 m^2
Purdue Research Park	263 ha	9 000 m^2 – 29 000 m^2
Mililani Technology Park	40 ha	16 000 m^2 – 20 000 m^2
University of Colorado Research Park	65 ha (developed)	12 000 m^2 – 110 300 m^2
Kazusa Academia Park	1 000 ha	20 000 m^2 – 110 000 m^2
Cummings Research Park	1 550 ha	Up from 20 000 m^2

Lot sizes in the area also changes according to size of total area of the technopark in addition to type and requirements of research fields. Lot sizes of the technoparks investigated vary between 4.000 m^2 and 110.300 m^2. (See Table 3.3)

3.4. Functional Information

The aforesaid technoparks were investigated in order to get information about possible research fields, required facilities and services.

3.4.1. Research Fields

Research fields of a technopark can be diversified from ‘automotive technology’ to ‘art & design’ according to research departments in associated university or basic activities in located city. All of the technoparks investigated are:

- Chemistry and Physical Technologies
- Cosmetics
- Textile Technologies
- Biotechnology, Biopharmaceutical
- Food Technologies
- Agriculture, Animal Industry, Seeds and Medicinal Plant Research
- Leather
- Forest Products
- Fruit Tree Research
- Water and Sea Products
- Sea Technologies
- Aquaculture – Water sports
- Humanities
- Geology, Geomorphology
- Earthquake studies
- Archeology
- Meteorology
- Energy Supply and Energy Production Industries
- Environmental Clean Up
- Environmental and Space Sciences
- Aerospace Industry

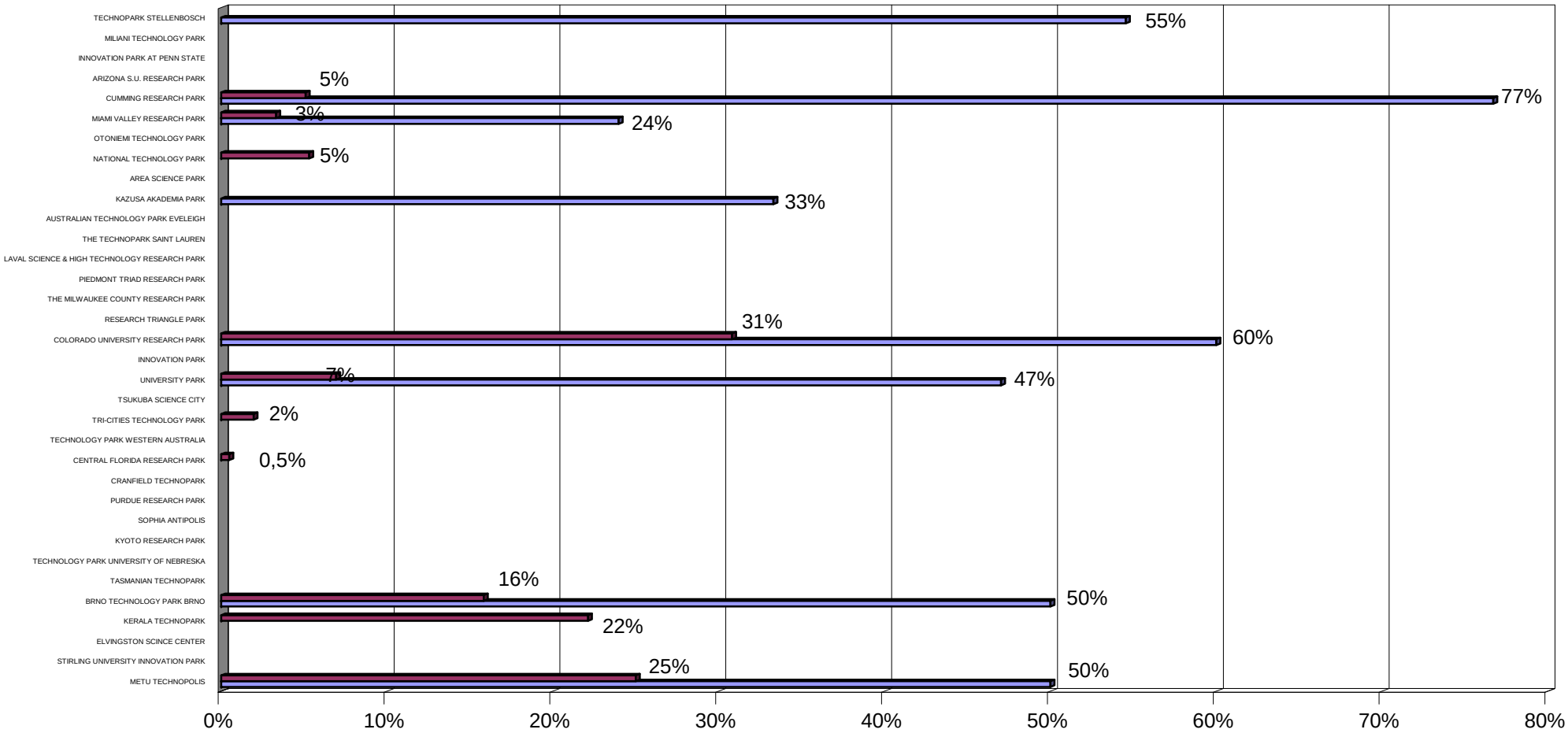
- European Studies
- Defense and Security Technologies
- Government and Military
- Life Sciences
- Built Environment
- Material Engineering
- Automotive
- Construction and Management
- Advanced Manufacturing / Entrepreneurship
- Statistics
- Software – Hardware
- Information Technologies
- Multimedia Products, Radio Communications
- Electronics – Telecommunication – Satellite Communications
- Electron Beam Microscopes
- Superconductivity
- Furniture – Lamination
- Packing
- Behavioral Sciences
- Rehabilitation
- Education
- Healthcare
- Entertainment – Music and Dance
- Art & Design
- Animated Content Creation

3.4.2. Facilities

Of the facilities situated in the investigated technoparks, all can be grouped in 5 titles which are shown in the Figure 3.9 and listed below,

- R&D
  - Public R&D
    - Incubator
    - Innovation Center
    - Technology Transfer and Development Center
    - Office Buildings
    - Research Centers
      - Prototyping Workshops
      - Laboratories
  - Private R&D
- Administration Facilities
  - Management Unit
  - Investment Unit
  - Business and Technical Information Service Unit
  - Meeting Rooms and Conference Facilities
  - Property Brokerage
  - Reception
  - Security
  - Enterprise Units
  - Financial Institutes

- Supporting Facilities
    - Commercial Center
        - Small Shops
        - Gastronomical Units
        - Hotels
        - Banks & Kiosks
    - Conference Center
    - Museum
    - Library
    - Education Center
    - Expo Center
    - Residential Areas
    - Recreational Activities
    - Healthcare Services
- Technical Facilities
    - Infrastructure System
    - Clinics and Laboratories
    - Warehousing
    - Thermal Units
    - Internal / External Security
- Manufacturing



	METU TECH	STIRLING UNIV	ELVINGSTON	KERALA TECH	BRNO TECH	TASMANIAN	TECHNOLOGY	KYOTO RESE	SOPHIA ANTI	PURDUE RESE	CRANFIELD	CENTRAL FLOR	TECHNOLOGY	TRI-CITIES	TSUKUBA SCIE	UNIVERSITY	INNOVATION	COLORADO	RESEARCH	THE MILWAUKE	PIEDMONT	LAVAL SCIE	THE TECHNOP	AUSTRALIAN	KAZUSA AKAD	AREA SCIENCE	NATIONAL TECH	OTONIEMI	MIAMI VALL	CUMMING RESE	ARIZONA S.U.	INNOVATION	MILIANI TECH	TECHNOPARK
RATIO OF TOTAL FLOOR AREA / TOTAL AREA	25%			22%	16%							0,5%		2%		7%		31%										5%		3%	5%				
RATIO OF TOTAL DEVELOPMENT AREA / TOTAL AREA	50%				50%											47%		60%								33%				24%	77%				55%

Figure 3.8 Percentage Distribution of Zone Information of Technoparks

For the purpose of comparing the distribution of facilities, all land usages in facilities are examined inside total area of technopark in which they are located. Due to the abundance of data, only 29% of technoparks investigated has got information about capacity of R&D facilities, 9% of them has got information about Administration Facilities, 32% of them has got data about Supporting Facilities, 9% of them about Manufacturing Facilities - after all some of them do not have any manufacturing facility- and none of them has got information about the capacity of Technical Facilities. Figure 3.9, which has been prepared by evaluating the average of the data obtained. R&D Facilities cover maximum land, Some technoparks have got even much more than the average, and e.g. 19% of total area of Kazusa Akademia Park belongs to R&D Facilities.[42] Also Supporting Facilities have important land use in technoparks. For example, 13,3% of total area of Tsukuba Science City belongs to Supporting Facilities.[32] As it was mentioned before, some of the technoparks do not have any manufacturing facility and existing ones are light industrial units, which do not cover, so much land.

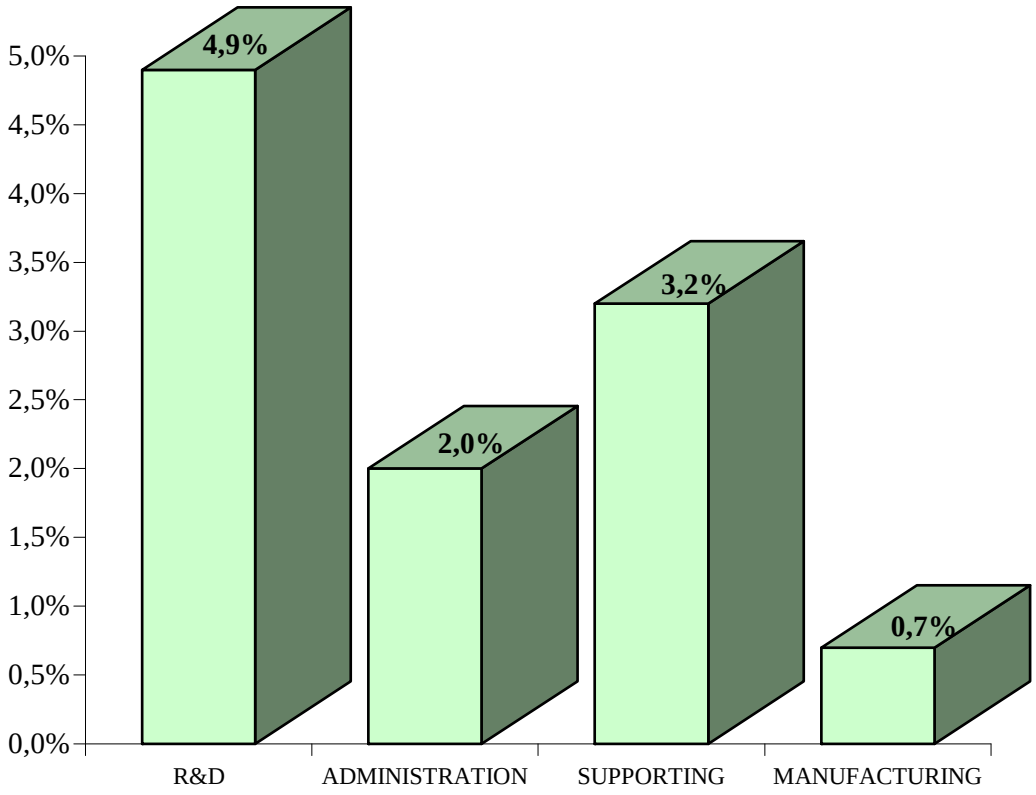


Figure 3.9 Distribution of the Average of Facilities

3.4.3. Services

Duties of the Administrator Firms towards tenant firms according to the technoparks investigated are:

- Telecommunications
- 24 Hour Access and Security
- Car Parking
- Software / Network Between Companies
- Technology Transfer
- Quality Control
- Training Programs – Seminars
- Financial Institutions
- Advisory Services / Supporting and Consulting Services
- Brokerage Services
- Foreign Trade Zone / Enterprise Zone
- Warehousing and Distribution
- Management and Marketing Assistance
- Conference Equipment Service
- Research Equipment Incubator and R&D Activities
- Transportation Access from City Center and Airport
- Flexible Leases
- Law and Order Conditions
- Landscaping
- University Partnership
- Accessing Patent Information and Technical Information
- Disabled access and Flexible Business Accommodation
- Easy access to Global Markets / High-Tech Manufacturing

3.5. Economic Information

Total number of the firms range from 20 to 950. Also, the number of employees range from 300 to 45.000. Surely, these huge differences can be explained by the size or capacity of technoparks, but it must be mentioned that various capacities of employees or firms can be seen in different technoparks with the same size, because of the fact that research fields and technology usage are different in these technoparks.

In sources of data, some of them were determined by the number of “qualified employee” or “skilled people” but others only by “the number of employee” without any statement of qualification. So, Table 3.4 was plotted to show this difference, but lack of information obstructed this aim. However, table shows that total areas of technoparks and types of research fields can change the ratio, there is not any standard about this rate. Correspondingly, National Technology Park and Purdue Research Park have the closest sizes in comparison with Izmir Technology Development Zone; on the other hand, research fields of Purdue Research Park and naturist design approach of National Technology Park are similar with concept of The Zone.

About 13 000 employees work at National Research and Educational Institutions in Tsukuba Science City and 8 500 of them are researchers. This ratio is approximately 65 %. [32] The ratio of skilled people per population of technopark could not be getting from Table 3.4, but this example can be a starting point.

3.6. Design Criteria of Technopark Examples

After evaluating examples of technoparks statistically by using their own data given on cyber environment, their design criteria of them were determine according to visual research from site maps. Detailed data about mentioned examples are given on Appendix D.

Zoning

General consensus of technoparks is combining related facilities according to related research fields in a low-density development set in an attractive, landscaped and woodland environment. Figure 3.10 (Also Figure D.12) is a good example of this zoning criteria.

Table 3.4 Ratio of Employee / Total Area of Some Technoparks

NAME OF TECHNOPARK	TOTAL AREA	NUMBER OF QUALIFIED EMPLOYEES	RATIO OF EMPLOYEE /TOTAL AREA	NUMBER OF EMPLOYEES	RATIO OF EMPLOYEE /TOTAL AREA	RESEARCH FIELDS
Area Science Park Trieste, Italy	55 ha			1 600	29 p/ha	Environment Biotechnologies & Diagnostics Chemistry & Biochemistry Electronics & Industrial Automation Physics, Aerospace & New Materials Informatics and Multimedia Specialized Services Telecommunications Biomedical Technologies
Piedmont Triad Research Park North Carolina, USA	72 ha (10 ha currently developed)			600	60 p/ha	Biotechnology Pharmaceutical Studies Medical Devices Health Sciences Business Service Information Technology
Central Florida Research Park Florida, USA	415 ha			8 500	20,5 p/ha	Training Systems Medical Equipment Behavioral Sciences Cancer Research Electric Power Generation Wireless Communications
The Milwaukee County Research Park Wisconsin, USA	71 ha	2 300	32,4 p/ha			Medical and Biotechnology Information Electronic Equipment Engineering Materials Other Technologies

Tri-Cities Science and Technology Park Washington, USA	1 619 ha	12 000	7,4 p/ha			Environmental Clean up and Restoration Medical Technology Energy Advanced Materials Life Sciences
Tsukuba Science City Tsukuba City, Japan	2 700 ha (R&D)			100 000	37 p/ha	Scientific and technological research to relieve congestion of facilities in Tokyo
National Technology Park Limerick, Ireland	263 ha	3 000	11,4 p/ha			Complex Systems Entrepreneurship European Studies Materials and Surface Science Music and Dance Teacher Education
Miami Valley Research Park Ohio, USA	505 ha (120 ha currently developed)			3 800	31,6 p/ha	Engineering Architecture Education Technology Consulting Business
METU Technopolis Ankara, Turkey	80 ha	4 000	50 p/ha			Software Electronics Information Technologies Defense and Security Technologies
Purdue Research Park West Lafayette, India	263 ha			2 500	9,5 p/ha	Engineering Industrial Technologies Information Technologies Life Sciences Media telecommunications Advanced Manufacturing Agribusiness
Cummings Research Park Alabama, USA	1 550 ha			22 500	14,5 p/ha	Education Technology Small Business Research Higher Education Government and Military

Kerala Technopark Thiruvananthpuram, India	63 ha	5 000	94 p/ha	6 000	95 p/ha	Information Technologies Communication Entertainment
Technology Park University of Nebraska Nebraska, USA	52 ha	500	9,6 p/ha			NASA Remote Sensing Technologies Software Rehabilitation Engineering Multimedia Products

Figure 3.10 Master Plan of Czech Technology Park [22]

Sizing

As mentioned before, lot sizes can range from 4.000 m^2 to 110.000 m^2. It was also mentioned that the average construction ratio is 0,30, however it can change from 0,07 to 0,57. Although there are various lot sizes, building sizes are more or less similar to each other. (See Table 3.5) There can be relatively small buildings in 800 m^2 and again relatively large ones 12.700 m^2 or 18.580 m^2, but it can be said that average building size is 3 000 m^2 .

When building photos in appendix D are investigated, it will be seen that all of them are 1– 3 storey buildings. Specially, design standards of Mililani Technology Park determine the maximum building height as 14 m from the ground to the roof plate. [50]

Table 3.5 Examples of Building Sizes of Some Technoparks

TYPE OF BUILDING	NAME OF THE BUILDING	TECHNOPARK	BUILDING SIZE
FACILITIES WITH LABORATORIES	The Nebraska Center	Technology Park University of Nebraska	1 400 m^2
	Technology Development Center	Technology Park University of Nebraska	2 140 m^2
	Business and Technology Center	Purdue Research Park	2 600 m^2
	Hamilton House	National Technology Park	4 185 m^2
	Technology Center	Purdue Research Park	5 580 m^2
	Technology Innovation Center	Mililani Technology Park	12 700 m^2
	Bespoke Buildings	Cranfield Technology Park	800 m^2 - 18 580 m^2

Cont. on next page

Table 3.5 Cont

TYPE OF BUILDING	NAME OF THE BUILDING	TECHNOPARK	BUILDING SIZE
FACILITIES NOT REQUIRING LABORATORY	Forth Valley Software Center	Stirling University Innovation Park	1 000 m^2
	Alpha & Beta Centers	Stirling University Innovation Park	1 200 m^2
	Hentschel Center	Purdue Research Park	1 300 m^2
	The One Technology Place	Technology Park University of Nebraska	2 800 m^2
	Kaplan Building	Czech Technology Park	3 200 m^2
	Trent House	Cranfield Technology Park	3 700 m^2
	Scion House	Stirling University Innovation Park	4 400 m^2
PRODUCTION BUILDING	FEI Company	Czech Technology Park	8 600 m^2
SOCIAL FACILITIES	Technology Park Function Center	Technology Park Western Australia	2 000 m^2

Circulation

It can be seen that vehicular circulation has a very important role in design standards of technoparks. Loops and cul de sacks are used in order to serve every building and parking ratios are very high in order to obstruct on-street parking.

In Design Guidelines of University of Colorado Research Park [75], the overall parking ratio for the entire Research Park is given as one car for every 30 m^2 of floor area of each building. Also in detail, required parking ratios are given as:

- Laboratory and research space, corporate and building multi-tenant offices: 1 space / 30 m^2 of floor area
- Conference Center / Hotel: 1 space / room plus 1 space per employee
- Ancillary Retail Uses: 1 space / 25 m^2 of floor area
- Restaurants or auditorium: 1space / 3 seats

Pedestrian circulations are considered important and common open spaces for pedestrians between facilities are designed in all of the examples. Parking areas are located behind buildings in order to save front area for pedestrian usage. Figures below show all of these circulation criteria perfectly. They can be also seen in Appendix D.

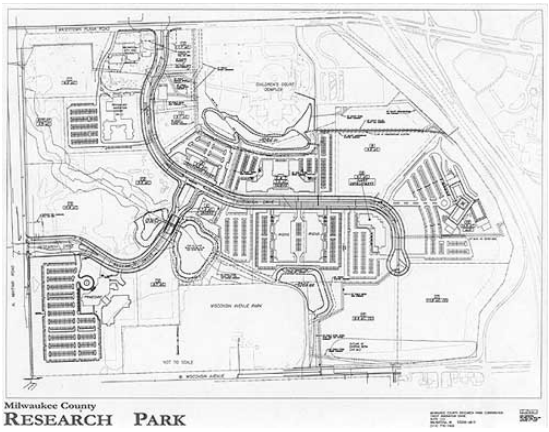


Figure 3.11 Master Plan of Milwaukee County Research Park [37]

Figure 3.12 An Aerial View of Milwaukee County Research Park [37]

Figure 3.13 Master Plan of Purdue Research Park [27]

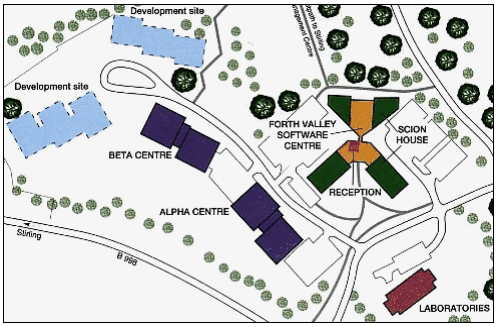


Figure 3.14 Site Map of Stirling University Innovation Park [19]

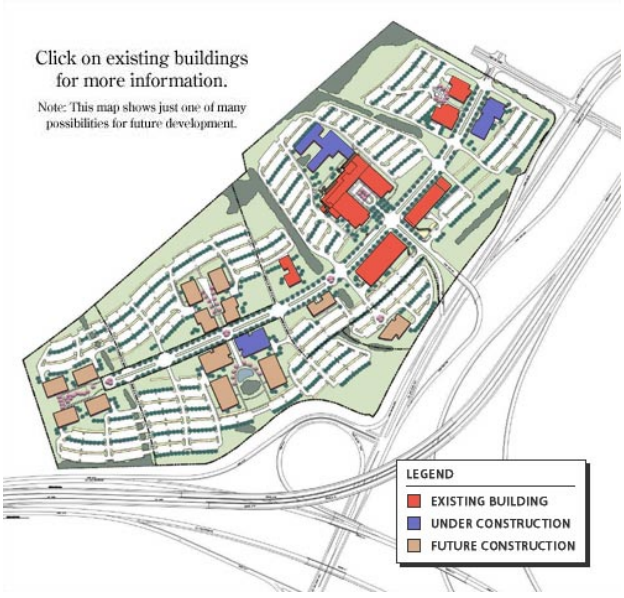


Figure 3.15 Site Plan of Innovation Park at Penn State [49]

CHAPTER 4

A CASE STUDY IN
IZMIR TECHNOLOGY DEVELOPMENT ZONE

By making use of key factors of creating a technopark, a case study was prepared. In this chapter of the study, analyses of the site were made in three parts before beginning the design. First of all, physical characteristics of the site were examined. During the study legal decisions about the site were determined. To describe the site, R&D potential was investigated in terms of location of the site. Then, a project proposal was designed according to proposed research fields, in accordance with general principles, by defining the outline of the program.

4.1. Determining Factors of Design

In this part of the study, the site of Izmir Technology Development Zone will be investigated thoroughly in order to prepare the most suitable design for the site. The Zone made up of two parts, as well as the main site, there is an additional site declared afterwards. Although the additional site will be mentioned, the actual subject of the study is the main site.

4.1.1. Legal Process

Izmir Technology Development Zone has 1/ 5 000 and 1/ 1 000 scaled Development Plans for both main and additional sites. Brief historical account of The Zone till development plans is:

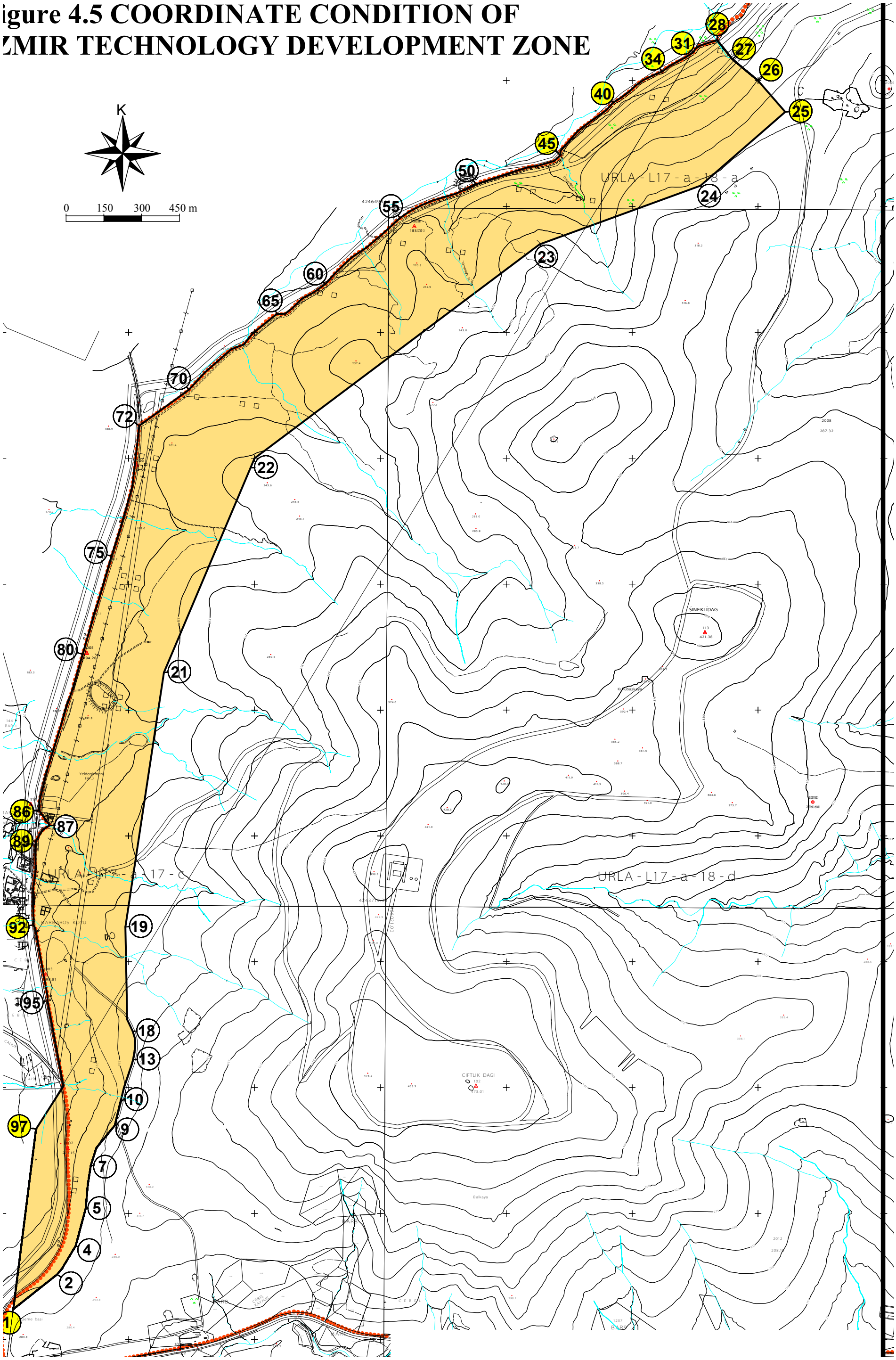
2001 – 2002 Investigation on benefits of establishing a technology development zone in Izmir for Aegean Region and the country through meetings, panel discussions and seminars. The Ministry of Industry and Trade about technology development zones, Governorship of Izmir, Municipality of Izmir, Izmir Institute of Technology, Dokuz Eylül University, Ege University and Izmir University of Economics, Aegean Region Chamber of Industry, and representatives of industrial firms situated in the region participated in these activities.

06.07.2001 The Law of Technology Development Zones – numbered 4691 was published on The Official Gazette – numbered 24454 and came into force.

19.06.2002 The Regulation of Application of Technology Development Zones was put into effect by being published on The Official Gazette – numbered 24790.

12.11.2002 Declaration of Izmir Technology Development Zone covering 2.184.000 m^2-sized area located in the IZTECH campus area. (See Figure 4.1)

igure 4.5 COORDINATE CONDITION OF
ZMIR TECHNOLOGY DEVELOPMENT ZONE



22.05.2003 Establishment of Izmir Technology Development Zone JSC and official declaration and registration it with register number 108114.

08.08.2003 Izmir Technology Development Zone was put into operation in 64.000 m^2 sized area, infrastructure and only one building that can be used by the Zone, located inside the IZTECH campus area as an Additional Zone.(SeeFigure4.2)

06.04.2004 Getting approval from the Ministry of Industry and Trade – Industrial Research and Development General Directorship about Development Plans of Izmir Technology Development Zone.

Plan decisions of The Development Plans are: [52]

3 500 ha sized campus area was located on areas granted by Ministry of Forestry and National Treasury, and on lots expropriated from private ownership. Contrary to the complex structure of the land ownership in northern region, the reason for the definite and totalitarian characteristic of land ownership in southern, western and eastern boundaries was the transferring of the land from private ownership to the Zone by expropriation. 218,4 ha sized Technology Development Zone inside the Campus area is granted by 15.08.1997 dated and 5.1805-492/520 numbered decision of Ministry of Forestry. 6,4 ha sized Additional Zone is located inside expropriated area from private ownership and was reserved for academic and administrative units of IZTECH.

The campus area is located inside 1/ 25 000 Scaled Cesme – Karaburun Environmental Plan approved by The Ministry of Housing and Public Works with 03.08.1994 dated and 350131207 numbered plan change. According to The Plan, for whole of the campus area, total construction ratio is designated as E: 0,02 because of being in 2^{nd} Degree Natural Preservation Area. (See Figure 4.3)

In The Requirement Program prepared by The Rectorate of IZTECH, it was designated that 390 000 m^2 floor areas would be enough for academic, administrative and service units of The Campus.

Total maximum floor area of 3 500 ha sized campus area according to designated construction ratio (E:0,02) : is 700 000 m^2

Remaining 310 000 m^2 sized area would be enough for floor areas of office and R&D areas, administrative units, model production units and social service units programmed in Izmir Technology Development Zone.

Units of Izmir TDZ located in 224,8 ha sized area (218,4+6,4) will be arranged according to proposed functions and envisaged population and required social and technical infrastructure, and will be indicated by sub-scaled planning studies.

Considering the density of possible functions, it was envisaged that existing secondary road in Barbaros Village, which provides connection of The Zone to Izmir-Cesme Road, should be widened to 30 m.

Due to the importance of the functions taking place in technology development zones and entrepreneurs' making use of these functions, the flexibility of transportation plan in 1/1 000 scaled Application Development Plan of The Zone was provided by showing only connection points of service roads on the 30 m-wide main road located long North-South axes. In 1/ 5 000 scaled Development Plan, zoning technique was used in order to eliminate restriction and make flexible planning approach possible.

In order not to be restrictive, undetermined land uses and location of service roads will become definite by 1/ 500 scaled State Plan which takes into consideration the physical analysis of load-bearing capacity in relation to geological structure, topographical structure, existing tree groups and stream beds.

For the whole of The Campus, **E: 0,02**

Total Area of The Campus: 3 500 ha

Total Floor Area for the whole of The Campus: 700 000 m^2

Total Floor Area of IZTECH: 390 000 m^2
(According to the Requirement Program of IZTECH)

Total Floor Area of Izmir Technology Development Zone: 310 000 m^2

Table 4.1 Statement of Izmir Technology Development Zone

Total Area	2 184 000 m^2
Total Developed Area	2 005 000 m^2
Construction Ratio (E)	**0,15**
Total Floor Area	300 750 m^2

Source: Izmir Technology Development Zone 1/ 5 000 Scaled Development Plan Statement Report

Table 4.2 Statement of Izmir Technology Development Zone – Additional Zone

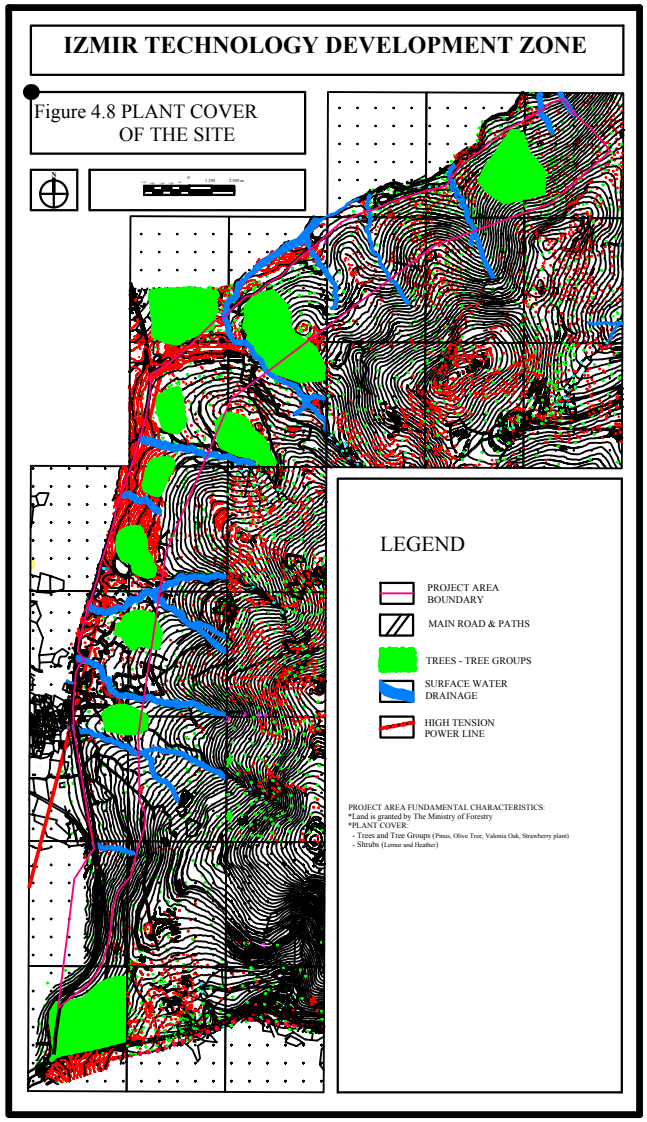
Total Area	64 000 m^2
Total Developed Area	63 901 m^2
Construction Ratio (E)	**0,35**
Total Floor Area	22 365,35 m^2
Existing Constructed Area*	7 841,2 m^2
Proposed Floor Area	14 524,15 m^2

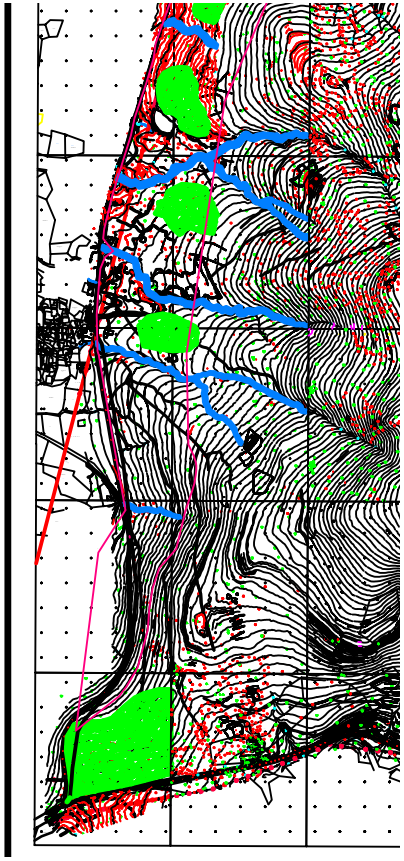
Source: Izmir Technology Development Zone 1/ 5 000 Scaled Development Plan Statement Report

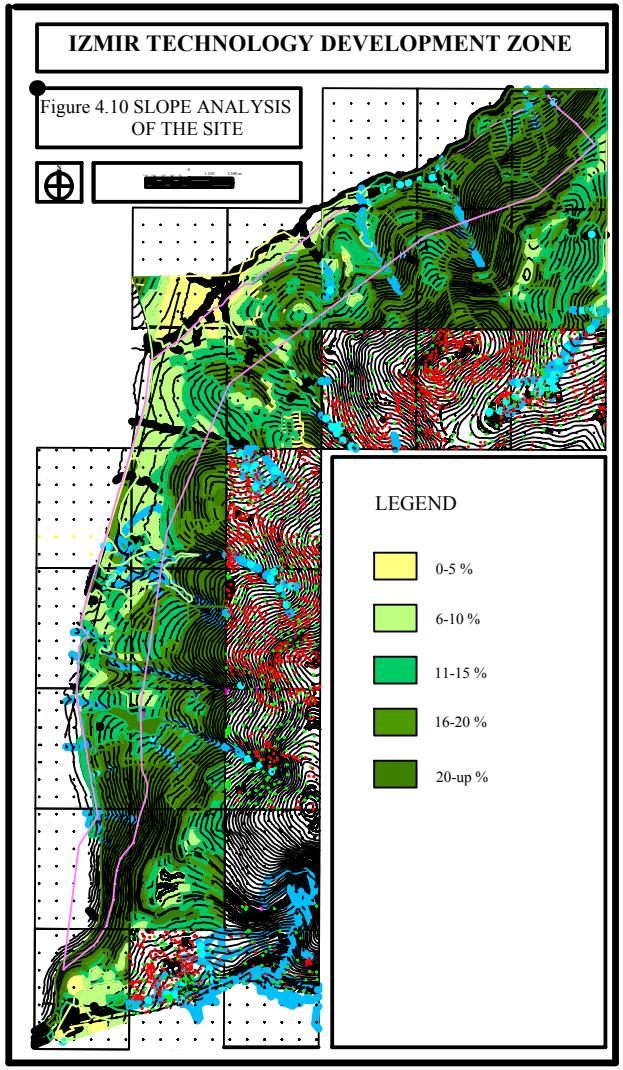
*: 7 841,2 m^2 sized Existing Constructed Area has not been included in Izmir TDZ-Additional Area, because it already takes place in Total Floor Area of academic and administrative units in the Requirement Program of IZTECH.

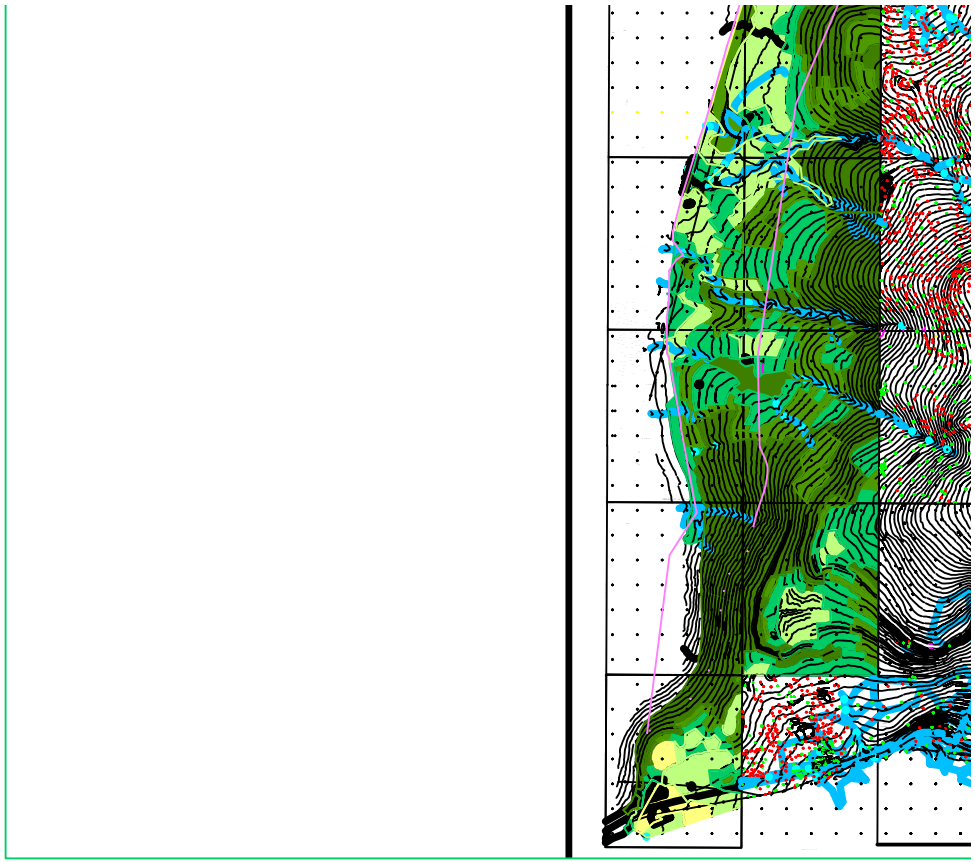
4.1.2. Natural Characteristics

Besides land covered with heath and scrub, geological structure of the site is of stony in character. The general slope of the site changes between 0% and 15%. (See Figures 4.4, 4.5 and 4.6) All of the campus area is located inside 1st Degree Seismic Zone


IZMIR TECHNOLOGY DEVELOPMENT ZONE
Figure 4.8 PLANT COVER
OF THE SITE
LEGEND
PROJECT AREA
BOUNDARY
MAIN ROAD & PATHS
TREES - TREE GROUPS
SURFACE WATER
DRAINAGE
HIGH TENSION
POWER LINE
PROJECT AREA FUNDAMENTAL CHARACTERISTICS:
*Land is granted by The Ministry of Forestry
*PLANT COVER:
- Trees and Tree Groups (Pinus, Olive Tree, Valonia Oak, Strawberry plant)
- Shrubs (Lemur and Heather)




IZMIR TECHNOLOGY DEVELOPMENT ZONE
Figure 4.10 SLOPE ANALYSIS OF THE SITE
LEGEND
0-5 %
6-10 %
11-15 %
16-20 %
20-up %



according to Turkish Earthquake Map published by The Ministry of Housing and Public Works. Principles of 'The Regulation About Constructions Built in Disaster Zones' stated in the Building Code must be applied to this project. Izmir Technology Development Zone is located inside IZTECH campus area declared as 2nd Degree Natural Conservation Area by The Numbered 1 Committee of Conservation of Cultural and Natural Riches. (See Figure 4.7) [53]

4.1.3. Location

Izmir, 3rd biggest city of Turkey according to population, is located west of Anatolian Peninsula, on the coast of Aegean Sea. The city, the first-degree exportation harbor of Turkey, is the most important city in Aegean Region encompassing cities like Manisa, Aydın, Denizli, Muğla and Uşak. Cities, which are outside of Aegean Region, like Balıkesir, Afyon, Isparta and Burdur, are influenced by Izmir. The province is surrounded by Ayvacık, Burhaniye and İvrindi from the north, which arte districts of Balıkesir, by Soma, Turgutlu, Salihli, Alaşehir and Sarıgül from the east, which are districts of Manisa, and by Kuşadası, Germencik, Sultanhisar, Nazilli and Kuyucak from the south, which are districts of Aydın,. Izmir is located between 37° 45' and 39° 15' north latitudes and 26° 15' and 28° 20' east longitudes. (See Figure 4.8)

Izmir TDZ consists of 218,4 ha sized land declared in the Official Gazette on 12.11.2002 with the number 24934 and 6,4 ha sized land has been declared as an additional zone in The Official Gazette on 08.08.2003 with the number 25193, both of which are inside 3 500 ha sized IZTECH campus area, located around the junction constituted by Izmir-Cesme Road and Karaburun Road, approximately 45 km from Izmir city center, and surrounded by boundary of Urla Municipality from the east, by Izmir-Cesme Highway from the south, by Barbaros Village from the west, and by Bozburun from the north. The Zone is located approximately 6472 m along the road of Barbaros Village on west side boundary of IZTECH campus area and averaging 300 – 350 m depth. (See Figure 4.9)

4.1.4. R&D Potential

Izmir, the main city of Aegean Zone, has 5 universities and these universities already have many R&D projects related with industrial firms which aim to have institutional and systematic R&D structure.

4.1.4.1. R&D Potential of Izmir

Industrial sector of Izmir is largely based on private entrepreneurship. Pertaining to being developed of farming, industries based on agriculture were improved and they head towards exportation. In this scope, textile, ready-made clothing, food, beverage, beer and tobacco supplier re main business branches. Also, iron – steel, petrochemistry, automotive, cement, shoe, fertilizer, agricultural tools and machines and ceramic industries are developed, and they produce both for domestic and foreign market.

Aegean Free Zone and Atatürk Industrial Park, two main industrial complexes of Izmir, contribute greatly to economy of Izmir and of Turkey. In Aegean Free Zone, 97 foreign and 341 native firms operate in production and commercial facilities in electronic and optical high–tech products, food and packaging, textile and mechanical industry increasingly continues. [54] In Atatürk Industrial Park, nearly 400 firms operate in plastic, packaging, textile, electronic, furniture, mechanical, leather, chemical materials and automotive spare part production sectors. [55]

4.1.4.2. R&D Potential of IZTECH

Izmir Institute of Technology was established in 1992 and has been engaged-especially in graduate education since 1994. As coordinator of graduate education, IZTECH consists of Faculties of Science, Engineering and Architecture and also Graduate School of Engineering Sciences. The main purpose of IZTECH is to raise creative brains by introducing upper level education and research facilities and to produce and developing high technology. [56]

Existing academic programs are:

- Undergraduate Programs
  - Faculty of Architecture
    - Department of City and Regional Planning
    - Department of Architecture
  - Faculty of Engineering
    - Department of Computer engineering
    - Department of Mechanical Engineering
    - Department of Chemical Engineering
  - Faculty of Science
    - Department of Physics
    - Department of Chemistry
- Graduate Programs
    - Biotechnology Program
    - Energy Engineering Program
    - Material Science and Engineering Program
    - Computer Software Program
    - Chemical Engineering Program
    - Mechanical Engineering Program
    - Food Engineering Program
    - Civil Engineering Program
    - Electronic and Communication Program
    - Construction Mechanic Program
    - Water Sources Engineering Program
    - Satellite Communication Program
    - Chemistry Program
    - Physics Program
    - Mathematics Program
    - Biology Program
    - Architecture Program
    - City Planning Program
    - Urban Design Program
    - Industrial Design Program
    - Architectural Restoration Program

- Ph D Programs
  - Architecture
  - City and Regional Planning
  - Chemical Engineering
  - Material Science and Engineering
  - Biotechnology

In addition to existing academic programs, research projects carried out at the University can be a guide when proposing research fields for the Zone. 50% of 20 research projects of the year 2001 were studied in graduate programs with no undergraduate programs like Biotechnology or material science and engineering. Also 25 projects studied in graduate programs were supported by Turkish government (TUBITAK, DPT), industry circles & other institutions. (See Appendix C)

4.2. Design Process of Izmir Technology Development Zone

Proposal is offered after determining legal decisions, natural characteristics, location and R&D potential of the site, research fields and social and technical units of The Zone, and sizes of the firms that will be located in The Zone. A concept plan is prepared by designating general principles, and at the end, a design project is prepared in order to determine main decisions for the Zone.

4.2.1. Proposed Research Fields

Definite research fields must be determined in order for advantages brought by specialization and increasing meeting requirements' capacity brought by pre-designation.

A perfect relationship between universities that are the source of trained manpower and knowledge accumulation and the industry that is the source of financing which is obligatory in order for the industrialization of a country. This relationship is of great importance both universities and industry in order to regenerate and improve themselves. [57]

In other words, academic excellence is an important prerequisite for successful interaction between universities and industry, in particular, for the large-scale science-based firms. [58] Hence, research fields are proposed according to R&D potential of Izmir Institute of Technology with respect to academic programs and research studies in the university and industrial R&D potential of the city.

On the other hand, the computer software industry is the fastest growing information-technology sector, and the ultimate expression of scientific labor-intensive activity. It sells pure knowledge, and fabrication could be reduced to the minimum material expression, and therefore, in theory, could be an absolute footloose activity. [59] Also, software demand increases causing a personnel shortage in software sector in Turkey. Small firms do not employ software personnel because their need for software is occasional. It is the universities where software programs are easily prepared to meet the needs of industrialists. [60] Thus, contemporary research fields like software or GIS are proposed as well.

Consequently, proposed research fields are:

- Biology
- Biotechnology
- Chemical engineering
- Food engineering
- Agro nourishment
- Pharmaceutical
- Material science
- Textile
- Mechanical engineering
- Automotive
- Hardware
- Software
- Electronics
- GIS
- CAD – CAM and related research fields.

4.2.2. Proposed Sizes of Firms

The relationships between large firms in research-intensive sectors with the universities stand in sharp contrast to those of small- and medium-sized firms in traditional areas of industrial activity. Both the extent and the nature of university / industry relations depend upon sector and firm size; and the objectives of such relationships similarly vary. [58]

Charles Monck summaries the characteristics of firms located on science parks in UK in 1987. [62]

Table 4.3 Sizes of Companies in Science Parks of UK

Number of Employees	**Percentage**
1 - 5	46
6 - 15	36
16 - 50	14
51+	4
Average size of company = 7.2 employees	

Source: C. Monck, "Science Park Tenants and Their Growth Potential Policy Implications", *Science Parks And the Growth of Technology – Based Enterprises*, (Edited by Hilary Sunman), UKSPA, 1987

Table 4.4 Ages of Companies in Science Parks of UK in 1986

Age of the Company	Percentage
Under one year	30
1 – 3 years	35
3 – 5 years	19
> 8	16

Source: C. Monck, "Science Park Tenants and Their Growth Potential Policy Implications", *Science Parks And the Growth of Technology – Based Enterprises*, (Edited by Hilary Sunman), UKSPA, 1987

35 science parks already established in UK determine how they can best develop national and local resources to support the growth of technology-based firms. The majority of 410 businesses located in science parks (67 per cent) are single plants, independent companies, engaged, almost exclusively, in recognized high technology sectors; two thirds are less than three years old and occupy less than 2 500 square feet. A high proportion of comers to science parks are new start-ups, the majority of them originate from the university and the immediate travel to work area. A company has 7,2 employees in average. The growth of high technology firms is impressive, far exceeding the growth of the small firms sector as a whole. [62]

However, the question of whether it is the large or small firms that are the major source of new innovations is irrelevant for two reasons: firstly, because both large and small firms have advantages and disadvantages in introducing new innovations and that these change from one period to another and from one industry to another; and secondly, the most effective innovations are where the advantages which large and small firms possess are combined. Thus, whilst small firms have the ability to react quickly, are more willing to take

risks, and have better internal communications than large firms, they generally lack the large firms' access to finance, lack in ability to market products through established dealer networks and lack the large firms' expertise in dealing with government bureaucracy which can be very important in the case of new products. [4]

Technology is advancing very rapidly, and large companies increasingly realize they cannot afford the investment necessary to stay in the forefront of all areas of R&D, which may be strategically important to them. It is increasingly difficult to predict which areas coming out of research will be important in the future. [63]

On the other hand, characteristics of small firms as quick decision making and carrying out decisions in a short time with favor of having pretty high qualified, creative, inclined and excited working technical personnel, their behavior like "their own work" on using personal effort and easily providing cooperation and harmony, procure superiority in innovation struggles compared to big firms. [64]

The main point is that a small company cannot have all the necessary skills, so that it desperately needs an association with people with their feet on the ground. [65]

As a solution, Radtke tells their strategic partnering model experienced in the United States as, "One of the interesting new aspects of the model is that they are based on treating the large and small company as equal partners. The basic common pattern involves a flow of capital, and access to markets from the large company to the small one, in return for which there is a flow of innovative products or access to what has been called a critical mass of technical expertise – which could not be gained except through one of these relationships. Large companies offer valuable resources to small start-up companies, starting with market access both at home and abroad, credibility with existing customers, and a marketing infrastructure of an established distribution network and instant name recognition with major corporations. Secondly, large companies have strong technology base which results from a sustained R&D program which small companies cannot effort. This is an important source of reverse technology transfer." [63]

Consequently, competition is becoming more aggressive, technology is changing at a faster rate, and, very importantly, the life of products on the market is becoming shorter. The total R&D effort therefore must increase very rapidly. In addition to incubator, other office units must be designed suitable for small-sized firms in order to keep in step with this rapidity, but also can be widen by joining together in order to meet possible needs.

4.2.3. General Principles Relevant to Requirements

Miller summaries the needs of occupiers on science parks as,

Image

Many of the occupants of research and development parks have a strong need for corporate identity and a good presentation to their clients, whom it would appear often visit their premises. They and their clients require secure premises, well managed, with considerable identity.

The Buildings

Conventional developers' specification buildings seem to be equally suitable and are much preferred by developers. With very few exceptions, it has been found that users can be accommodated in a regular 1,5 meter grid with conventional 13,5 meter wall-to-wall interiors.

Links With Academic Institutions

Firm links with research institutions were invariably required. This is an area where development companies on their own would have considerable difficulties.

Flexibility

Many of the successful research and development companies have periods of startling growth. Buildings are not in themselves inherently flexible. Larger parks with land left to develop give a greater scope for servicing the inevitable moving around within the park. This also should include a degree of additional flexibility in leasing terms not typical of standard institutional type leases.

Environment

Everybody seeks a good environment and, in general, companies in similar industries like to group together. Research and development companies similarly like to be in their own environment, notwithstanding the fact that some of other companies might be direct competitors.

Conclusion

If it is felt appropriate for science parks to attract an outside property developer, then knowledge of the characteristics and requirements of their investment is essential. Promotion of science parks in general will be important in the recognition of the contribution, which these parks can make to the economy. [66]

In addition to requirements Miller mentioned, main special principle of the design is

harmony with nature:

At the heart of the history of the western civilization dominating the world culture today lays the history of man's relation with nature. The principle of domination in the dialectic of enlightenment from the ancient Greek to the modern times always showed itself in "the subjection (of man) to nature or the subjection of nature to the self". [67] However technology causes alienation from nature as a typical condition of modern civilization, preservation of nature is accepted as another principle of all nature-based design.

4.2.4. Outline of the Program

After determining general principles relevant to requirements, outline of the program is designated on the basis of initial researches. Values taken from the comparison of examples of technoparks investigated. These compared values are, population of technoparks, total area of technoparks, types and capacities of facilities in technoparks and proportion of the areas separated for facilities in technoparks.

Some technoparks that have reachable data about their total areas and number of employees are investigated in order to designate population of Izmir Technology Development Zone. After evaluating the results on Chapter 3, Section 3.5, 2 500 qualified employee in 3 750 population is proposed for the Zone.

Also, by considering the diversity mentioned on Chapter 3, Section 3.3 Zone Information about Technopark Examples in the World, average lot sizes and building ratios and feasible building sizes of technoparks were evaluated in order to offer solution for proposed design. By setting of from evaluations in Table 3.2, it was seen that plan decisions of 1/5 000 Scaled Development Plan Statement Report, approved by the General Directorship of Industrial Research and Development of the Ministry of Industry and Trade on 06.04 2004, can be taken as diagnostic factor. So, general construction ratio of The Zone is 0,15 and total floor area of the buildings on a lot should not exceed 0,40 of the total area of the lot.

After evaluating lot sizes of technopark examples, it is proposed that, reserved areas are set apart for entrepreneurs who want to construct their own buildings wider than 2 000 m^2 with "Built-Operate and Transfer" model. Entrepreneurs who need place up to 2 000 m^2 are proposed to rent office(s) in order to situate in the Zone. It means minimum lot size can be 5000 m^2 by calculating construction ratio of lots, 0,40.

After investigating building sizes of some technoparks (Table 3.5) and design criteria of some technopark examples, Izmir Technology Development Zone was proposed to be formed with 7 main land-use decisions in respect to the general concept constituted.

These land use decisions are:

a) Central Innovation Area
b) First R&D Center
c) Second R&D Center
d) Accommodation Area
e) Nature Park
f) Research Forest
g) Afforested High Slope Area

a) Central Innovation Area

The Area is the main part of the Zone that has central units in order to use by the entire zone. It also plays the role of information technology center by bringing studies on computer hardware, software, electronics, GIS, CAD – CAM together.

Central Innovation Area includes these functional units:

Management Unit: is the building includes administration of the one that can direct the Zone's services like security, network system, ups and patent office. It has offices, meeting and conference rooms with an area of 6 000 m^2.

Incubator: is the building has flexible offices that can be combined in for entrepreneurs' requirements with an area of 6 500 m^2.

Incubators are seat of study development that give technology improvement help to small firms by providing definite supports like material, consulting, education, etc., in definite conditions like tenant spell or study criteria. Generally, new, technology-based, small sized but rapid improving and possessor firms with high value-added potential are located in incubators. Inside the incubator building, 20-30 firms according to their sizes are situated in addition to the administrator firm. Tenant entrepreneurs leave the incubator when they become ready to manufacture, and new entrepreneurs replace them. [1] The incubator companies in Israel have increased in number up to a total of 30 in the beginning of 90s'. Each incubator hosts around 10 companies on average and 5 people at most in each office. [68]

Prototyping Center: is the building as a kind of workshop for model production, which has flexible units that can be used for required purposes with an area of 3 600 m^2.

Library: is the building that houses 600 000 books which will be used by the entire zone, with an area of 5 100 m^2.

Social Center: is an extroverted building that includes a large auditorium (2 000 – 2 500 seats), medium sized halls (200 – 300 seats), meeting / seminar rooms (for 25 – 100 people), exhibition halls, and commercial units and restaurants that have relation with recreational center with an area of 14 800 m^2.

Recreational Center: is open space in relation with social center that includes sports facilities such as 2 basketball fields, 2 tennis courts, 2 volleyball fields and a carpet field for football and a supporting unit that include changing rooms and wet areas with an area of 100 m^2.

b) 1st R&D Center

It is the part of The Zone separated for scientific studies that need similar infrastructure and have similar wastes, like biology, biotechnology, food engineering, agronourishment, pharmaceutical, chemical engineering, material science and textile.

The 1st R&D Center has two kinds of semi-public buildings with 17 400 m^2 total floor area. These are:

Central Laboratory: is the building, which is the common area of the center that includes basic work requirements of the firms in the center with an area of 1 800 m^2.

Incubators: are buildings having flexible units that can be leased by small-sized entrepreneurs with an area of 5 200 m^2.

In the remainder part of the center 17 ha area is divided into lots with 68 000 m^2 total floor area for entrepreneurs that need more than 2 000 m^2 sized units.

c) 2nd R&D Center

It is the part of the Zone separated for physical sciences, which need similar infrastructure, have similar wastes and also noise pollution problem that must have be solved, like mechanical engineering, energy engineering and automotive.

The 2nd R&D Center has two kinds of semi-public buildings with 20 000 m^2 total floor area. These are:

Incubators: are buildings that each one is 5200 m^2 sized

Prototyping Center: is the building as a kind of workshop with flexible units that can be leased or used periodically with an area of 4 400 m^2

In the remainder part of the center 10 ha area is divided into lots with 40 000 m^2 total floor area for entrepreneurs that need more than 2 000 m^2 sized units.

d) Accommodation Area

It is another common area of The Zone that is designed for 375 employees as 10% of the population with their families. Average family size is accepted as 3, and it is designed for 1 125 people.

Accommodation Area includes these functional units:

Guest House: is the building that include restaurants, first aid center, childcare center little commercial units with an area of 2 000 m^2 that will be used as central social unit by all of the accommodation area.

Staff House: are buildings made of 80 m^2 houses totally having 30 000 m^2 floor area.

e) Nature Park

Izmir Technology Development Zone is designed as not only a pleasant place to work, people study and live here too. In addition to all nature-based design of The Zone, 18,4 ha area is saved for Nature Park that includes jogging trail and trekking parcures.

f) Research Forest

17 ha of The Zone is reserved for agricultural experimental requirements of studies in 1st R&D Center as Research Forest including greenhouses, growth chamber (suitable for growing plants or storing materials) and laboratories. Also this forest can be used as continuation of 1st R&D Center if required in future.

g) Afforested Area

It can be seen that general plant coverage of The Zone is made of Pines, Vilonia Oak and Olive Tree. Totally 70 ha high slope areas of The Zone are proposed to be afforested with these endemic trees.

Before determining design stage of project proposal, Landuse Table must be defined in order to join outline of the program. (See Table 4.5)

4.2.5. Design Stage of Project Proposal

After determining outline of the program, conceptual plan and site plan are designed respectively.

4.2.5.1. Conceptual Plan

The general landuse for the whole technology development zone are based upon functional zoning arrangements determined in outline of the program. Conceptual plan defines location of the program with reasons depending on potentials and restrictions of the site. (See Figure 4.10) However the area seems to be an excessive site for construction, two natural factors of the land restrict usable land: Firstly, general slope of the land is more than 11 % and secondly, various riverbeds that divide the land are present. In order to create a safe settlement on concerned area, riverbeds are tried to being used as potential of the project. They are used as green belts of the area. Other than restrictions, the area serves an attractive natural landscape potential for the purposed facilities. There are pines, Vilonia oak and olive trees locate alone or with groups spread on the area that contribute to the planting of the project area.

Table 4.5 Landuse Decisions of The Zone

ZONE	TOTAL AREA	LANDUSE	TOTAL DVL. AREA	TOTAL FLOOR AREA	BUILDING RATIO
AFFORESTED AREA	70 ha	-	-	-	-
RESEARCH FOREST	17 ha	-	-	-	-
1ST R&D CENTER	34 ha	CENTRAL ACTIVITIES	6 ha	17.400 m^2	29 %
		LOTS FOR 'BOT'	17 ha	68.000 m^2	40 %
CENTRAL INNOVATION AREA	29 ha	RESEARCH ACTIVITY	9 ha	16.000 m^2	40 %
		SOCIAL ACTIVITY		20.000 m^2	40 %
2ND R&D CENTER	30ha	CENTRAL ACTIVITIES	5 ha	20.000 m^2	40 %
		LOTS FOR 'BOT'	10 ha	40.000 m^2	40 %
NATURE PARK	18,4 ha	-	-	-	-
ACCOMMODATION AREA	20 ha	HOUSING ACTIVITIES	10 ha	40.000 m^2	40 %
TOTAL AREA	218,4 ha	TFA OF RES. ACTIVITIES	161.400 m2	221.400 m^2	TOTAL FLOOR AREA
		TFA OF SOCIAL ACTIVITIES	60.000 m2		

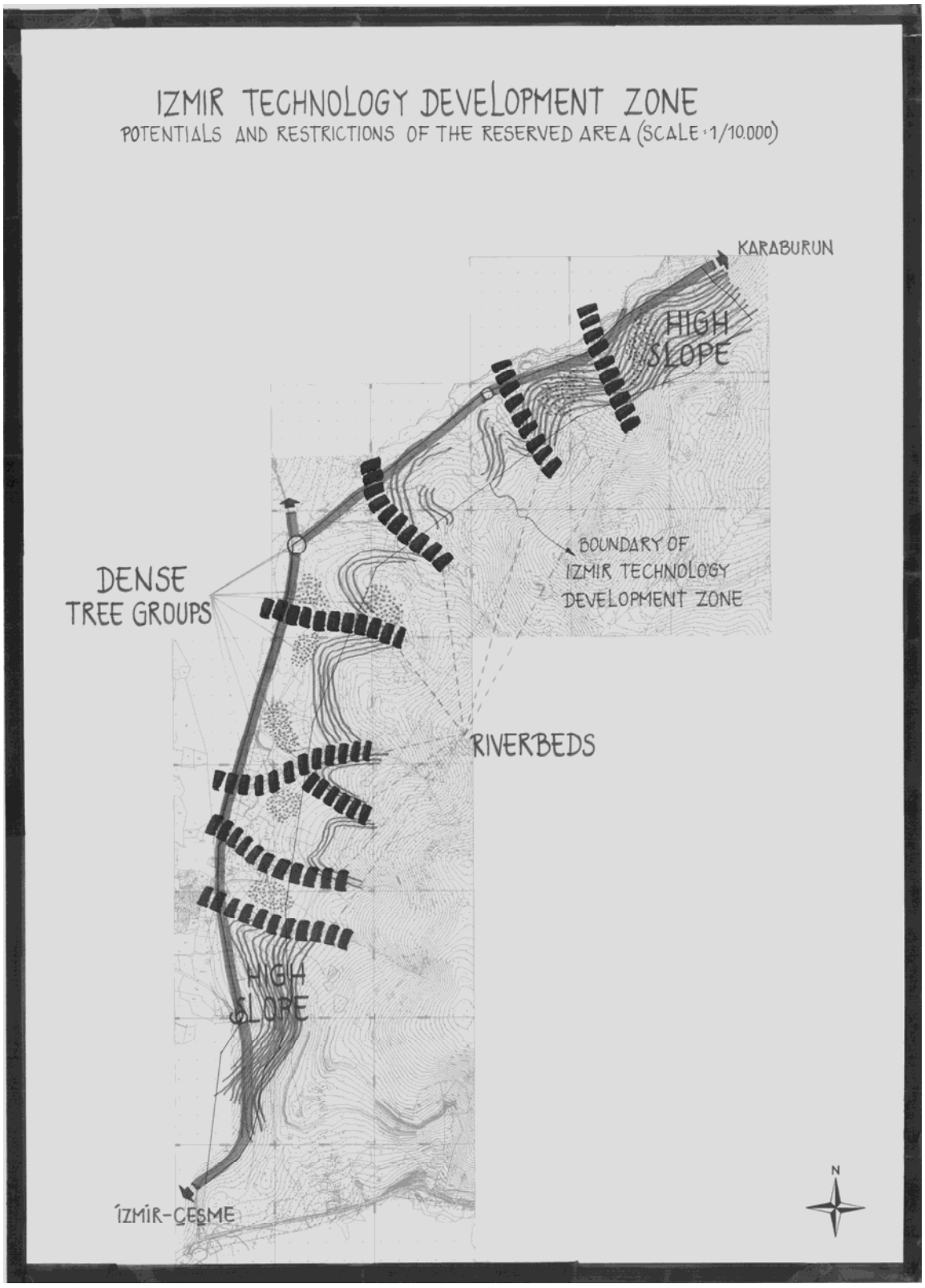


Figure 4.10 Potentials and Restrictions of the Site

a) Functional Decisions

Physical features of the site have been tried to being used as potentials while forming the final functional decisions. For example, linear shape of the area has obstructed facilities from being brought together. But also this shape gives a chance to remove some facilities from each other. Moreover, the slope of the area both in southern and northern tips of the Zone shortens this linearity.

Activities within the technology development zone have been planned according to their functional relations among each other. Central Innovation Area, which includes units for common usage, is the main part of the Zone and must also physically be located in the center for easy access.

Because of their different aspects, 1st and 2nd R&D Centers don't have to be close to each other but it would be better that they be close to Central Innovation Area. 1st R&D Center, which has been allocated for sciences that have similar wastes like chemical waste and radioactive waste, must have been isolated and it would be better that their waste disposal area is far from accommodation area. Also, sciences that are studied in this area require agricultural experimental area, which is located on physically most feasible site.

Trees must be densely planted in order to isolate 2nd R&D Center, which is reserved for scientific research which is thought to cause noise pollution. The riverbeds were attractive for isolating the area.

Accommodation Area is located on self-supported area surrounded by Nature Park and natural environment of the Zone. An important point about location of Accommodation Area is restriction brought by The Law of Technology Development Zones. According to the Law, total floor area of social facilities in a technology development zone cannot exceed 30% of total floor area of whole zone. Consequently, Accommodation Area is designed in a way that it could e widen through east way, outside of the boundary of The Zone.
(See Figure 4.11 and Figure 4.12)

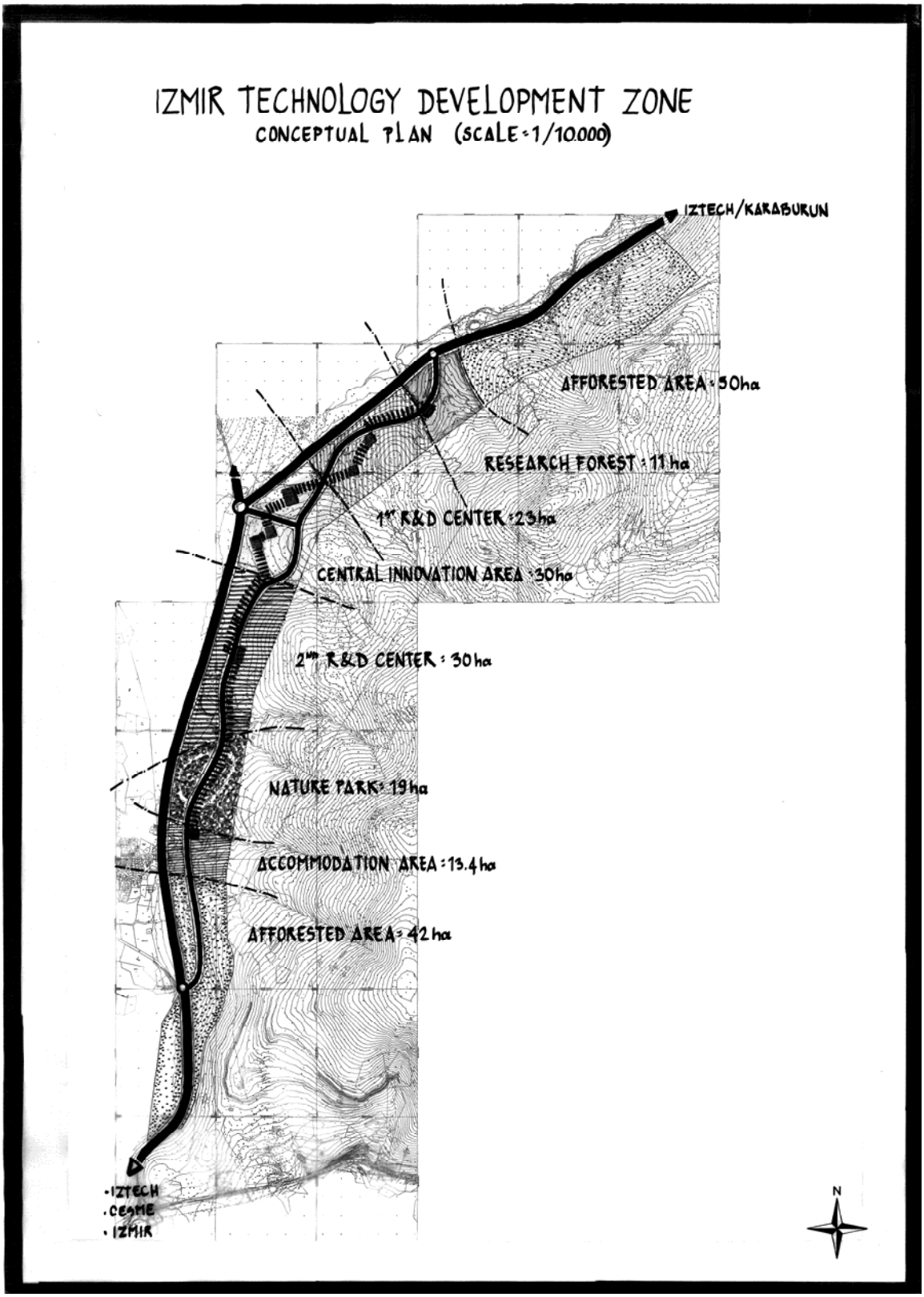


Figure 4.11 Conceptual Plan of Izmir Technology Development Zone

b) Circulation

Circulation system is considered in three phases: vehicular circulation, pedestrian circulation and bicycle circulation.

Vehicular Circulation

Safe and convenient vehicular circulation is a paramount feature of Izmir Technology Development Zone plan. Decisions about circulation begin with proposed connection with academic campus from the north. Thus, technology development zone is connected with the university on two sides, both south and north. The basic vehicular artery of The Zone is 30 m wide road extend along North – South axis that comes from Karaburun and joins with Izmir – Cesme road. There are three entrances to The Zone from this axis. The main one is located in the centre of the area.

20 m-wide road on the same axis, beginning and ending with junctions on secondary entrances and with connection to the main entrance has been proposed in order to decrease density of the main road. Bus stops for mass transportation system have been proposed on the east side of this road. Also 15-m wide local loops have been proposed for the purpose of giving access to the facilities.

Parking Ratios

In the proposed plan for Izmir Technology Development Zone, parking areas were envisaged as areas showing quality of place. From this point of view, they were designed to serve each partial areas and proposed as 1car per 30 m^2 floor area of the building for the entire Zone.

Pedestrian Circulation

Despite negative impression of linear shape of the site, a dominant pedestrian network beginning and ending with common spaces of zones was tried to form an alternative access.

The axis starts from Accommodation Area and reaches over to Research Forest on north – south direction. But, it does not mean that people would walk along 3 km starting from Accommodation Area in order to arrive at Research Forest. Combination of short connections like linking between 1st R&D Center and Research Forest forms this long linear axis.

Bicycle Circulation

In addition to hierarchy of transportation that meets the needs of both pedestrians and automotive users, through adequacy of pedestrian circulation inside the area, pavement on west side of 20 m-wide road was proposed to save for bicycle path as an alternative circulation.

c) Infrastructure

Investigations during this study show that technical infrastructure was the most important requirement of R&D. All of R&D facilities like offices, laboratories or prototyping units need different infrastructure according to their research fields. So, after designating general required infrastructure, social needs are proposed for R&D centers.

General infrastructure of The Zone includes:

- High quality and sufficient energy
- Generator, UPS system
- Fiber optic data distribution
- De ionized water, pure water
- Electromagnetic compability
- Drinking water, sewage, fire extinction and irrigation networks
- Security, fire alarm system
- Individual heating and air conditioning

Central Innovation Center includes wasteless research fields like information technologies, GIS or CAD – CAM; so do not need any more service. But 1st R&D Center includes:

- Sterilization system
- Gas storing, transferring systems for different gases
- Wet area, showers and changing rooms
- Disposal system for bacteria
- Hot water disposal system
- Chemical waste disposal system
- Radioactive waste disposal system

2nd R&D Center includes:

- Gas storing and transferring systems for different gases
- Pneumatic system
- Pressured air system
- Oily air and dry air system
- Noise testing laboratory

4.2.5.2. Site Plan

Detailed design study of Central Innovation Area was prepared in order for the area would best reflect the services. Also parts of both R&D Centers are shown in order to explain the connections of three R&D Zones with each other.

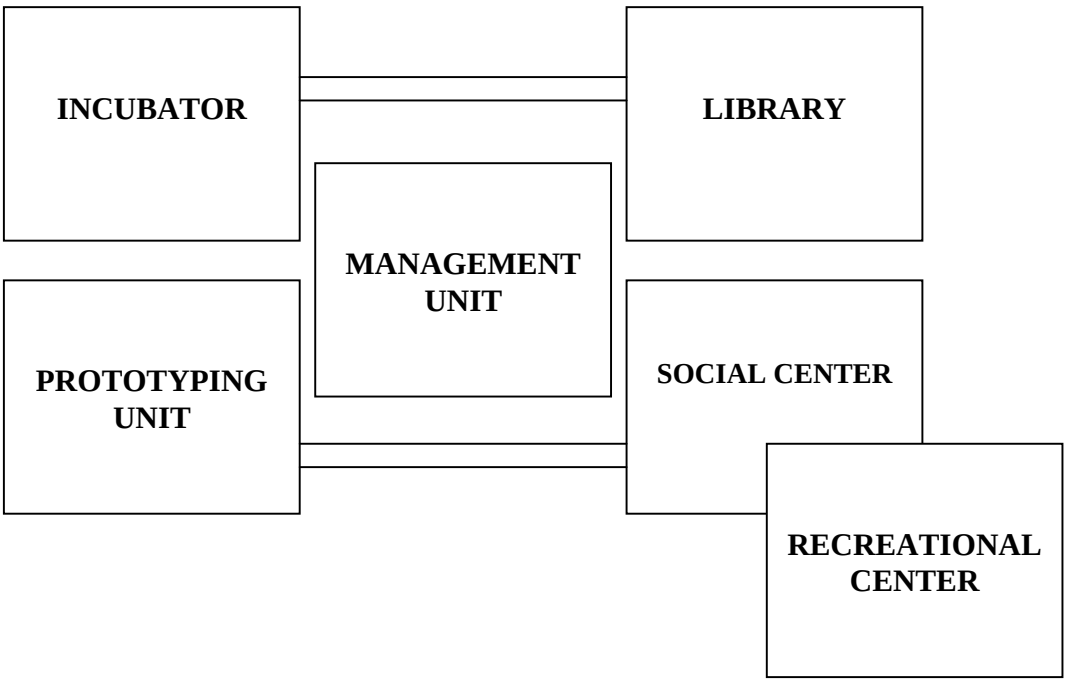


Figure 4.13 Functional Diagram of Central Innovation Area

In order to be directive security hut is proposed in entrance. 20-lot parking area for entering and waiting turnout for exiting of visitors was proposed nearest the entrance.

Management Unit (6 000 m^2) was tried to be the landmark of the entrance by raising the columns, it was also located on center that provides to be more reachable. Ramps were designed on entry stairs of Management Unit in order for accessibility of disabled people. These stairs reach two sides of The Center.

Library (5 100 m^2) and Social Center (14 800 m^2) are social units that service the entire Zone. They were located so as to form a common area with two axes. One coming from the Management Unit and the other going to the sports fields.

Sports fields also have their own common area, too. They are connected with each other, besides they are accessible to the supporting unit (100 m^2) which is located near the Social Center in case there is extra need.

Prototyping Center (3 600 m^2) and Incubator (6 500 m^2) have common area connecting with Management Unit and providing access to 1st R&D Center. Main pedestrian axis connecting common areas surrounded by facilities is located inside the area in a way that it should be different from vehicular system. Vehicular system is thought to be the outer loop that gives access through activities to car parks surrounding the facilities. The capacity of car parks on Central Innovation Area is 1125-lots except for visitor parking area. In addition to main pedestrian axis, there are two more kinds of pedestrian paths. One being weak route that joins car parks with facilities; the other being shared road that joins car parks and junctions inside the area which could be used if required.

R&D Centers were designed with the same concept: Central activities such as incubators (each of them is 5 200 m^2) were located so as to form a common area and surrounded by parking lots. Also R&D lots for built-operate and transfer were located around central activities.

Bus stop of mass transportation system is located on eastside of the road which is the most accessible point of the center. General bus parking area of mass transportation is also located on the eastside of the road. The reason for locating this parking area is that it is close to Management Unit that includes Administration of the Zone. Bicycle path is thought to be on the west side of the road and was among the main decisions of the Conceptual Plan.

CHAPTER 5

CONCLUSION

Since 1952, foundation of the world's first technopark in USA, lots of organizations have already been established with various titles in all over the world. Some of the researchers try to define differences, on the other hand some of them thought they are similar, whatever the name of the organization is, research park, science park, technopark or technology development zone, they have the same purpose: connecting entrepreneurs with researchers under an establishment in order to improve regional and also national economy in global competition.

Turkey is also trying to take place in this race for many years. All of the legislation about industry aim to provide national economy, to raise entry of foreign capital and have various decisions in order to encourage investments. Council of Ministers is authorized to designate the locations and boundaries of the aforementioned zones except Industrial Parks. The Ministry of Industry and Trade's consent is enough for establishing Industrial Parks. Also some regulatory and organizer units are defined in related legislation as, 'Zone Directorship' for Free Zones, 'Administrator Firm' for Technology Development Zones and 'Industrial Park Organization' for Industrial Parks. Expropriation can be applied incase required for all of zones mentioned but, the basic difference of Industrial Zones is being a full-public organization. Ownership of The Zone belongs to national treasury, economically dependent on budget of The Ministry of Industry and Trade and the commission made of mayors and representatives of ministries and establishments applies administrations. Also not being used of Zones' lands is another important difference of The Zone. From various points of views, 'The Law of Technology Development Zones' is more flexible. This flexibility can be defined as a reason of trust on researchers. So, there are 15 official technology development zones already established and this number is rapidly increasing.

The subject of this study takes place after declaration of area as ‘technology development zone’; feasible zone how must have been done. The research especially concentrates on provision of technoparks that have relationship between university and industry that supported by government. Technoparks include many facilities according to their research fields. Every facility should be sensitively concerned within the concept of planning so that the starting point was the aim of the zone. According to legislation about technology, Izmir Technology Development Zone was tried to design as a technopark that uses R&D potentials in maximum. So, design process was started with proposing research fields which can use R&D potential of Izmir and IZTECH after determining potentials. From the same point of view, The Zone was designed as suitable for small-sized firms but also flexible for bigger ones in order to use by both entrepreneur researchers of the university and main industrial companies of Izmir as well.

As deciding design criteria of Izmir TDZ, re-criticizing of technopark examples was done. In this situation, one of the most critical part of the research emerged as the evaluation of technopark examples in the world I order to obtain a general consensus about provision of technoparks in different regions. It is observed that, technoparks that take shape according to the environment they present have sizes in between traditional campus environment and big technology parks in all over the world. Some of them aim to accelerate local economic improvement leads to bigger technoparks, conversely others aim to create competition and solve unemployment problem and need smaller organization. While re-criticizing these examples, correctness of legislation was compared, and it was seen that every site is unique, but there are some general features that could be guide.

An important result drawn from the initial study is impossibility of determining number of firms, so that population of technology development zone was tried to obtain by evaluating similar samples. This population effects capacity of social facilities like accommodation area. But it must be mentioned that, flexibility of design leads to increasing proposed population, but this difference do not effect design criteria of The Zone. Abundance of free area of Izmir Institute of Technology provides additional area for social facilities if required.

Design guidelines and standards are determined according to requirements with reference to above evaluations, and it can be said that, The Law of Technology Development Zones is successful about putting a general standard on technopark formation in Turkey however it has lack of design criteria in detail. But his lack ness can be explained as the effort in order to start applications as soon as possible.

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APPENDIX A

VIEWPOINT OF A COMPANY ACCORDING TO ITS EXPERIENCE IN A SCIENCE PARK

EXOTECH LTD

History and Origin

Formed to create and innovate new products for industrial and consumer markets

Products	Application
Rotabolt	Load indicating fastener
Auto Controller	Welding gas economizer
Elect-Jack	Electric car jack
Auto-Wipe	Roll dispenser – domestic
Skid-Kap	Petro-chemical cover
Auto-Press	Car tyre pressure gauge

Operation

Date moved to Science Park	1984
Area of premises (square feet)	500
Number of staff	3

JOHN HIRST

Exotech, Warwick Science Park

About six years ago I set up a manufacturing company called Rotabolt Limited, in Dudley, West Midlands; it grew from 3 people initially to 16 employees, and was doing so well that it was taken over about three years ago. When it was acquired I decided to start up another company, and, looking around for opportunities, I decided that design and consultancy, rather than manufacturing, offered well potential. Design and consultancy needs good presentation, a good image to attract customers, and, particularly if the company has limited financial resources, a Science Park seems the ideal situation. At the time, fortuitously, Warwick University Science Park was just being completed. I applied for premises, and m pleased to say I was very quickly accepted, and moved in there in January 1984. We were in fact one of the first companies.

The company set out to design new products and seek licensees, and we have done this successfully with three products so far. They are not hi-tech products at all, but they apply existing technology cleverly to different situations: - for example, a welding gas control valve, definitely no high technology; a load indicting bolt, which is a new modification of very old technology; and an improved form of a washing machine valve. We sell the license rights for these ideas. In addition to this, we do standard consultancy work, where people bring design work to us – typical examples would be a computer tape test rig, an electrical rely design, and a parking bollard.

Over the first two years I was working alone; by early 1987 there will be three of us. For us, the advantages of the Science Park are that, in the start-up phase when we must keep the cost down to a minimum, the initial outlay is reduced because we have access to word processors, copying facilities, conference facilities, someone to answer the phone if there is no one in, and a good reception area which is very important for the company image. We also use the university facilities; we use the workshops also, we use the test machines, we use the libraries, we use the sports facilities, we use the eating facilities, we can use everything. We have formal and informal agreements with staff on the university, who can help us with design problems. On the sales side it is useful to. As the Science Park is expanding there is a need for advice on particular specializations – in our case in mechanical design. Many of the new companies are in electronics software, and we have in fact had a lot of orders from other companies on the Science Park. On one side there is the university to help in designing things, and all around there are companies, which can actually provide orders for things. It is a nice situation, and a good working environment – which I think is vital – we do enjoy our work there, and I think that is very important, something often overlooked by a larger company.

Source: J. Hirst, "Two Companies Present Their Viewpoints", *Science Parks And The Growth Of Technology – Based Enterprises*, (Edited by Hilary Sunman), UKSPA, 1987

APPENDIX B

PRELIMINARY INVESTIGATION ABOUT R&D IN INDUSTRIAL SECTOR

In order to obtain information about research & development places and to get knowledge about production processes, excursions needed to be organized to the companies that have R&D department. Industrial companies that have R&D departments were searched and e-mail or fax was sent to them. At the end, two excursions –in Izmir and in Manisa- were organized to the companies that approve the demand.

In addition to R&D places, manufacturing places and machines were also examined; requirements such as infrastructure were learned; and a few questions were asked to get more information about structure and university relationship of the company.

The questions were about,

- Dates of establishment of the company and founding of R&D department
- Type of exportation (is it only production or know-how is also been exported)
- Total workforce of the company and workforce in R&D department
- Total area of the company and area for R&D place
- Types of the R&D department
- Space requirements
- Special requirements for infrastructure according to the companies researches or production
- Their opinion about taking place in Izmir Technology Development Zone

B.1. Excursion to Companies in Izmir

"Gunkol Gunes Enerjisi ve Klima Sanayi AS, TEBA Durable Consumer Goods Department", which is established in Gorece and "TAN PLAST Ar&Ge Teknolojik Urunler Plastik ve Kalıp San. Dıs Tic. Ltd. Sti", "DELPHI DIESEL – Delphi Otomotiv

Sis. ve Tic. AS" and "SI-ME.CO Isı Ekipmanları ve Kalıp San. Ltd. Sti." which are placed in Aegean Free Zone were investigated.

B.1.1. Gunkol Gunes Enerjisi ve Klima Sanayi AŞ.
Teba Durable Consumer Goods Department

Interview with Project Managers; Fatih ARSLAN and Burak AKTUG.

a) Brief Historical Account

The firm was established in 1967 as a workshop in a little place in Karabaglar. The first name of the firm was "Gunkol AS" and solar energy collectors were manufacturing. At the beginning, the founder of the firm was responsible for researches also in addition to all other activities in the firm. Developing since that time, the firm begun to manufacturing durable consumer goods. Now there is an organized R&D department producing in Gorece and manufacturing occurs in the factory in Pancar.

b) Numerical Data

Manufacturing occurred in another place, so the conversation was only about R&D department. There are two types of R&D department in the firm: Hot R&D and Wet R&D. Wet R&D was founded in 2001in order to produce washing machine but there is not any production yet. The firm especially studies in Hot R&D department that produce cookers.

R&D department of the firm consists of two parts: Concept Design and Mechanical Design. The workforce including project manager of concept design is 13. Mechanical design part consists of two new product development parts: America and Europe. In America part there are 3 workers and in Europe part there are 12 workers with their own project managers.

Total area of the Hot R&D Department is at present in $600m^2$, including office place with $15m^2$/person (See Figure B.1), test rooms (See Figure B.2) and other special places. There is no any special place for Wet R&D Department, but it is said that also another $600m^2$ would be enough for Wet R&D.

Annual endorsement of the firm is approximately 100 million EURO and 95% of it is from exportation.

Figure B.1 A View From Office Area of TEBA Consumer Goods Department

Figure B.2 A View From Electrical Laboratory of TEBA Consumer Goods Department

c) Production and R&D Principle of The Firm

The firm realizes R&D as a department, which ensures technical feasibility of the product with directives of marketing, solution of production problems and finding materials.

R&D Department of the firm usually works in parallel with customers' demand. As well as the firm grows and also exportation branches (countries) develop, customers' demands are change. Mechanical Design Part researches feasibility of these demands and quality of the product. Besides, Concept Design Part researches as brainstorming and their researches improve by questionnaires with customers. They have studies to acquire patent rights in order to have know-how infrastructure when they become a large company like "Miele", but they do not sell their know-how.

For the production electronics is widely used and they work with other electronics firms and suppliers.

d) Possibility of Taking Place In Technology Development Zone

However they are prejudiced about unprofessional manner of universities, like worries about preparing paper or getting income to revolving fund, they are also moderate about entering in Technology Development Zone in order to produce new projects with university or making good use of utilities of other firms.

They have opinions about spot research titles can be searched in order to solve firm's problems about production or give some help to customer like cooking time, packaging or paint resistant to fire, etc.

e) Infrastructure and Services That The Firm Suggests to be in Technology Development Zone

- Hardware, software and prototype units are basically required for mechanical structure of R&D department
- Modeling software firms producing fluid mechanics or hard modeling
- Patent office department like legal consultancy
- Electro magnetic compatible laboratory

- Gas transferring system
- Pneumatic system
- Pressured air system
- Oily and dry air system
- Network system
- Air conditioning
- Water in special temperature and pressure for corrosion tests
- Ramps inside the buildings
- Ceramic covered walls and PVC furnished floors

B.1.2. Tan Plast Ar&Ge Teknolojik Urunler Plastik ve Kalip San. Dis Tic.Ltd.Sti.

Interview with Technician Ozlem TUZCU.

a) Brief Historical Account

The firm was established in 2003 with 5 partners that 3 of them are only for financial support and 2 of them actively in work, located in Aegean Free Zone and produces rapid prototyping machines.

b) Numerical Data

The entire firm is composed of 1 secretary and 1 technician in addition to 2 active partners. Only the technician works in the workshop that everything dependent on automation.

Office place is approximately $70m^2$and workshop is $50m^2$.

There is no information about annual endorsement owing to the firm's not already completing one year.

c) Production and R&D Principle of The Firm

The firm does not work on R&D; they produce prototypes of the products designed by the R&D Departments of the firms that applied. 50% of materials used in production are discharged as solid waste.

d) Possibility of Taking Place in Technology Development Zone

The firm thinks that they are self-reliant and self-sufficient and also the tax-exemption advantage of being in Aegean Free Zone is enough for them.

e) Infrastructure and Services That The Firm Suggests to be in Technology Development Zone

- Solid waste system
- Special chemical waste area
- Ionized floor for an antistatic workplace
- Different power outlets for different machines
- Insulated rooms
- Show room

B.1.3. Delphi Diesel – Delphi Otomotiv Sis. San ve Tic AŞ.

Interview with Production Engineering and R&D Manager Osman SIREN.

a) Brief Historical Account

The firm was established in the name “Dizel San” and moved to Isıkkent after having corporation with another firm named “Lucas” in late 1980s’. In 2001, originally an American company named “Delphi” bought the firm and it was decided to move to Aegean Free Zone. After the decision, only in one year the construction and infrastructure were simultaneously completed. Since 2002, diesel fuel pump and injector systems were produced in Aegean Free Zone.

b) Numerical Data

Total workforce of the firm, including administrative and manufacturing departments, is 400 and 45 of them are engineers. There are 6 engineers, 4 technical draughtsman and 4 technicians in Product Engineering Department that also works as R&D Department.

Total enclosed area of the firm is 13200m^2 with office place approximately 3000m^2, manufacturing place that approximately 8000m^2 and its own cleaning places. The foundation is established based on simple manufacturing principle, it is easy to understandable in visual perspective and manufacturing stages are in logical order from the first to the packing.

Annual endorsement of the firm is 30 million$ and 80% of it is from exportation.

c) Production and R&D Principle of The Firm

Besides Turkey, there are factories in England, France and also Spain, Korea, Brazil, Mexico and India. Total workforce is approximately 200.000 in 12 factories. In England and France, there are technical centers that have workforce approximately 200, for product development researches. Because of high investment requirements, designs manufacturing in other countries are supported from these technical centers. Production foundation in Izmir does not have capacity like a technical center, but has R&D researches based on customers' demand.

Fundamental principle of the company is manufacturing the product full of know-how and new in the market in England and France until the market price decrease. Then, when manufacturing costs in these countries a lot, moving manufacturing towards low-cost manufacturing countries like Turkey.

In England and France, products have been developed without customer, and there are relationship between technical centers and universities. As for in Turkey, the product can be designed starting from scratch or minor/major changes can be done on the product if the customer demands. But because of absence of prototype production workshops, the sample products produced in assembly line and because of limited possibilities, test of product are done during customer use.

d) Possibility of Taking Place In Technology Development Zone

Global principle of the company is producing new know-how product in technical centers but this principle doesn't obstruct the local firms reserving time, money or workforce for local researches. Even, one of the customers of the firm wanted to get relationship with ITU, so they worked with ITU, once in the past.

However they are moderate about being in Technology Development Zone, their R&D system based on customers obstructs this opinion, because their majority of customers are in Istanbul, Ankara and Konya.

e) Infrastructure and Services That The Firm Suggests to be in Technology Development Zone

- All of the firms in Aegean Free Zone have its own waste treatment systems and domestic sewage is collected in common collector. The firm has both waste treatment system and sewage treatment plant. Because of painstakingness about environment of the firm, fillings and waste oil are sold –in barrels- to İzeldas, a licensed firm in İzmit for recycling.
- There are 5 cooling tanks; 3 of them for air conditioning, 2 for cooling process water
- There is an air conditioning unit with 6bar system pressured which sent $51m^3$air to $15.000m^2$ area
- There is a power generator producing 2000kw electricity which is enough for all of the establishment except thermal operation, takes up $25m^2$ space
- Fire security, heating, cooling and air conditioning are controlled by a computer based central system
- Sometimes 20 workbenches are required in order to produce a fragment; it makes no difference for 1 unit or 1000 units. But some specific workbenches can be enough in order to changing samples. In other words, 19 workbenches can be remaining in manufacturing area and 4-5 machines in testing one; so, $250m^2$ would be sufficient for the testing unit.
- Prototype production workshop
- Central lubrication system for machines

- Transferring and storing systems for different oils
- Spare water tank
- Sound insulation
- Security service

B.1.4. SI-ME. CO Isi Ekipmanlari ve Kalip San. Ltd. Sti.

Interview with Design Engineer Dogu GONEN.

a) Brief Historical Account

The firm was established in February of 2003 by 3 partners, left from another durable consumer goods firm, with financial support from Italy in Aegean Free Zone. The firm was established for producing design only at the beginning and later begun active manufacturing. Cooking equipments are being manufactured.

b) Numerical Data

The firm consists of 1 general manager, 2 responsible for marketing department, 9 engineers and 9 workers.

Total floor area of the firm is $500m^2$; in addition to it there is $50m^2$ mezzanine. $150m^2$ of total flat area is for office place, and the rest is for manufacturing. The firm has already been bought a lot being $40.000m^2$. $15.000m^2$ of the area will be designed as enclosed area including $1000m^2$ for office units.

There is no information about annual endorsement owing to the firm's not already completing one year, but in average 250 cookers per a day are being manufactured and all of the manufacturing are being exported. Their annual endorsement aim for 2007 is 10 million$.

c) Production and R&D Principle of The Firm

In the firm, there isn't any comprehensive R&D Department, yet. Inside spare parts of the oven is only designed by the firm, outside panel is designed by industrial

design firms. All metal sheets used in production are imported from Italy, other parts have been bought from suppliers, and plastically spare parts of the prototypes have been produced by prototype production firms and finally assembling of the product being done.

d) Possibility of Taking Place in Technology Development Zone

At the present they are pleased to be in Aegean Free Zone and tax-exemption of Technology Development Zone doesn't matter for them. But, they pay 3750$ as rent for 500m^2 standard building of Aegean Free Zone and they are financially straitened about their scrap iron that they had to give to Aegean Free Zone Foundation with also payment for it.

They solve these problems by buying a new lot in Gaziemir, so, they don't need to entire in Technology Development Zone.

e) Infrastructure and Services That The Firm Suggests to be in Technology Development Zone

- Gas storing and transferring systems for different gases
- Laboratories that are characterized as design workshop practicing different prototypes

B.2. Excursion to Companies in Manisa

"MERLONI Elettrodomestici Beyaz Esya Sanayi ve Ticaret AS", "DELRON Elektronik AS" and "POLINAS Plastik AS" which are located in Manisa Industrial Park were investigated.

B.2.1. Merloni Elettrodomestici Beyaz Esya San. ve Tic. AS.

Interview with R&D Manager; Efe ELBEK and Assist. Manager; Semra AKARGUN.

a) Brief Historical Account

Asil NADIR established the firm in Manisa Industrial Park in 1990, and then in 1995 it was taken over by Merloni, which is an international company, producing refrigerators with “Ariston” and “Indesit” trademarks.

b) Numerical Data

It is a rapidly developing company that becomes 3 times bigger in 3 years. Totally there were 7.000 employees work for 800 million $ annual endorsement in 1999 and now in 2003, there are 22.000 employees work for 2,5 billion $ annual endorsement.

Investments were intensified on Turkey since 2000. Totally 4,5 millions EURO (approximately half of them are for product and the other half is for process) was reserved for investments in Turkey in 2003. Manufacturing 285.000 units product is projected for 2003 but till now, 335.000 units are manufactured so, 400.000 units product are envisioned. 50% of the production is exported.

While production is in increase, number of employee decreases since 1999 because of the economic crises in Turkey. There were 98 white-collar workers in 1999 and now in 2003, this number decreases to 70. Beside white collars, there are approximately 350 blue-collar workers in the firm. 44% of them are permanent and 56% of them are casual laborers. Production cost is 15% cheaper, because of wages in Turkey, but the products are high in quality.

Total available area of the firm is 272.000 m^2, which is the largest lot in the industrial park. 29.000 m^2 of the area is total covered area with production and office places approximately 23.000 m^2. 200 m^2 office place and 100 m^2 laboratory are belonging to R&D Department. Also there are warehouses placed in approximately 15.000 m^2.

c) Production and R&D Principle of The Firm

Besides Turkey, there are factories in Italy, England, Portugal and Russia producing refrigerators. Approximately 4 million refrigerators are produced annually. Also, the international company has totally 16 factories that produce washing machine,

dishwasher and cooking equipment in France, Italy, England, Portugal and Russia. Total production of the company is 16 million units per one year. Fundamental principle of the company is manufacturing only one type of product per one factory in order to be efficient. For example, only 70 cm width refrigerators are produced in Turkey. (See Figures B.3 and B.4)

A new product is presented on the market per approximately 9 months and this new product life is 3 years. R&D Department of the firm works on product design and development and mould expert for production design of the new product. Electronic and mechanical parts of the products, that aesthetics design done in Italy, are designed in the firm. Also, the department researches solving quality problems and decreasing cost. They have not export know-how, yet, on the contrary they import from Italy but it is projected to acquire patent rights for next year.

There is a small prototyping unit in the firm but it is not enough. Basic prototypes are produced in Italy like other factories in other countries done.

Basic inputs of the refrigerator are; iron sheet, plastics and polyurethane for insulation. All of the raw material is imported from Italy as the principle of the firm. There can be reduced by wastage at the beginning or at the end of the manufacturing but there is no solid waste incase production occurs without fillings. Metal wastes are sold as scrap iron and others can be 100% recycled by being broken in the factory.

d) Possibility of Taking Place in Technology Development Zone

They were supported by some foundations like TUBITAK and TTGV for laboratory investments of new products before. And they study with ITU on decreasing the vibration and noise. Also, the firm in Italy has common studies with University of Ancona.

In addition to that they are troubled about being dependent to Italy and England for prototyping and noise testing, they prefer to find a solution nearby.

So, the firm is moderate about entering in Technology Development Zone, furthermore, they asked how to enter, but they are also prejudiced about unprofessional manner of universities, like other industrial firms.

Figure B.3 Refrigerator Door Testing Machine of Merloni Ellettrodomestici

Figure B.4 A View From Benchmarking Laboratory of Merloni Ellettrodomestici

e) Infrastructure and Services That The Firm Suggests to be in Technology Development Zone

- There is a reliability test laboratory including vibration test, door opening-closing test and salty water test for testing paints. Also other parts of the firm are;
- Quality control laboratory
- Prototyping laboratory
- Workshops
- Thermoforming unit
- Mechanical manufacturing unit
- Warehouses (however manufacturing system is just in time, warehouses are required)
- Because of closed cycled structure of water used for cooling, there is no liquid waste except domestic sewage which is collected in common collector of industrial park
- Basic infrastructure needs of the firm are water, electricity and vapor. Cost analyses are done for water vapor, if vapor costs expensive, they can produce
- Frequency is very important, in case they produce their own fixed power
- Electricity is produced from natural gas in Industrial Park, so it costs cheaper
- There is a power generator producing electricity enough for office place and emergency assembly line
- The most important product is prototype but for one of prototyping laboratory 300.000-400.000 EURO investment is required.
- Noise testing laboratory is also expensive and the company has one in England
- There are no firm studies on electromagnetic adjustment in Izmir. The firm had to send products to Ankara for testing
- More rapid and strong communication opportunity
- UPS
- Patent office department
- Social facilities

B.2.2. Delron Elektronik AS.

Interview with the Factory Manager Selim DOGANATAN.

a) Brief Historical Account

The firm was established in 1994 and located in Manisa Industrial Park since1995. It is one of the firms of a family company including 7-8 firms. The firm is an electronically supplier of Basarı Elektronik, Siemens, Alcatel, etc.

b) Numerical Data

There are totally 70 workforces in the firm.
Total area of the firm is 15.000 m^2 and 4.000 m^2 of the area is used.
25% of the product is directly and 25% indirectly exported.

c) Production and R&D Principle of the Firm

Computer aided designs are given by customers, they can also design the pattern but, they are working according to customers' demand yet.

Imported copper-plated plaques are punctured according to customer's design and displayed the pattern by covering with ultra sensitive blue film. Then, covered with tin in order to protect copper during abrasion. At the end blue film is pulled up and electronically card is produced.

R&D Department of the firm is already constructing.

d) Possibility of Taking Place in Technology Development Zone

Entering in Technology Development Zone has not been considered yet. First of all the firm must need to enter in, then it will be considered by financial specialists if R&D Department develops. They asked the entering cases in Technology Development Zone and advantages of being in it.

e) Infrastructure and Services That The Firm Suggests to be in Technology Development Zone

- Metal wastes are sold to Istanbul
- Biological waste treatment is the most important infrastructure; chemists of Industrial Park test firms' wastes, every firm pays as much as they pollute
  Also there are basic requirements as;
- De-ionized water
- Pure water

B.2.3. Polinas Plastik AS.

Interview with R&D and Quality Providing Department Manager

a) Brief Historical Account

Established in 1982 and begun production in 1985, the firm is the greatest plastic producer in Turkey and in top ten in the world.

b) Numerical Data

They work with 350 permanent and 150 sub contractors. R&D Department consists of one manager, 4 engineers and one technician. Also Quality Providing Department with 17 workers supports R&D. In addition to workers inside the firm, there are 2 advisors; one of them is from over nation, the other is a professor from Hacettepe University.30% of the product is exported.

c) Production and R&D Principle of The Firm

They produce packaging material made of polypropylene. This raw material can be 100% recycled by being broken in the factory. R&D Department of the firm studies on analyzing raw materials and rival firms' products. They have two laboratories; one

of them is for R&D and the other is for Quality Providing, but not have a prototyping workshop.

d) Possibility Of Taking Place In Technology Development Zone

They worked with METU, Bogazici University and Aegean University previously and also they are in cooperation with Chemical Engineering Department of Bilkent University, now. But they do not have any idea about Technology Development Zones.

e) Infrastructure and Services That The Firm Suggests to be in Technology Development Zone

- Gas storing and transferring systems for different gases
- Special warehouses inside, in fixed temperature and humidity
- Special warehouses outside for gas tubes
- Security against fire

APPENDIX C

RESEARCH PROJECTS STUDIED IN IZTECH

Table C.1 IZTECH Research Projects of The Year 2001

NAME OF THE PROJECT	DIRECTOR OF THE PROJECT	FACULTY / DEPARTMENT
Micro structural Characterization of Corroded MgO-Based Cement Kiln Refractory	Assist. Prof. Dr. Sedat AKKURT	Material of Science and Engineering Program
The Preparation of Composite Ceramic Filters for Biotechnology Applications	Prof. Dr. Muhsin ÇİFTÇİOĞLU	Biotechnology Graduate Program
The Synthesis and Characterization of Biopolymer-Bioceramic Composites	Assist. Prof. Dr. Funda TIHMINLIOĞLU	Department of Chemical Engineering
Purification of L (+)-Lactic Acid	Assoc. Prof. Dr. Şebnem HARSA	Biotechnology and Bioengineering Interdisciplinary Graduate Program
Improvement of The Production Process of Metal Soaps and Industrial Applications	Prof. Dr. Devrim BALKÖSE	Department of Chemical Engineering
The use and Characterization of Compose Alumina, Zirconium, Silica Titanic Ceramic Membranes in Gas Separation	Prof. Dr. Muhsin ÇİFTÇİOĞLU	Material Science and Engineering Graduate Program
Increasing the Performance of Down hole Pumps Used in Geothermal Energy	Prof. Dr. Zafer İLKEN	Department of Mechanical Engineering
Effect of Hydrothermal Curing on Mechanical and Micro structural Properties of Cement-Based Materials	Prof. Dr. Muhsin ÇİFTÇİOĞLU	Material Science and Engineering Graduate Program
Experiment Station to Investigate the Behavior of the "W Type Solar Charge Station"	Research Assist. Farah TATAR	Energy Engineering Graduate Program
The effects of biosurfactants on the remediation of soils contaminated with pesticides	Assist. Prof. Dr. Handan ERTÜRK	Food Engineering Graduate Program

NAME OF THE PROJECT	DIRECTOR OF THE PROJECT	FACULTY / DEPARTMENT
Analyzing of air type Solar collectors Produced by Aluminum Foam Material	Prof. Dr. Zafer İLKEN	Department of Mechanical Engineering
Assessment of Groundwater Quality in Torbalı Region	Assoc. Prof. Dr. Gökmen TAYFUR	Engineering Faculty
Preparation and Characterization of ha Powders, Dense and Porous ha Based Composites	Prof. Dr. Muhsin ÇİFTÇİOĞLU	Material Science and Engineering Graduate Program
Determination of Equilibrium and Diffusion Coefficients in Polymers by Inverse Gas Chromatography Technique	Assist. Prof. Dr. Funda TIHMINLIOĞLU	Department of Chemical Engineering
Measurement of Transport Characteristics of Polymers by Gravimetrical Method	Assist. Prof. Dr. Sacide ALTINKAYA	Department of Chemical Engineering
Laboratory Testing of the Corrosion of Sintered High Alumina by BOF Slags	Assist. Prof. Dr. Sedat AKKURT	Department of Mechanical Engineering
Molecular Characterization Of Turkey's Microbial Flora	Assist. Prof. Dr. Ali Fazıl YENİDÜNYA	Department of Biology
Investigation of Characteristics of Mortars and Plasters in the Historical Buildings of Western Anatolia	Assoc. Prof. Dr. Başak İPEKOĞLU	Architectural Restoration Graduate Program
Speciation and Preconcentration of Inorganic Antimony and Manganese in Waters Using Micro column –Flow Injection System and Determination by Atomic Absorption Spectrometry Microbial Flora	Assist. Prof. Dr. Ahmet E. EROĞLU	Department of Chemistry
Implementation of lightweight, low cost polymeric composite materials processing technologies and development of composite lightweight armor materials for military applications	Assist. Prof. Dr. Metin TANOĞLU	Department of Mechanical Engineering

Source: http:// www.iyte.edu.tr

Table C.2 Projects Supported by Turkish Government (TUBITAK, DPT), Industry & Other Institutions

NAME OF THE PROJECT	DIRECTOR OF THE PROJECT	SUPPORTER
Evaluation of Natural Zeolites for Environmental Purposes	Prof. Dr. Semra ÜLKÜ	DPT
Geothermal Energy Research, Development, Test and Education Center	Prof. Dr. Zafer İLKEN	DPT
Identification, molecular mapping and introgression of genes conferring resistance to tobacco mosaic virus (TMV), potato virus Y (PVY) and cucumber mosaic virus (CMV) in pepper (Capsicum annuum)	Assist. Prof. Dr. Sami DOĞANLAR	TUBITAK
Fabrication and Characterization of super conducting MgB2 wires	Assist. Prof. Dr. Salih OKUR	TUBITAK
Applications of Magnetron Sputtered Thin Film Advanced Materials: Superconductor and Semiconductor Electronic Devices; Metal/Polymer Surface Coating	Assist. Prof. Dr Lütfi Özyüzer Assoc. Prof. Dr. Mehmet Güneş	DPT
Investigation of the Pozzalonic Additives Used in Horasan Mortars and Plasters	Assoc. Prof. Dr. Hasan Böke	TUBITAK
Effect of Acidity of Zeolite Based Catalysts on 1-Butene Izomerization	Assist. Prof. Dr Selahattin Yılmaz	DPT
Gap state spectroscopy on microcrystalline silicon	Assoc. Prof. Dr. Mehmet Güneş	TUBITAK and Julich Research Institute (Germany)
Multi component Drying of Semi crystalline Polymer Films	Dr. Surya Mallapragada Iowa State University USA	National Science Foundation (USA)
Syntheses, X-Ray Single Crystal Structural Determination and Physical Characterization of Layered Transition Metal Oxides Solid State Materials	Assist. Prof. Dr. Mehtap Emirdağ	TUBITAK
Design of Optic Switch and Router for All Optic Computer Network	Assist. Prof. Dr. Mehmet Salih Dinleyici	DPT

NAME OF THE PROJECT	DIRECTOR OF THE PROJECT	SUPPORTER
Identification and Cloning of Cry Genes from Natural Bacillus Strains and Developing Methods for Multipurpose Crystalline Protein Production	Assist. Prof. Dr. Ali Fazıl Yenidünya and Assoc. Prof. Dr. Dr.Hatice Güneş	DPT
Generation of improved E. solitarians to be used in the construction of legend libraries	Assist. Prof. Dr. Ali Fazıl Yenidünya and Assist. Prof. Dr. Alper Arslanoğlu	TUBITAK
The Creation of Tenzoresistors with Low Thermal Coefficient of Tenzosensibility	Assist. Prof. Dr. Metin Tanoğlu	NATO
Processing and Characterization of Ceramic Matrix Composites Produced via Polymer Pyrolysis Method at Low Temperatures	Assist. Prof. Dr. Metin Tanoğlu	TUBITAK
Process development for and industrial applications of metal soaps	Prof. Dr. Devrim Balköse	DPT TUBITAK
Preparation and Characterization of Polypropylene Based Composites	Assist. Prof. Dr. Funda TIHMINLIOĞLU	DPT TUBITAK
Gecekondu Areas in Izmir after the Construction Amnesty Acts: Socio-Economic, Spatial Analysis	Assoc. Prof. Dr. Semahat Özdemir	TUBITAK
Crashing behavior of aluminum closed-cell foam filled aluminum and polymeric composite multi-tubes	Assoc. Prof. Dr. Mustafa GÜDEN	TUBITAK
Defining Sewage Potential of Chloride Organics	Assist. Prof. Dr. Aysun Sofuoğlu	TUBITAK
Tunneling Characteristics of Intrinsic Josephson Junctions in High Temperature Superconductors	Assist. Prof. Dr. Lütfi Özyüzer	TUBITAK
Studies on the meta static relevance of differentially expressed genes between meta static and non-meta static isogonics adenocarsinoma cell lines.	Assoc. Prof. Dr. Hatice Güneş	TUBITAK
The Heck and the Suzuki Reactions Catalyzed by Pd-N-Heterocarbon Complex Loaded Zeolites	Prof. Dr. Levent Artok	TUBITAK
Production of functional packaging materials by use of biopreservatives	Assoc. Prof. Dr. Ahmet Yemenicioğlu	TUBITAK

NAME OF THE PROJECT	DIRECTOR OF THE PROJECT	SUPPORTER
Identification and characterization of Boron tolerant genes in Hordeum vulgar L. (Barley) by using mRNA Differential Display and RT-PCR.	Çağlar Karakaya	TUBITAK

Source: http:// www.iyte.edu.tr

APPENDIX D

DESIGN CRITERIA OF TECHNOPARK EXAMPLES

- MIAMI VALLEY RESEARCH PARK
- THE MILWAUKEE COUNTY RESEARCH PARK
- PURDUE RESEARCH PARK
- CZECH TECHNOLOGY PARK
- STIRLING UNIVERSITY INNOVATION PARK
- TECHNOLOGY PARK UNIVERSITY OF NEBRASKA
- TECHNOLOGY PARK WESTERN AUSTRALIA
- CRANFIELD UNIVERSITY TECHNOLOGY PARK
- MILILANI TECHNOLOGY PARK

MIAMI VALLEY RESEARCH PARK

http://www.theresearchpark.com

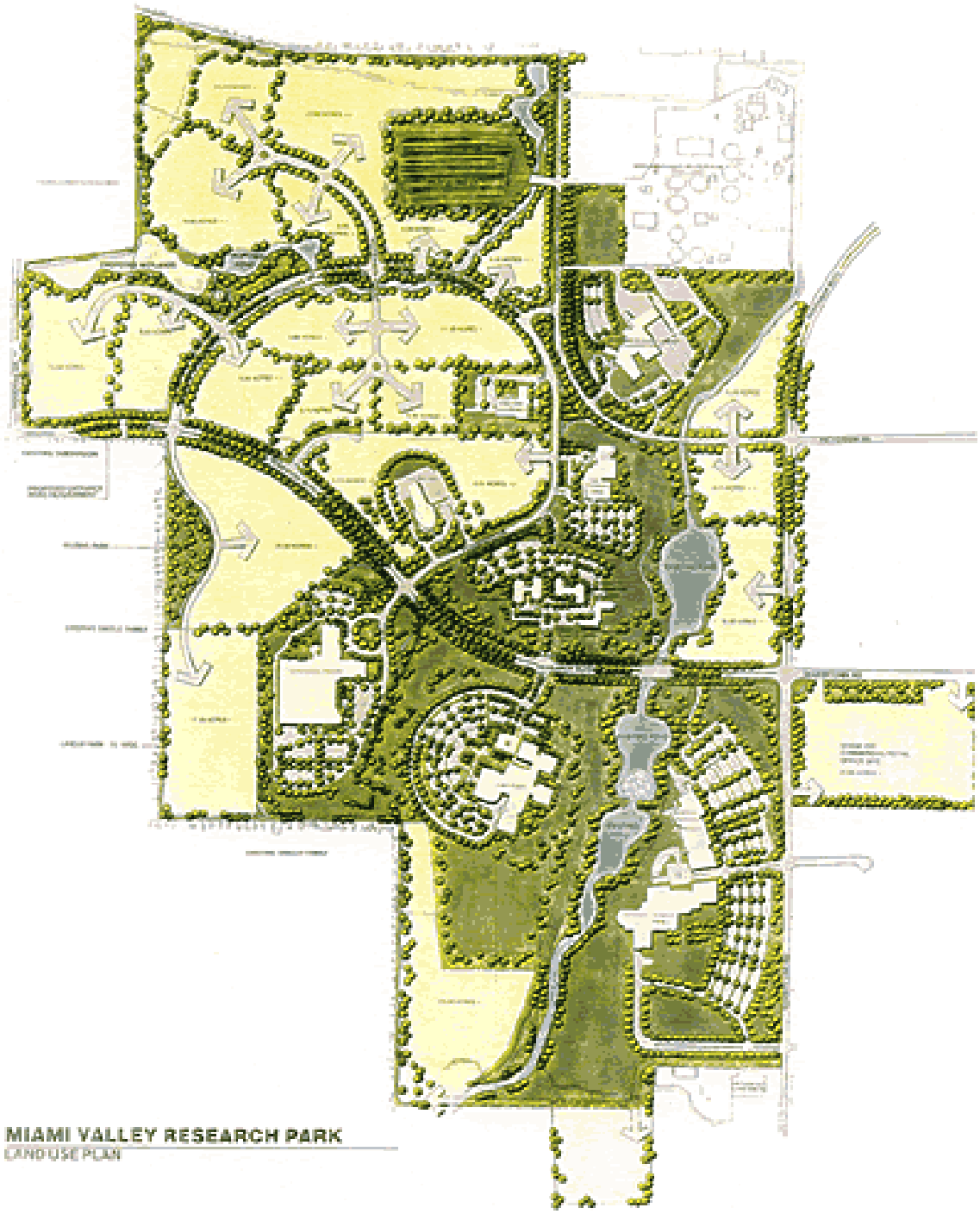


Figure D.1 Master Plan of Miami Valley Research Park

The Research Park's development is in its infancy. A comprehensive land-use plan, design manual and set of restrictions have been adopted that provide low-density development (25%) and covenants to assure residents their property values will be protected. Strict performance standards apply and there is a major emphasis on environmentally sensitive planning. Landscaping is required for the entire site, outdoor storage is not permitted and all utilities are placed underground. Every effort has been made to guarantee a "university campus environment" that will be attractive to employees, aid in employee recruitment and enhance property valued.

Park Facts

- 505 ha
- Located east of metropolitan Dayton, Ohio in suburban communities of Kettering and Beavercreek
- 120 ha currently developed
- Capital investment in Park development of $250 million
- First building completed in spring of 1985
- Fourteen buildings completed totaling 167 400 m^2
- 45 Organizations located at the Park
- 3,800 people employed at the Park

THE MILWAUKEE COUNTY RESEARCH PARK

http://www.mcrpc.org

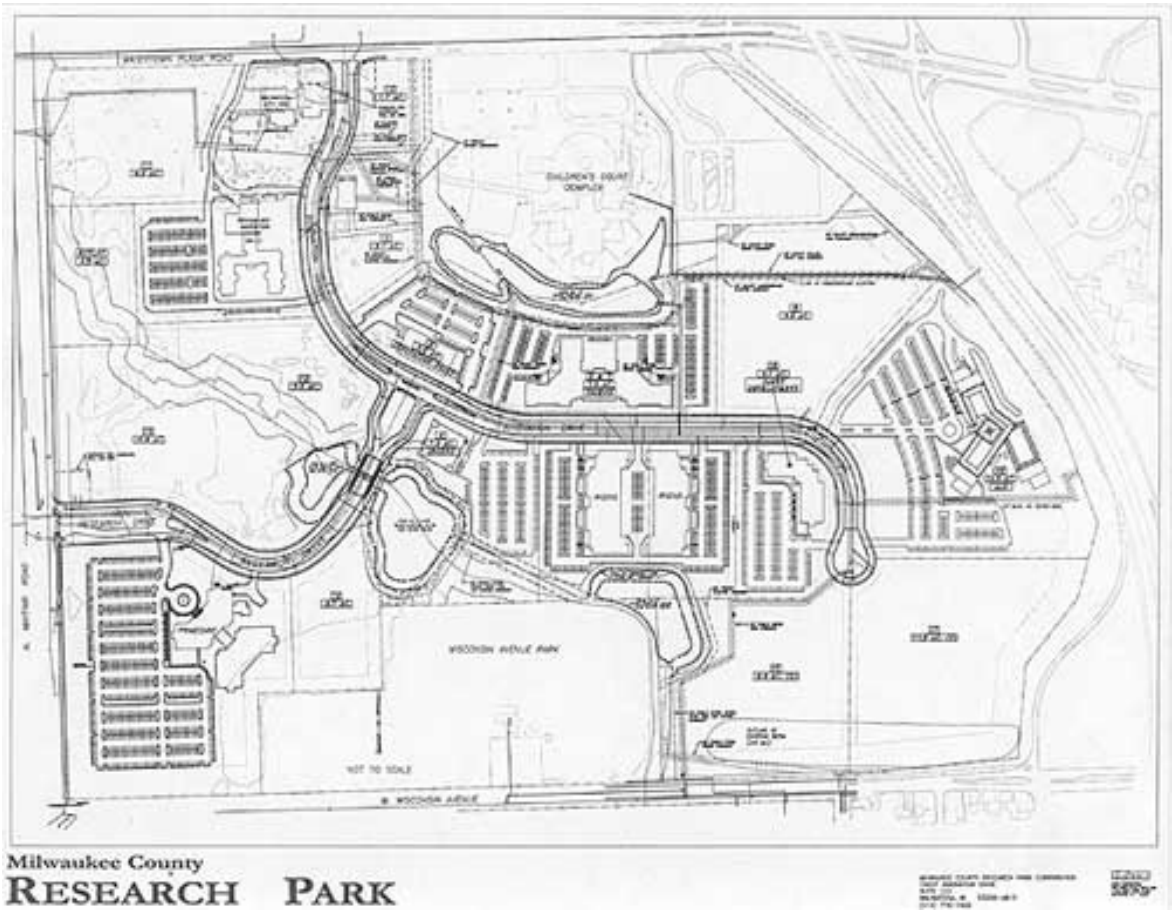


Figure D.2 Master Plan of Milwaukee County Research Park

Figure D.3 An Aerial View of Milwaukee County Research Park

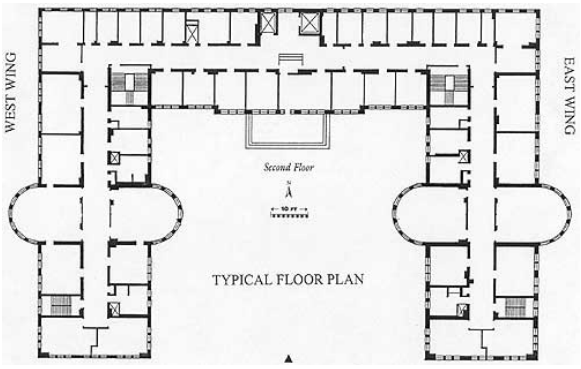


Figure D.4 The Technology Innovation Center (TIC) is the Research Park's self-supporting 12.700 m^2 high-technology business incubator - one of the largest in the United States.

The 71 ha Research Park lies within a larger, 450 ha natural expanse called the Milwaukee County Grounds. The setting features permanent green space buffers, extensive wooded areas, activity trails, sidewalks, ponds and a natural waterway. The master plan calls for a "campus like" environment that will differentiate the Research Park from other real estate developments. Building sites that range in size from 4 000 m^2 to 80 000 m^2 are available for qualified users.

Land is available for acquisition in the Research Park by means of purchase or long-term lease. The Research Park Board of Directors has the authority to sell all of the land within the Research Park without going to the Milwaukee County Board of Supervisors for approval. Lots 2, 3, 4, 5, 6, 7, 12, 13, 15, and 17 contain land that has been set-aside for a nature conservancy, activity trails, or storm water management. The purchase price of these lots may be adjusted to reflect net useable area. The gross acreage may be used in certain cases for building and parking lot coverage ratios. Lot sizes and dimensions are adjustable to provide flexibility in meeting a user's specific needs.

Lot	Gross Acreage	Net Acreage
1	2.1	2.1
2	4.0	3.6
3	3.0	2.7
4	7.8	3.6
5	4.9	4.4
6	3.9	3.5
7	5.1	4.6
8	9.8	9.8
9	5.6	5.6
10	1.6	1.6
11	6.3	6.3
12	5.5	3.9
13	10.8	8.2
14	3.7	3.7
15	9.9	8.0
16	14.3	14.3
17	11.3	10.7
18	4.1	4.1

PURDUE RESEARCH PARK

http://www.purduereserchpark.com

Figure D.5 Master Plan of Purdue Research Park

Purdue Research Park, which opened in 1961, is currently in the second phase of its development. The park is home to more than 90 companies that employ 2.500 people. Many of these companies are developing Purdue-licensed technologies. The park provides an interactive environment for private business/industry, mainly in the high-tech arena, and experienced Purdue University researchers.

Properties for Sale

LOT 1 - 1,7 ha with 5.200 m^2 building capacity and corner location.

LOT 2 - 2 ha with 8.900 m^2 building capacity, common area and lake view.

LOT 3 - 2 ha with 8.400 m^2 building capacity and lake view.

LOT 4 - 1,5 ha with 5.200 m^2 building capacity and corner location.

LOT 5 - 2,6 ha with 8.400 m^2 building capacity and lakefront site.

LOT 7 - 2,4 ha with 8.300 m^2 building capacity and lakefront site.

LOT 8 - 1,6 ha with 4.800 m^2 building capacity and lakefront site.

LOT 9 - 2,7 ha with 7.900 m^2 building capacity, lake view and corner location.

LOT 10 - 1,6 ha with 4 .000 m^2 building capacity and lake view.

LOT 11 - 1,8 ha with 6.400 m^2 building capacity and corner location.

LOT 12 - 0,9 ha with 4.600 m^2 building capacity and corner location.

LOT 14 - 2,9 ha with 8.400 m^2 building capacity and corner location.

The above building lots are being made available thanks to an important economic development partnership between Purdue University, Purdue Research Foundation and the City of West Lafayette. These entities are working together to provide an attractive, cutting-edge atmosphere where high-tech companies will feel right at home.

This new phase of development features a 7-acre lake, a round-a-bout drive system and heavily landscaped tracts that create an inviting, park-like setting. This carefully designed plan evokes a sense of community for employees as they stroll through common areas and down numerous walkways. Plans call for these paths to be connected to the area trail system.

Incubation Complex of Purdue Research Park

To assist new ventures as they develop their technologies, the Purdue Research Park offers a shared-office concept, flexible leases and attractive rental rates within the high-tech incubation complex. The complex includes three different incubator facilities: the Purdue Technology Center, the Business and Technology Center and Hentschel Center. The park's incubator concept is designed to provide start-up companies with a supportive environment of equipment, services and resources offered at minimal cost. Companies also benefit from access to various amenities such as two-way video-conferencing, flexible office and lab space and high speed Internet access. Plus, Purdue's main campus is just two miles from the park, giving incubator tenants easy access to libraries, laboratories, and staff.

Purdue Technology Center

Purdue Technology Center, headquarters of the Purdue Research Park, was completed in 1999 and features office space and custom created laboratory facilities. Along with full access to Park Perks, tenants of the PTC benefit from a spacious lobby and reception area; five conference rooms including a 75-person capacity multi-media conference room with a full compliment of professional presentation equipment; an electronic pass card security system; a full-function kitchen; two-way video conferencing facilities; CentraNet phone hookup capability; and a dock equipped with scissors lift. Firms accepted into the Purdue Gateways Program are given leasing priority in the PTC.

Figure D.6 A View From Purdue Technology Center

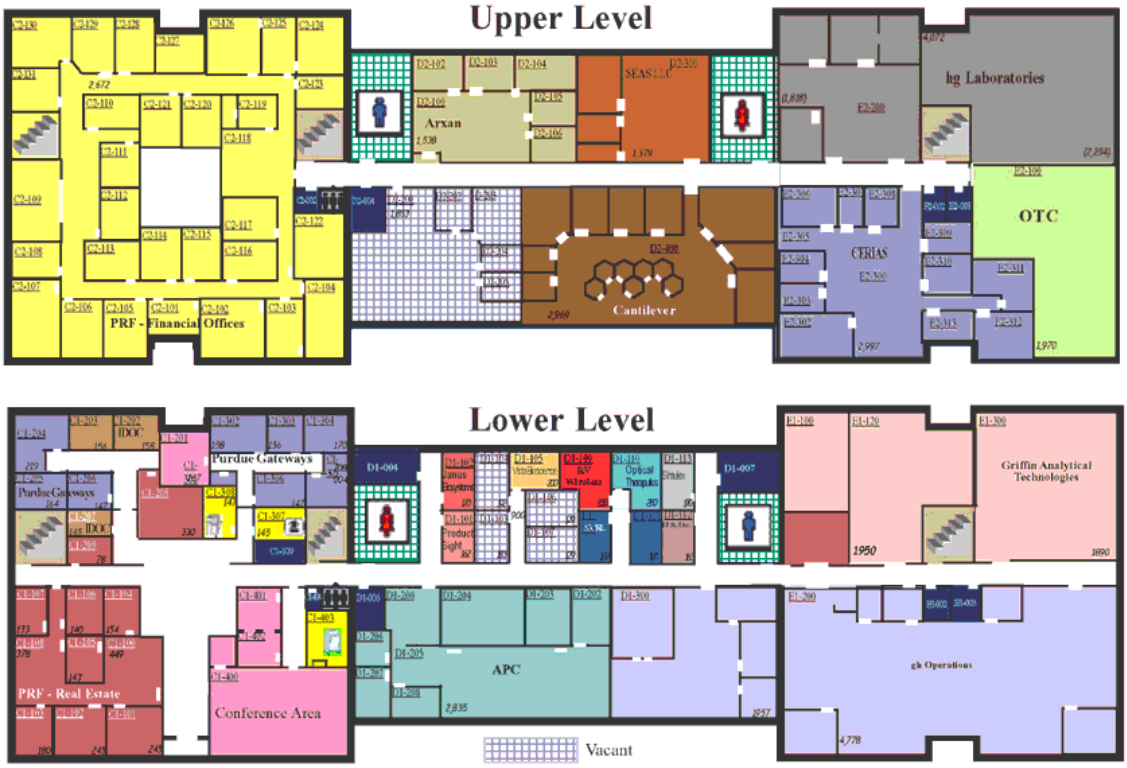


Figure D.7 Plan of Purdue Technology Center

(5.580 m^2 facility)

Business and Technology Center

Built in 1969 as a flexible lab facility, today's Business and Technology Center is part of the park's high-tech incubation complex. Along with full access to Park Perks, BTC tenants benefit from shared office equipment, the BTC conference room, common use of a computer/printer, and reception/clerical support. The BTC features a utility chase system throughout the facility, making the creation of wet lab areas possible. Leases for lab space are priced based on the level of existing equipment/instrumentation present.

Figure D.8 A View From Business and Technology Center

FigureD.9 Plan of Business and Technology Center
(2.600 m^2 facility)

Hentschel Center

Built in 1964, Hentschel Center offers flexible-sized office space and can accommodate a variety of non-laboratory needs. Tenants of this facility often are more developed, self-reliant companies that do not demand the high degree of shared office equipment and business support services offered to tenants of the PTC or BTC. Hentschel Center tenants have limited access to Park Perks.

Figure D.10 A View From Hentschel Center

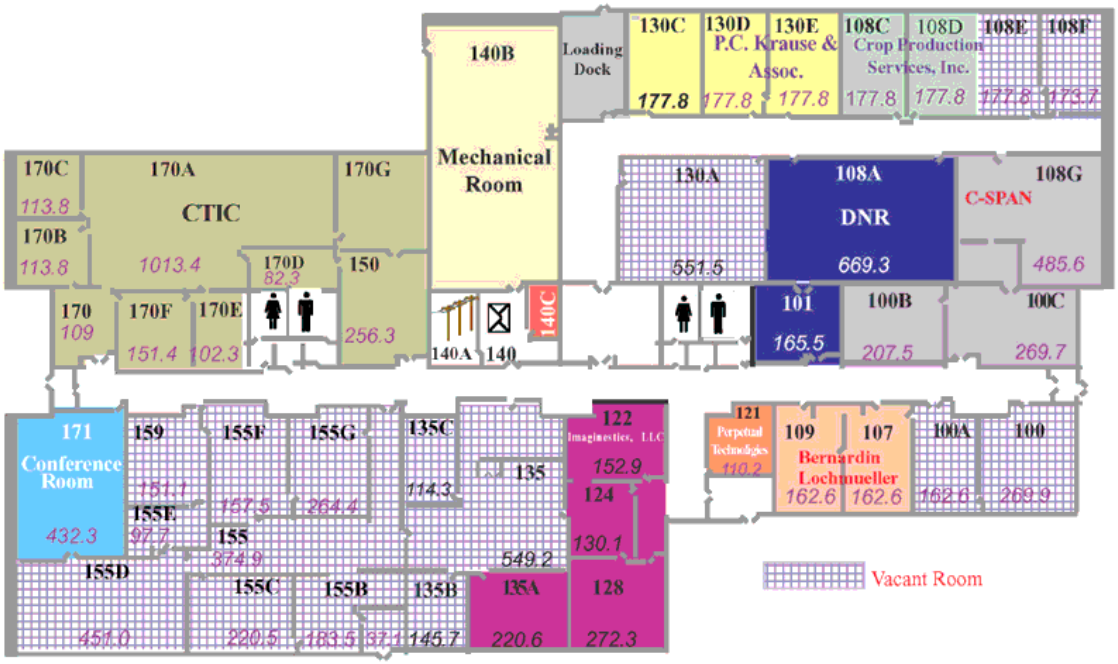


Figure D.11 Plan of Hentschel Center
(1.300 m^2 facility)

CZECH TECHNOLOGY PARK

http://www.technologypark.cz

Figure D.12 Master Plan of Czech Technology Park

The Czech Technology Park master plan has been adopted by the City of Brno as the land use strategy for 120 hectares of land, including the campus of the Technical University, 3km north west of the city center. The Technology Park is concentrated on 60 hectares of land and integrates business, research and academia in a low-density development set in an attractive landscaped and woodland environment.

Phase 1 of the development is concentrated on two zones adjacent to the principal faculty buildings of the Technical University. The main arterial highway runs alongside the development, providing easy access to the city and connection to the international motorway network. Local tram and bus routes connect to the Technology Park and provide a frequent service to the city center.

Figure D.13 Kaplan Building 3 200 m^2

Figure D.14 Flexible accommodation totaling 28 380 m^2suitable for office, research, technological development and production

Zone A

Zone A of the Czech Technology Park covers 5 ha of land divided into serviced plots strategically located adjacent to the main university complex. The zone provides a total of 28 380 m² of high specification office, research and light industrial accommodation. Allocated car parking at a high ratio, landscaped grounds and high quality finishes combine to provide excellent working conditions to suit the requirements of modern business. The 3 200 m² Kaplan Building was the first to be completed within this zone and has been designed to provide some of the most advanced office space in the Czech Republic. Natural environmental control techniques ensure that running cost are considerably less than conventional office buildings.

The remainder of Zone A consists of fully serviced plots providing road and utility connections for a further 21 700 m² of accommodation. A range of building designs is available from the developer to meet the occupational requirements of locating companies. Flexibility ensures that space can be developed for office, research and light industrial uses. Large floor plates can be taken as a whole or subdivided to create individual suites with separate entrance access.

Figure D.15 Completed Zone B Production Facilities

Figure D.16 Single Units or Large Production Facilities from 850–8000 m²

Zone B

Zone B covers 5,5 ha of land and provides a range of buildings intended for production and assembly, with a varying proportion of office space. A total of 14 000 m² has been developed in the first two blocks within the zone and a further 8 000 m² can be constructed to suit occupational requirements.

Supporting infrastructure provides direct access to the main highway adjacent to the zone, with further connections proposed in the form of a major multi-level interchange.

Pleasant landscaping surrounds the buildings, and external areas provide high ratio car parking and transportation access to rear loading bays. Internally the developer's finish provides a power floated production floor with capped off three-phase power supply and installed heating and lighting, both to the production and office areas.

STIRLING UNIVERSITY INNOVATION PARK

http://www.innovation.stir.ac.uk

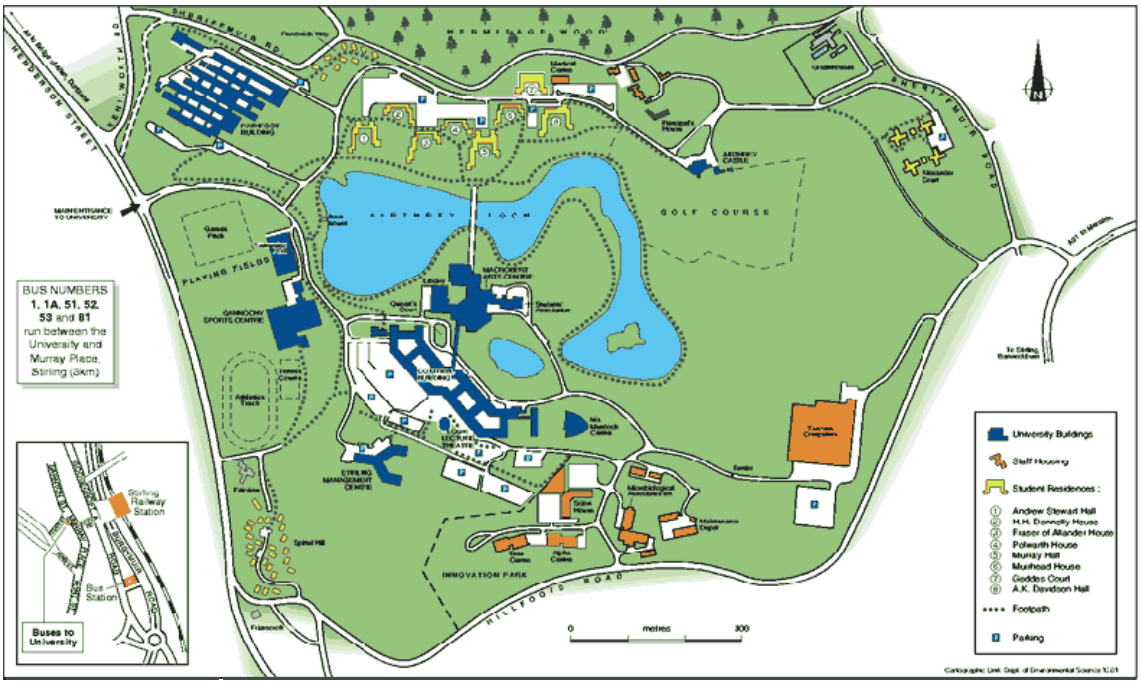


Figure D.17 Site Map of Stirling University With Showing Innovation Park

Stirling University Innovation Park is located on 5,6 ha of the University of Stirling's scenic 121 ha campus and is home to over 40 companies prospering in technology based business. Originally landscaped in the early 19th Century, and coupled with the Park's strategic location in the heart of Scotland there could not be a more beautiful setting form which to do business.

Set on the University of Stirling's scenic campus the Innovation Park provides an attractive location with high quality accommodation and business support services for research and development, technology and knowledge-based organizations.

An active member of the United Kingdom Science Park Association the Innovation Park holds a portfolio of units available for immediate occupation. These range in size from 40 m^2 – 300 m^2. Leases are available on flexible terms, tailored to the individual companies requirements with a wide range of business support services available to all companies.

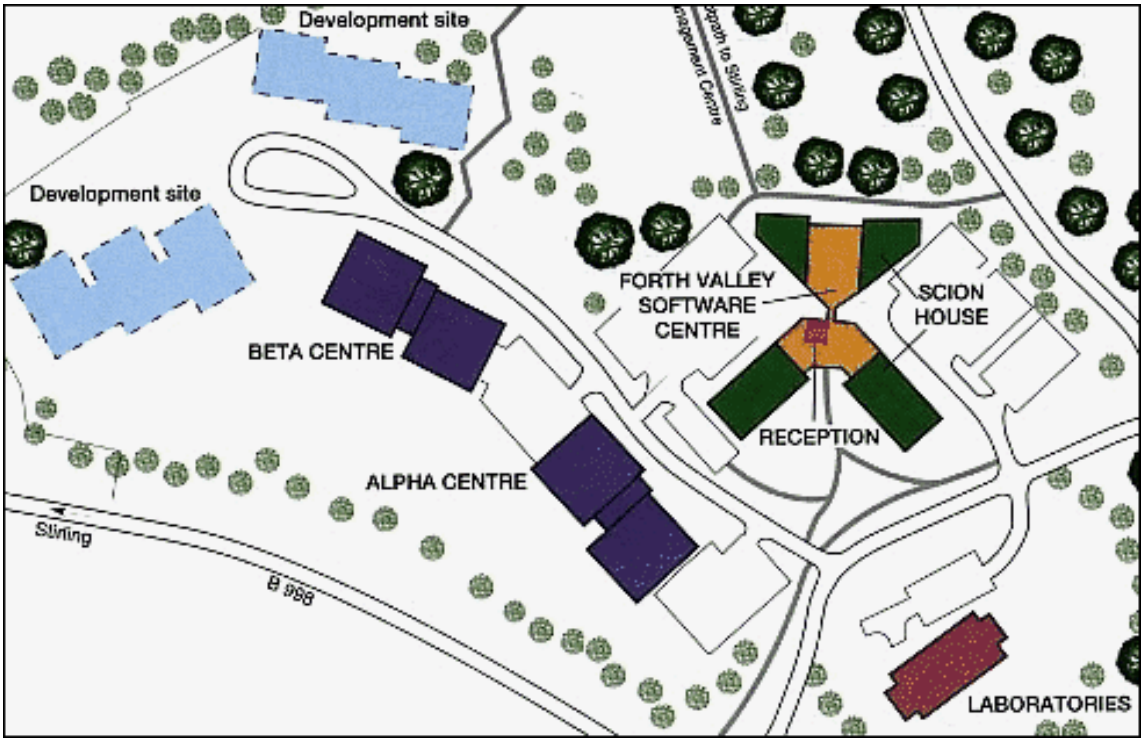
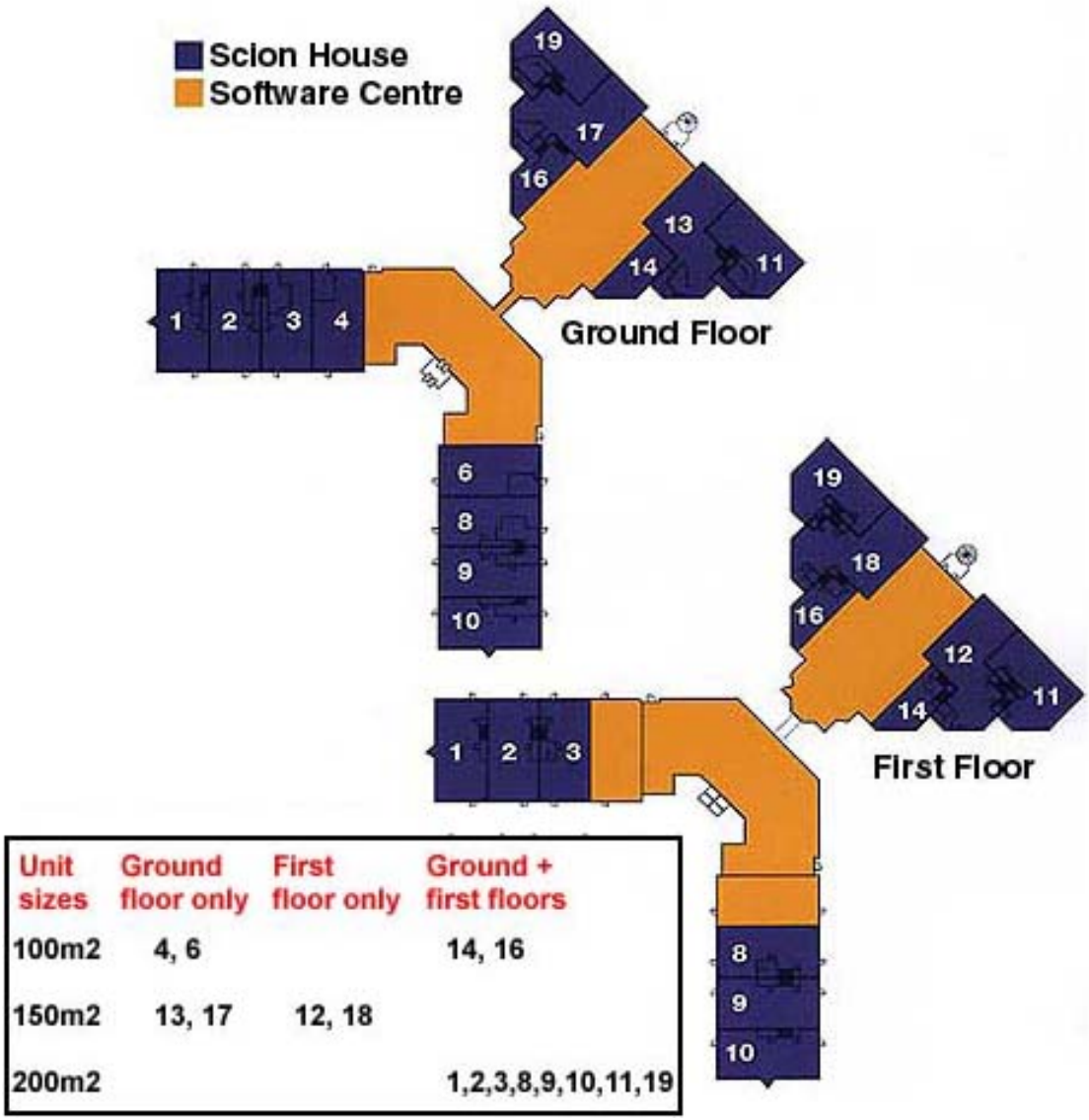


Figure D.18 Site Map of Stirling University Innovation Park

Scion House

Scion House, opened in 1993 with a further extension completed in 1997, is a high quality two storey terraced building housing 18 individual business units ranging in size from 100 m^2 – 200 m^2. Scion House offers the perfect environment for emergent companies, combining superb accommodation with integrated business support services.

Each business unit is self-contained and fitted to a high specification including carpets, blinds, recessed lighting, toilets and kitchen area. Flexible leases are available offering companies the flexibility to re-locate to larger premises on the Innovation Park as their business expands.



Unit sizes	Ground floor only	First floor only	Ground + first floors
100m2	4, 6		14, 16
150m2	13, 17	12, 18	
200m2			1,2,3,8,9,10,11,19

Figure D.19 Plan of Scion House With Showing Sizes of Units

The Forth Valley Software Center

The Forth Valley Software Center is located in Scion House on Stirling University Innovation Park. The Center is a member of the Scottish Software Federation and has been designed with the aim of providing a supportive environment, which will help software companies to develop and successfully market their products.

The Software Group of Scottish Enterprise has promoted the concept of a network of Software Centers across Scotland through the development of Soft Net.

The Soft Net concept comprises a network of Software Centers located in areas with high potential for the development of software businesses. Stirling has demonstrated all the necessary criteria to become part of this network and the Forth Valley Software Center provides an ideal focus for software activities in Central Scotland.

The Forth Valley Software Center, which was in part funded by the European Regional Development Fund, has been carefully planned to accommodate the needs of developing companies and has numerous facilities. In the core unit there are twelve software development suites suitable for three to ten people, which can be used for a variety of purposes. They are ideal for new start-up companies, for the development of a product to the commercial stage, or as a base for a non-Scottish company looking to develop in Scotland and support its local client base.

The Center also has sixteen company units, ranging from 40 m^2 to 100 m^2, for more established ventures. Other facilities include a seminar and training room, which can seat up to 40 people, a product demonstration room, and social area and reception facility with photocopier and fax machines.

One of the Center’s main assets is its location on the Stirling University campus, which makes it especially suitable for companies who will benefit from close collaboration with the strong academic and research activities of the University. Resident companies will be encouraged to explore areas such as technology transfer, research and consultancy, where joint programs might be established.

As well as the cultural advantage of being based on a university campus, companies at the center will be able to access a variety of equipment via the University's IT Services department, which can be used for training, demonstrations or short-term developments, such as porting between systems. IT Services can also help with training and support as companies expand their operations into new environments.

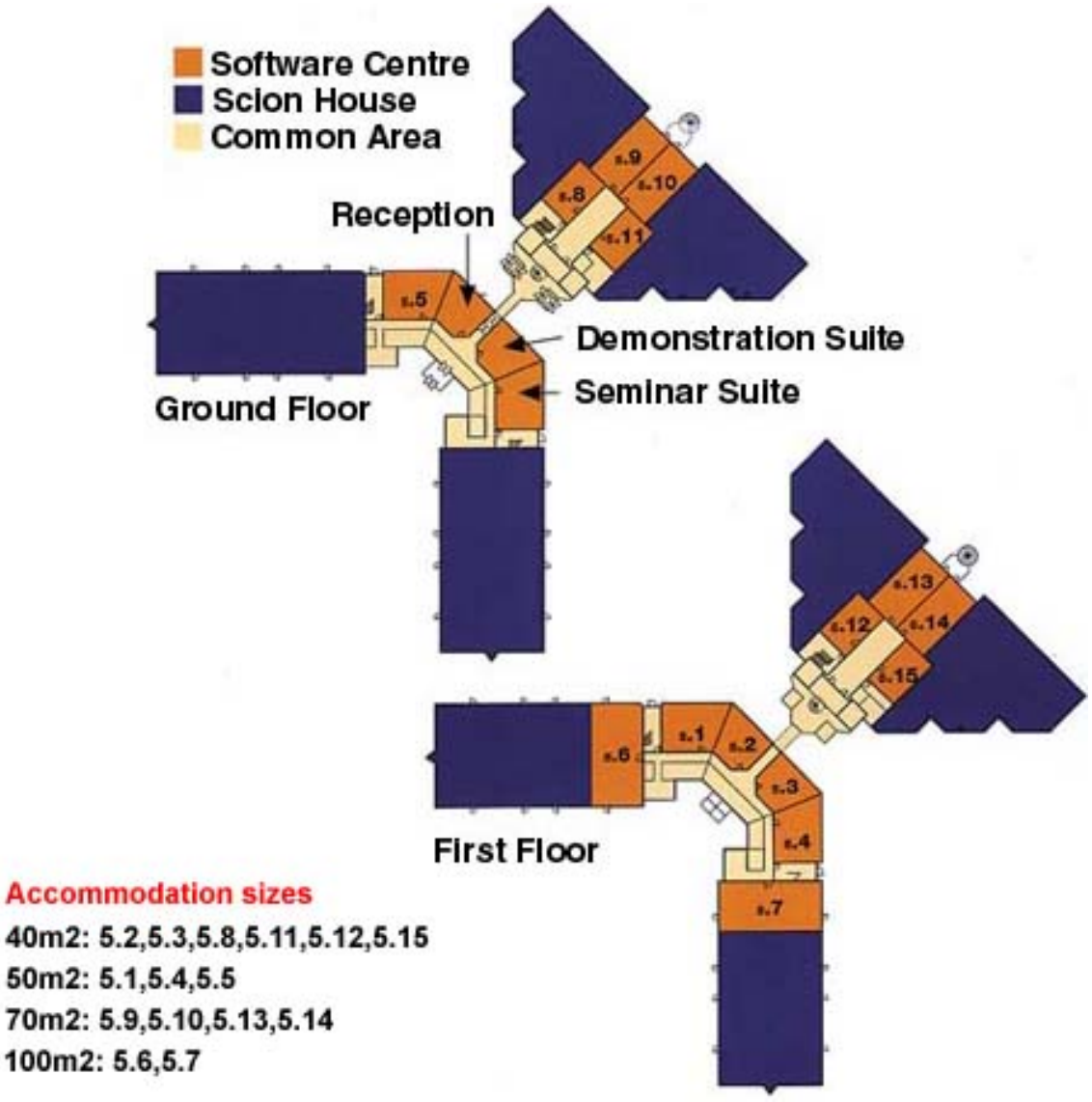
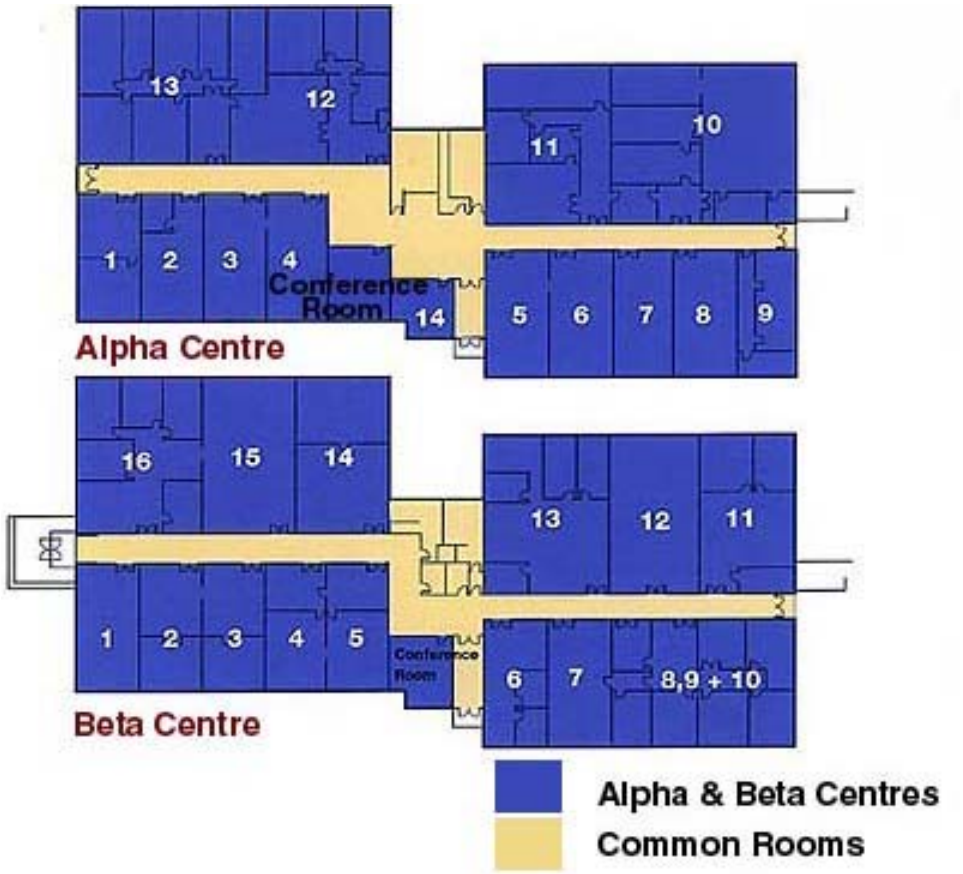


Figure D.20 Plan of Software Center With Showing Sizes of Units

Alpha & Beta Centers

The needs of technology and knowledge based companies are fully catered for in the multi-unit Alpha and Beta Centers, offering a wide range of offices ranging from 15 m^2 to 150 m^2.

Designed to cater for rapidly expanding enterprises, all units are available for lease on a renewable, short term basis. This allows your company to move to larger premises as and when required with no cost penalties. Both facilities are serviced with visitor reception areas, photocopiers, administrative assistance, meeting rooms and kitchens.



Alpha Centre unit sizes	Beta Centre unit sizes
15m2: 14	45m2: 1 - 7
45m2: 1 - 9	85m2: 11, 12, 14, 15
110m2: 11, 12	110m2: 13, 16
150m2: 10, 13	135m2: 8, 9, 10 Joined

Figure D.21 Plan of Alfa and Beta Centers With Showing Sizes of Units

New Developments

Stirling University Innovation Park has outline planning permission for two sites which will provide approximately 4,800 m^2 of additional business space in total.

Provision has been made for ample car parking. The area is already serviced by roads, gas, electricity, drainage and water. In addition, access is available to a digital telecommunication infrastructure.

Buildings can be designed and constructed to a particular users requirements and simply linked into the existing network of utilities, reducing development times and costs to a minimum. Support packages for design and build projects may be available.

TECHNOLOGY PARK

UNIVERSITY OF NEBRASKA

http://www.unebtechpark.com

Figure D.22 Master Plan of Technology Park – University of Nebraska

The Park is a 52 ha high amenity, master-planned development, ideally located on rolling wooded terrain with natural ponds, in the rapidly growing Highlands area of northwest Lincoln, Nebraska.

The Technology Development Center

The Technology Development Center (TDC) is the incubator for the University of Nebraska Technology Park. Its mission is to help launch growing technology-based companies whose success will provide economic benefits and employment opportunities to the citizens of Nebraska. The TDC is a 2.140 m^2 building with approximately 1.300 m^2 of lab, production, and office space available for lease. Located at the intersection of Highlands Boulevard and East Innovation Drive, the building is comprised of a central administration area and two wings: Productivity Building and Collaboration Building.

The TDC is designed to expand to 5.600 m^2 and provide maximum internal and external flexibility. Space can be readily modified to fit the needs of tenants as they enter the TDC and as they expand and move out into the Park, or elsewhere in the state. The central administration area consists of offices for Park management, auditorium and meeting space for client companies, as well as staff and support services.

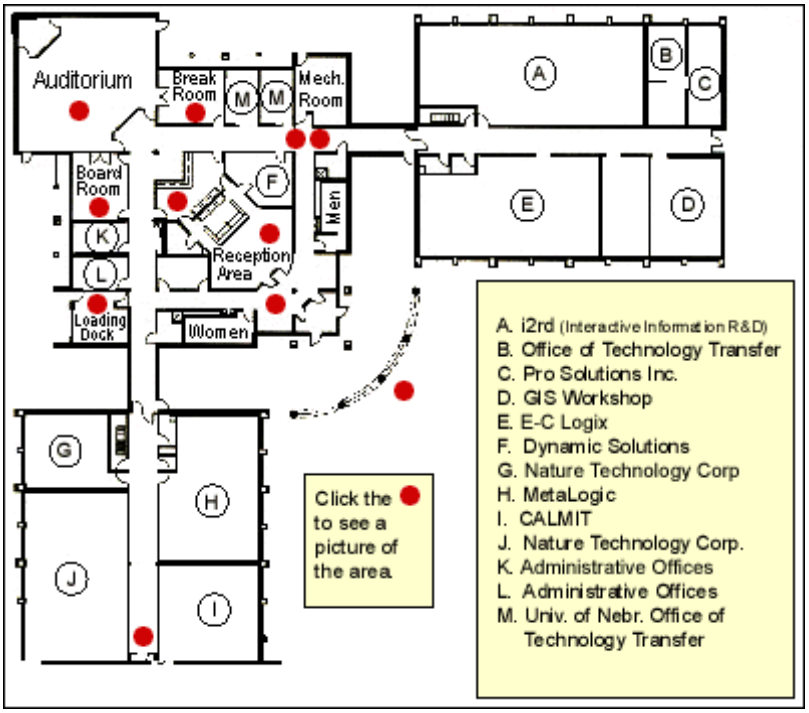


Figure D.23 Plan of Technology Development Center

The One Technology Place

The One Technology Place office building was completed in 2001. It provides customized flexible space for companies ready to move out of the Technology Development Center and for more established, larger firms that want to locate near other high-tech companies in the Tech Park.

The 2.800 m^2 facility is owned and managed by Ameritas Life Insurance of Lincoln, Nebraska. The Technology Park has a master lease for the building, which offers attractive, cost-effective space for companies affiliated with the park.

Figure D.24 The One Technology Place (a Multitech Building)

The Nebraska Center

The Nebraska Center for Excellence in Electronics is a unique partnership between Nebraska's high technology industry, state government, and institutions of higher education. NCEE will provide training, product development support, and testing for regulatory compliance of electronic products.

The 1.400 m^2 facility includes:

- 10-meter anechoic chamber certified for FCC, Canada and EC regulatory testing.
- Environmental testing capabilities for EC and MIL 810, C, D, and E certifications.
- Surface mount production equipment for training and fast prototype builds capable of placing 0402 size parts.
- Board layout CAD systems for training and production integration.
- Use of facility by companies and educational institutions for training, production support, design verification and research.
- Training programs, in conjunction with Southeast Community College, on regulatory certifications, fine pitch board layout, surface mount manufacturing, and other customer-specified needs.

Figure D.25 The Nebraska Center (a Multitech Building)

TECHNOLOGY PARK

WESTERN AUSTRALIA

http://techpkwa.curtin.edu.au

Figure D.26 Information Map of Technology Park Western Australia

Established in 1985 and covering an area of 42 hectares, Technology Park continues to be an important catalyst for science and technology developments in Western Australia, and is home many of the State's innovative companies.

Its growth over the past decade has been dramatic, with the number of organizations based at Technology Park increasing from 25 to over 80, employing around 2,500 people. Approximately 20% of people working at the Park are engaged in Research and Development activities and the majority of organizations export their products and services.

A $2.0 million refurbishment of the Function Center was completed in 1999 to provide enhanced facilities to occupants and external users of the Park. Shortly, the State in conjunction with the private sector will commence the establishment of a hotel and improved recreation and sporting facilities for the Park.

Technology Park Function Center

Clients and colleagues will be impressed with the facilities and ambience at Technology Park Function Center. Key features include:

- Convenient location just 6 kms from the Perth CBD, opposite the Perth Hockey Stadium at Curtin University
- Beautiful parkland setting
- 16 seat Boardroom
- 80 seat Theatre
- Three Seminar Rooms that can be configured for groups from 8 – 300 people
- Licensed Bistro
- Indoor and outdoor dining facilities
- Two spacious Foyers that double as breakout or display areas
- A wide range of quality audiovisual equipment
- High speed internet and data access
- Full video conferencing facilities for two party and multi-party connections
- Ample free parking
- Three phase power
- Public telephone, Swan Taxi phone and snack/drink vending machines
- Shower facilities

- Available for hire 24 hours per day, 7 days per week by arrangement

Technology Park Function Center also offers easy access for people with disabilities. All conference facilities are at ground level, entrances to all rooms are through extra-wide double doors, foyers are spacious and uncluttered, and there is clear signage to all meeting rooms and a convenient drop-off point at the side entrance facing Hayman Road. Disabled toilet and shower facilities (unisex) are available.

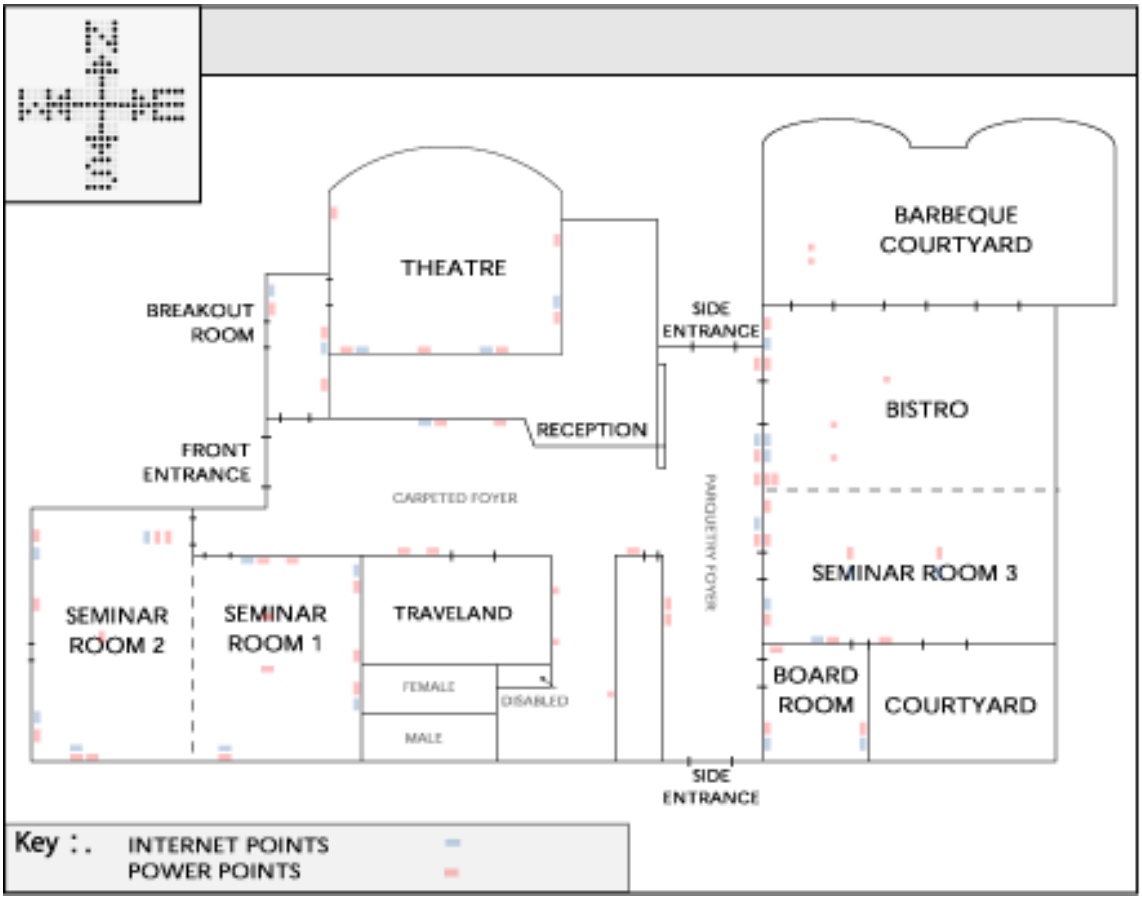


Figure D.27 Floor plan of Technology Park Function Center

The Theatre

The Theatre features 80 fixed chairs with fold-down (right handed) tablets, arranged in six rows over three levels. There are also multiple internet and data connection points plus a pinup board measuring 1.4 x 1.47 meters mounted adjacent to the entrance doors. The hire charge includes use of all equipment operated from a touch screen lectern, including:

• Data projector and rear projection screen

• TV

• VCR, DVD and CD players

• Radio tuner

• Sound system

• Lighting controls

• Video camera feed

Room Specifications

Length: 13.4m

Width: 14.4m

Height: 2.70m

Breakout Room

Access to the Theatre is via an Anteroom measuring 8.6 x 4.2 meters that is popular as a registration or display area and can also be used for small breakout groups. One wall of glass overlooking the gardens provides ample natural light.

Room Specifications

Length: 8.6 m

Width: 4.2m

Height: 2.36m

The Barbeque Courtyard

The Barbeque Courtyard is popular for meals, tea breaks and social functions. Food and beverages are supplied by Betts for Catering.

Room Specifications

Length: 10m

Width: 20m

The Bistro And Terrace

The Bistro and Terrace are popular for meals, tea breaks and social functions. Food and beverages are supplied by Betts for Catering. Betts also operates a Bistro Bar Monday – Friday offering a range of fresh foods and beverages for purchase over the counter.

Both areas lend themselves for use as informal breakout areas and the Bistro is also equipped with multiple internet and data connection points and a wall-mounted TV/VCR.

Room Specifications

Length: 12.1m

Width: 16.2m

Height: 2.36m

Seminar Room 1

Seminar Room 1 is equipped with a sound system, multiple internet and data connection points, a ceiling mounted 8 ft screen and three wall-mounted pin boards 2.4 m wide x 1.2 m high, two positioned on the side wall and one on the front wall. One wall of floor to ceiling glass overlooking the Park provides plenty of natural light.

Room Specifications	*Capacities*
Length: 10.5m	Theatre Style: 120
Width: 13.0m	Classroom: 70
Height: 2.36m	Work Groups: 90

Seminar Room 2

Seminar Room 2 is equipped with a sound system, multiple internet and data connection points, a ceiling mounted 8 ft screen and two wall-mounted pin boards 2.4 m wide x 1.2 m high, positioned either side of the screen. Two side walls of floor to ceiling glass overlooking the Park provide natural light and a tranquil vista. A secure exit door opening directly to the car park allows easy loading and unloading of display materials etc.

Room Specifications	*Capacities*
Length: 10.8m	Theatre Style: 140
Width: 14.8m	Classroom: 70
Height: 2.36m	Work Groups: 90

❖ Seminar Rooms 1 and 2 can be combined to form a large, column free space for up to 300 people in theatre style. It is also popular for displays and exhibitions.

Room Specifications	*Capacities*
Length: 21.3m	Theatre Style: 300
Width: 13.0m	Classroom: 140
Height: 2.36m	Work Groups: 180

Seminar Room 3

Seminar Room 3 offers a deep, rectangular column-free space that can be configured for a variety of purposes, with multiple internet and data connection points. Double doors in a wall of floor to ceiling glass provide access to a dedicated, private courtyard 9 m long x 7 wide overlooking the gardens.

Room Specifications	*Capacities*
Length: 16.2m	Theatre Style: 100
Width: 9.8m	Classroom: 60
Height: 2.36m	Work Groups: 72

The Boardroom

The Boardroom features 16 luxurious leather chairs around a large central board table with multiple internet and data connection points plus video conferencing facilities.

Room Specifications

Length: 7.2m

Width: 7.0m

Height: 2.36m

CRANFIELD UNIVERSITY TECHNOLOGY PARK

http://www.cranfieldtechnologypark.co.uk

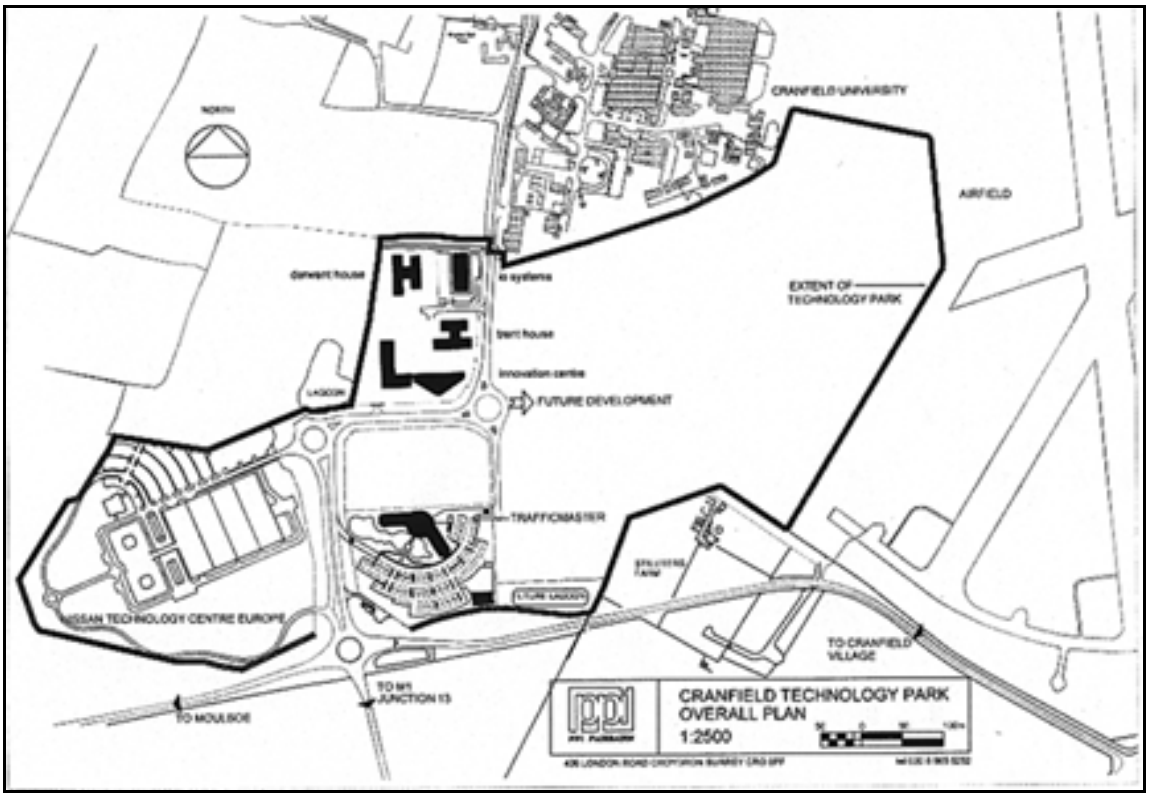


Figure D.28 Overall Plan of Cranfield University Technology Park

Cranfield University Technology Park is designed to meet the needs of knowledge-based companies with growth potential, whether start-up businesses or divisions of major global companies. The Park comprises three levels of building set in a high quality environment with generous parking and landscaping, providing an ideal setting for knowledge based industries.

The Park has development potential of approximately 40 ha. Consequently very large developments such as the Nissan Technical Center Europe (20.440 m^2) can be accommodated. In order to provide bespoke buildings to occupiers' specific requirements on the Park, the university has appointed St Modwen Developments Ltd as its development partner.

The Cranfield Innovation Center

Figure D.29 Views from Cranfield Innovation Center

Cranfield Innovation Center is a high-specification landmark building, in the center of Cranfield University Technology Park.

The fully managed Center provides suites from 26 m^2 to 165 m^2 for growing businesses, and has excellent car parking. Suites are available on easy in/easy out terms. The aim is to help businesses from start-ups to corporate off-shoots grow and prosper. The Center is a community of like minded businesses, who can support, encourage and learn from one another. A full range of administrative services is available Innovation Center including reception, meeting rooms, equipment and secretarial support. Business support is available from the Cranfield School of Management.

Trent House

Figure D.30 Views from Trent House

There are two office building, each of 1,858 m^2, divided into suites from 185 m^2 to 555 m^2. These quality buildings provide a high quality modern working environment with excellent car parking.

Features include:

- Suites 185 to 555 m^2.
- Comfort cooling or VAV and suspended ceilings.
- Impressive reception area with lift access.
- Excellent car parking.
- Flexible lease terms.
- Break option for expanding businesses relocating on Technology Park.

Bespoke Buildings to Occupiers Requirements

St Modwen will develop buildings from 800 m^2 to 18,580 m^2 designed and tailored to suit the individual needs of occupiers on either lease or virtual freehold sale basis.

St Modwen will offer every assistance to growing businesses looking to step up from Level I or Level II accommodation to purpose build bespoke accommodation.

MILILANI TECHNOLOGY PARK

http://www.mililanitechpark.com

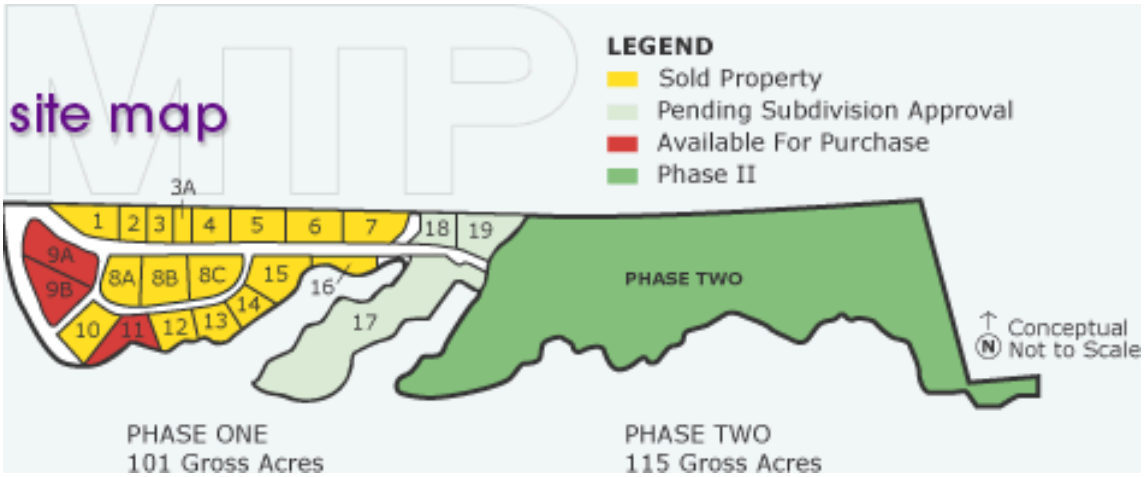


Figure D.31 Site Map of Mililani Technology Park

Mililani Technology Park (MTP) is a development of Castle & Cooke Properties, Inc. The Park, dedicated in 1987, is a heavily landscaped, campus-like park for high-tech companies and other services. The Park has mixed-use (IMX-1) zoning, which allows a variety of office and light industrial uses. With this zoning, companies no longer need to be in "high-tech" industries to locate to the Park. However, the design and infrastructure of the Park are geared toward the demanding high-tech market.

Design Standards Of Mililani Technology Park

To enhance Mililani Technology Park's high-quality appearance, the Park's Covenants, Conditions and Restrictions contain strong design criteria ensuring that all buildings reflect the character of the Park. The MTP Design Committee reviews all construction plans to assure that they conform to the following standards

1. Building coverage can be up to 35% of the total lot size.
2. The total floor area in the buildings on a lot should not exceed 40% of the lot's total area.
3. Attractive landscaping must cover 25% or more of the lot.
4. The setback minimum is 8,3 m from all boundaries of the lot.
5. The maximum building height is 14 m from the ground to the roof plate.
6. On-street parking is not allowed, and adequate parking for the needs of the owner or occupant must be built into the designs.

APPENDIX E

EXAMPLES OF BUILDINGS

Social Facilities

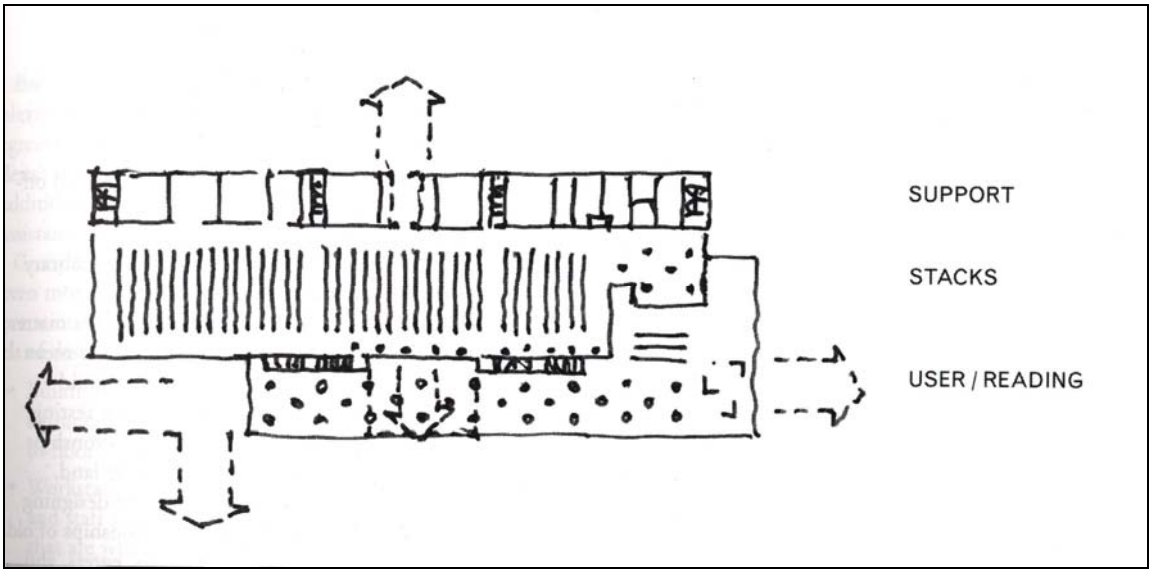
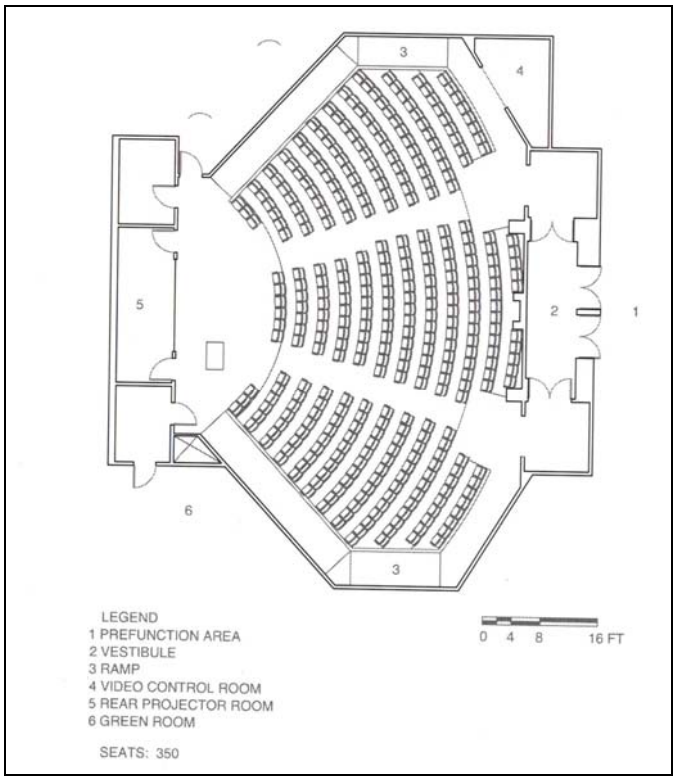


Figure E.1 An Example of Open - Ended Library Plan with Clear Zoning Allows Expansion in Multiple Ways



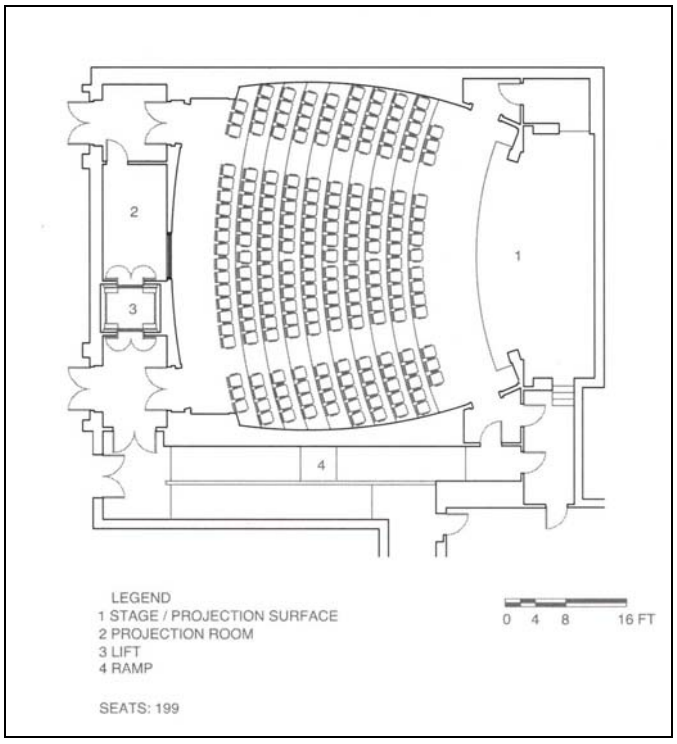


Figure E.2 Examples of Sloped - Floor Auditoriums

Research Facilities

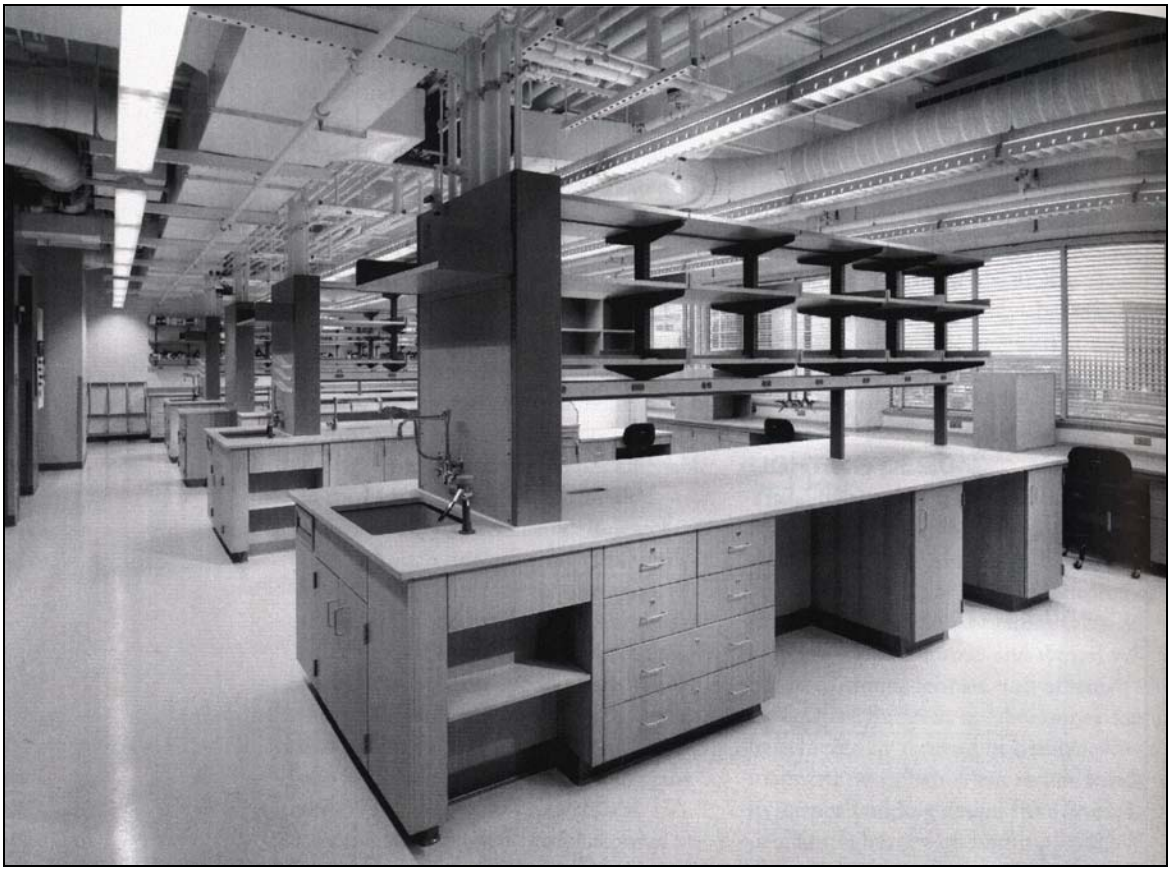


Figure E.3 An Example of Research Lab

(having epoxy countertops of a gray color, sheet vinyl floors, and an open ceiling; write - up benches along the perimeter wall continue the epoxy tops for potential future lab use)

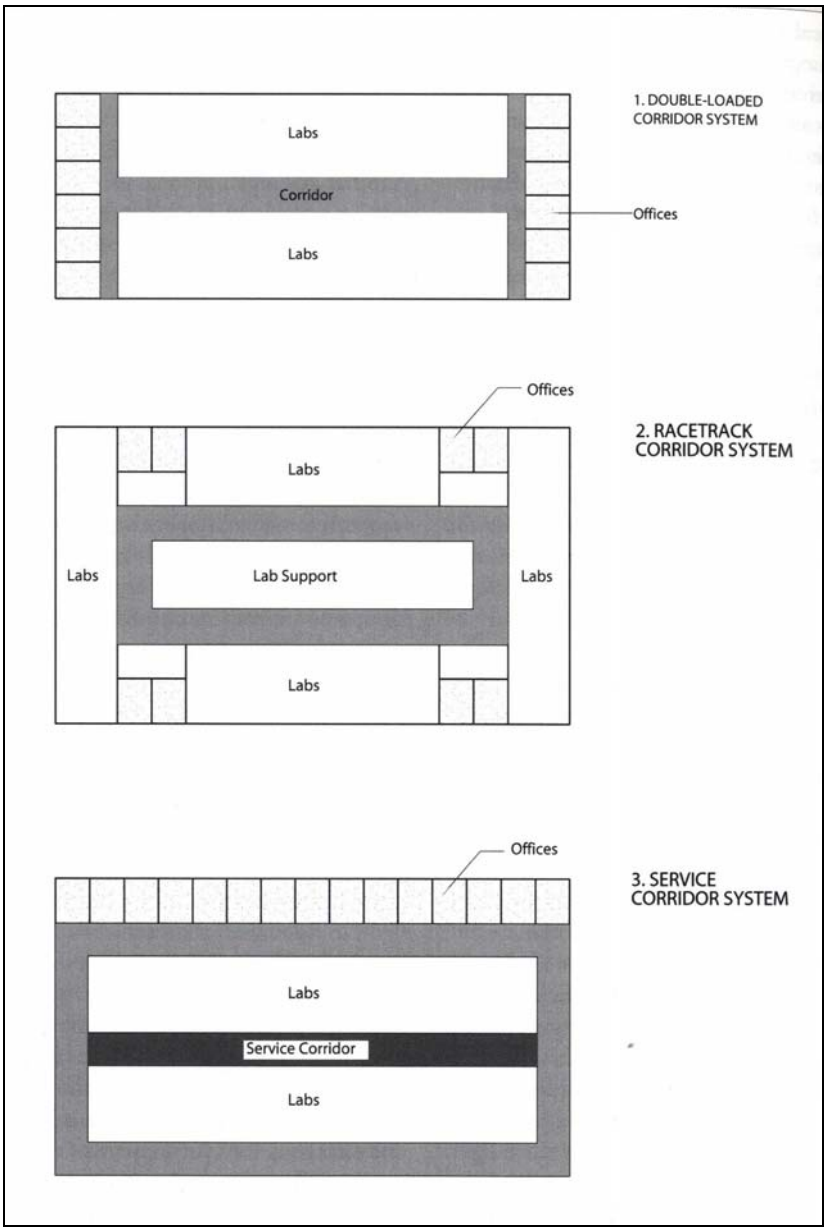
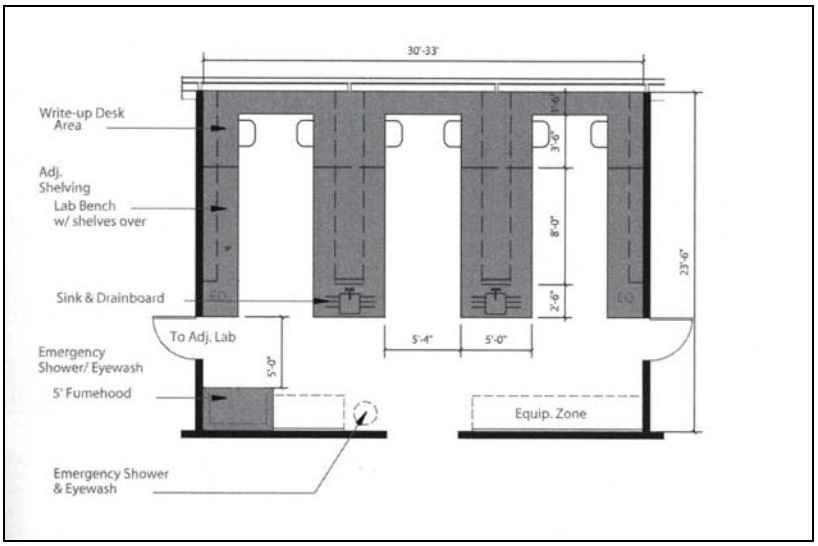


Figure E.4 Generic Lab Circulation Diagrams



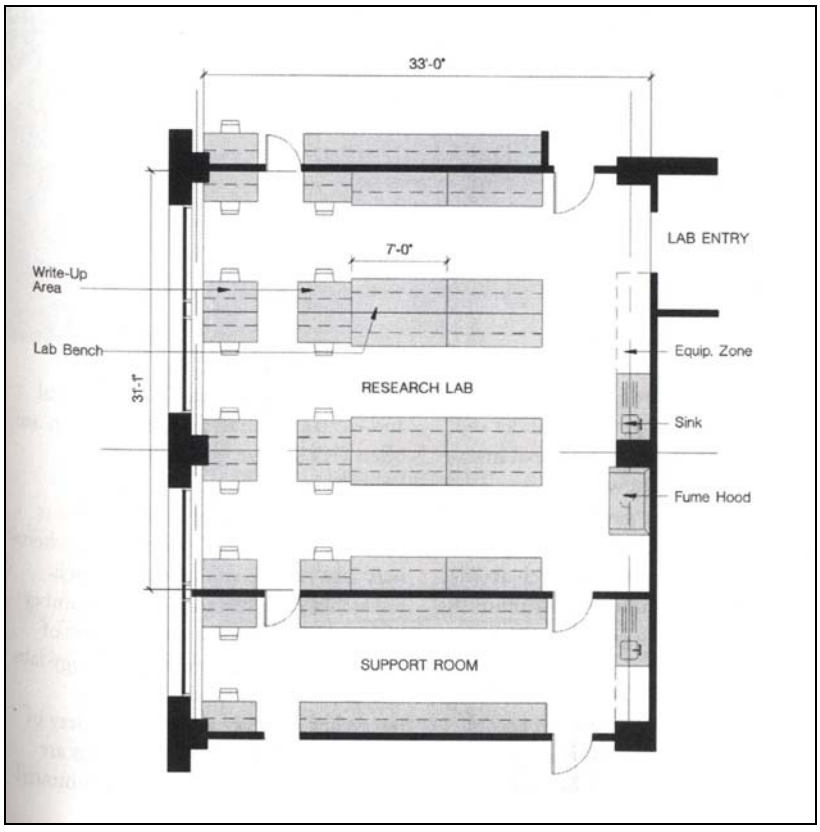


Figure E.5 Sample Floor Plan Layouts of Biology Research Laboratories

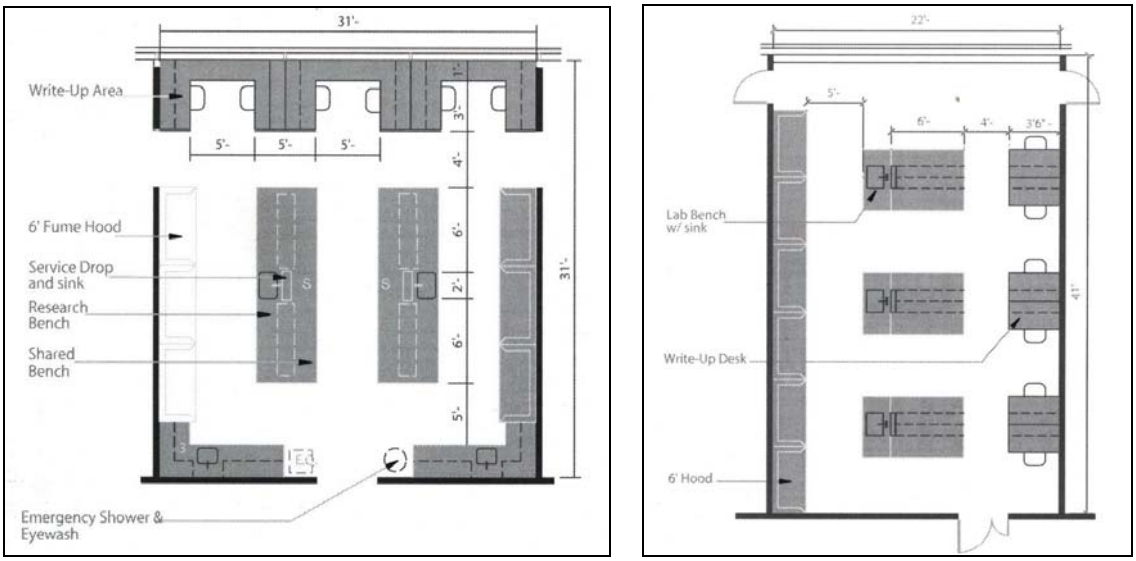


Figure E.6 Sample Floor Plan Layouts of Chemistry Research Laboratories

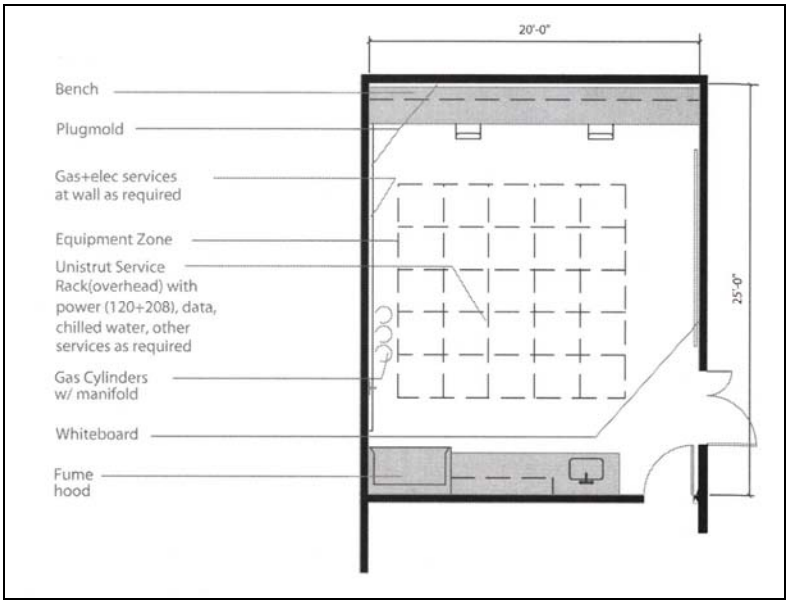


Figure E.7 A Sample Floor Plan Layout of Physics Research Laboratories

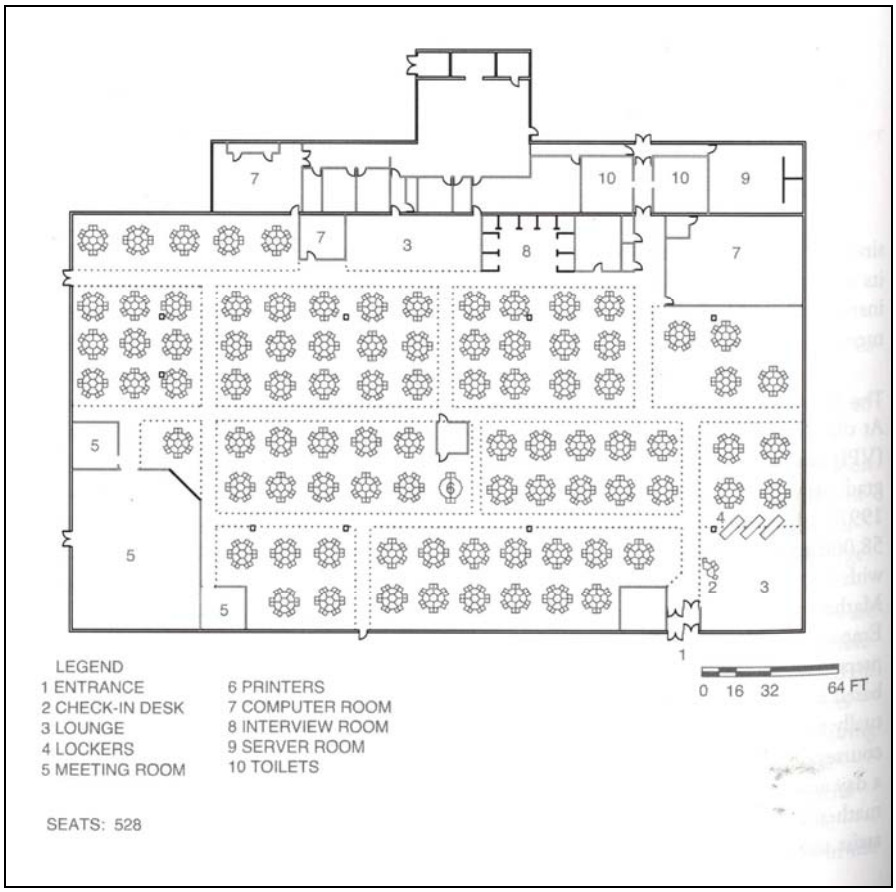


Figure E.8 An Example of The Mathematics Emporium