

FIG 3-1: BIBI SLIPPERS/ UNIVERSITY OF PRETORIA

There is ample theory available on business incubators to get a complete understanding of what it is, and how it works. The literature will demonstrate that business incubators is the ideal location for new graduates to develop and grow their start-up businesses. Literature will show how to design a business incubator which will be the accelerator for successful businesses. It will be evident to see that business incubators promotes entrepreneurship through providing the needed facilities, services and programs.

I will be studying literature that shows the key issues involved with business incubators and to establish it in such a way that it is sustainable. The Literature will sketch the characteristics of the environment in order for it to be a complete and tailored business support incubator in order for graduates to reach their full potential within the business world. The research will show how to implement the concept to create positive spin-off effects within the socio-economic context of South Africa in order to promote economic well being.

Spatial relationships is important when designing an environment which have to optimize the function of being the Incubator of Innovation. The literature will indicate how to accommodate creative beings who need to upgrade and change their environment in order to be inspired. Each year there will be tenants leaving and new tenants coming in with different needs and requirements. I will be studying the concept of Open Building which accommodates the phenomena of inevitable change, to make it easier, less costly and more sustainable.

The urban design literature will indicate key concepts and principles to apply to my project. By studying and adopting some of the patterns described in Christopher Alexander's book of A Pattern Language (Alexander, Ishikawa &

introduction

The introduction to the literature study gives a brief overview of what the study would encompass as well as the relevant books pertaining to a specific subject.

Silverstein 1977), I would be able to strengthen a sound argument within an urban and architectural context. Kevin Lynch in his book of Image of the City (Lynch 1960), talks about how a person orientates oneself in a place. I will be incorporating his theories of paths, nodes, edges, landmarks and districts in order to strengthen my project within the urban setting. The book of Responsive Environments (Bentley, Alcock, Murrian 1985) is able to provide me with some guidance to knit the university back into the urban fabric in order to complement the environment.

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introduction

How did business incubation start?

The first so-called incubator started in 1959 in a near-derelict building in New York where the term 'incubator', credited to Joseph Manusco (Barrow 2001:11), started off as a joke. The building was used for the initiative to make space for small firms to get started. However it was the British Steel Industry in 1975 who would have the first proper business incubator, initiated to help create employment for areas affected by the scaling down of steel production in Europe. They not only offered shared workspace but provided capital loans as well as training and advice to the start-up firms.

In 1980, the Rensselaer Polytechnic Institute(RPI) Technological University, was looking for ways to expose their students to the business world. Business people came to lecture the students on techniques to start a business and students worked with these businesses to get first-hand experience on how a business function. Students and professors then started their own companies which propelled the incubator, boosting the local economy and proving through this concept that small companies could revive the local economy . During the 1980s a few hundred such facilities were distributed all over the United States, Canada, Europe and Australia. A study (Harley 2001) have indicated that the number of incubators worldwide literally doubled every five years, from a few hundred in 1985 to more than 3450 business incubators in 2000.

How does business incubation work?

Most entrepreneurs are in need of incubation as they have the innovative brilliance but they are not business people (Richards 2002: 6). Business incubators function through providing strengthened business skills, business services and facilities, improved operating environment and business

incubator

A business incubator is a multifaceted operating space which provides entrepreneurs with business support through targeted resources and services that accelerates the successful development of their start-up company. Resources and services are provided, according to the needs and requirements of recently graduated entrepreneurs, and the process is orchestrated by the incubator management in order to create a successful incubator.

networking to nurture early-stage businesses into maturity, increasing their prospects for business survival and growth. Professor Swierczek states that incubation or innovation centers form the "interaction between the research community and the business community" (Swierczek 1992 in Barrow 2001: 6). Business incubators in general aim to produce sustainable graduate businesses, insuring an increased income whilst creating a return on shareholder's investment as well as economic development for the local community.

Critical elements of a successful incubation program:

- A broad range of supporting stakeholders such as common wealth, state or local governments as well as community based groups or a even private company.
- Service the demand from the local entrepreneurs who wants to improve their survival and growth of their early stage small businesses.
- Provide tailored facilities and services and not just office space for the tenants nurturing period.
- Effective incubator management group for the continuing support, development and sponsorship of their start-up businesses.
- The success of an incubator is dependent on insuring a regular turnover of graduate businesses.
- The incubator should deliver the required outcomes and provide profitable investment for the relevant stakeholders.

Is there a need for business incubators?

It is innovative companies with their creative ideas that are the drivers of a sustainable economy, and incubators build the bridge that connects genius to commerce (Richards 2002: 6) One study (Harley 2001) reported in 2000, a total

incubator

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number of 3450 incubators worldwide and today there are over 4000 business incubators. Prof. David Birch, in his landmark work emphasizing the importance of new businesses (Birch 1979), discovered two reasons for the increase in number of incubators. Firstly, small businesses who employs less than twenty workers, were responsible for over two-thirds of the increase in employment in the United States between 1969-1976 (Birch 1979). Secondly Prof. Birch's research have indicated that although this was the case, these small businesses were also extremely fragile. He noted that approximately eight million of those companies in the United States closed down each year (Birch 1979).

Another study done by Prof. David Birch have shown that only half of all small firms will survive more than five years (Birch 1987). Statistics done by Bates and Nucci have indicated that, although new business creation had increased profusely, the failure rate of such businesses were still towering (Bates and Nucci 1989). Roure and Keeley have determined that the reason for the high failure rate is as a result of a lack in management expertise as well as under-capitalization (Roure and Keeley 1990). Therefore in response to these problems business incubators are developed, providing business management skills and the needed capitalization, in order to foster and protect small start-up companies in their fragile early-stages of development.

What are the benefits for South Africa?

Through the implementation of business incubators, small businesses are assured of their survival in the capitalist business world. Entrepreneurs are therefore motivated to be creative in developing innovative concepts and products for their own firm, in order to show the world what they're made of through their God-given abilities.

incubator

All governments, whether local or national, want to create new jobs above any other goal as it is the basis for socio-economic growth. As discussed above and under the socio-economic context of South Africa, these small innovative companies are the drivers of any sustainable economy. Therefore through these incubation programs, ensuring the survival of these small firms, there would be job creation evident, causing economic and social upliftment for South Africa.

Incubators are not only advantageous for the firms that go in for incubation and the local economy, but it also has profitable opportunities for South Africa's private sector. Governments would be enthusiastic in putting money into such initiatives which would be profitable for the orchestrators of such an incubator. As explained under the Client, the orchestrator could also receive a percentage fee of the individual's investors or from the profit made.

Who goes in for incubation?

It is well managed intelligence and creativity that generates income, therefore when combined by entrepreneurs to form innovative thinking become the drivers of the economy. It is innovative entrepreneurs that are needed and not small business men or women. Most new business start-ups are not entrepreneurs, but indeed just poor copies of the already existing ideas and businesses. Entrepreneurs are individuals who has the capacity and the passion to develop innovations or ideas of the future in order to "shift economic resources out of an area of lower and into an area of higher productivity and greater yield" (Say 1800 in Barrow 2001: 22).

There are different types of incubators catering for various individuals. Some companies have their own in-house incubators where new employees would

incubator

work in collaboration with more experienced individuals. There are also public incubators open for any entrepreneurs but for the purpose of this thesis, the focus would be on an incubator for the University of Pretoria.

Have universities been involved with incubators before?

When it comes to developing incubators, universities have always been at the forefront, which by the 1980's already had several hundred campus-based incubators. (Barrow 2001: 43) Among these was the Yale University's incubator which was facilitated by Dr Sam Chauncey, who persuaded the Olin Company to donate a vacant small arms factory building to the university in 1982. Dr Chauncey raised a million dollars from the city, the state and private sources to remodel the building into an incubator facility, which had incubated over a 100 companies and created 500 jobs within a period of five years (Barrow 2001: 43). Another is the Utah Innovation Center which was built in the Utah University's research park, which offered a broad spectrum of incubating services to clients in return for equity stakes.

There were also a number of university incubators developed in the United Kingdom, one of which was the Cambridge Science Park. This incubator at Cambridge is an excellent example of how new enterprises are stimulated through a business incubation program facilitated by a university but I will elaborate and discuss it further in more detail under the precedent studies.

What does a typical model look like?

It is as a result of a lack in resources, facilities and business management skills that there is a high failure rate in business start-ups. Therefore these start-ups must be able to depend on the incubators for these nurturing capabilities.

incubator

Incubators' role is to "contribute to their companies so they are stronger, better and faster than those that are not in incubations" (Richards 2002: 45). In order to be nurtured by such an incubator, the entrepreneur should have capital available to pay for rent, provide the initial funds needed for the materials to develop such an innovation, as well as funds with regard to the cost of living. This capital should also be available until such time that the product is commercialized, is selling and making a profit and if such funds are not available, the entrepreneur's dreams would remain only dreams.

"The incubator has to have the ability to help raise capital for its companies" (Orion 2001 in Richards 2002: 46). Whether the means entails being hooked into a low interest alternative lending source, or getting grant funding or whether it is allocating a capital investor. Allocating an investors are a necessity to build a bridge between a genius idea and a commercial product. Knowing that innovative small firms are the drivers of a sustainable economy, investors would be keen to invest in it, once they are assured that their particular investment are within a safe and secure environment, which would ensure a successful return on investment.

The incubators should set reasonable and obtainable goals and should know the market extremely well in order to align themselves with the right partners, get the right investors and support the right companies. Therefore an exceptionally experienced business person, who is well networked in the economic environment should manage such an incubator.

According to Tyler Orion (Orion 2001 in Richards 2002: 43), director of Orion, which is a company who look at the needs and resources of an incubator, the heart of incubation is mentoring and business development as well as assistance with marketing and finance.

incubator

Orion states that just by giving them a secretary, a copy machine and a mail room was never a good model. (Orion 2001 in Richards 2002) The incubator must be tailored to the needs of the entrepreneurs in order to accommodate their unique innovation. The incubator should provide the resources and funding, technology and facilities, business skills as well as marketing and licensing opportunities in order to function as a real incubator.

What are the specific characteristics?

Their should be some sort of criteria involved or a selection process, in order to accept only clients with a viable business concept or innovation. The incubator The incubator should require that the start-ups meet their milestones and should hold them accountable for their progress. Providing direct investment and access to growth capital or at least establishing channels for financing is an absolute necessity for the incubation process. Accommodating for the ever-changing area needs of the tenant through flexible and customizable spaces, is a necessity for a successful incubator. However it is the provision of businesses services which is key to the incubators' value-adding capabilities.

Business services can be subdivided into two categories namely general and professional. General business services includes office as well as specialized equipment in laboratories and workshops; internet access; shipping, receiving and mailing services; clerical and administrative services; reception services. In regard to the professional business services the incubator should provide services for legal matters; intellectual property; accounting; book-keeping, recruitment and staff selection as well as education and training programs. Wisdom and experience in business and management skills are offered to the entrepreneurs through qualified coaching, advisory groups and training programs (Barrow 2001 : 49).

incubator

These business management services include the preparation of business plans; marketing and business strategy formulation; public relations; research and development; employee relations including employee share ownership issues; international trade; government relations and procurement, and networking.

The incubator should establish synergy among the clients to enable a network of relationships in creating alliance between the collective ventures. An extremely good knowledge of the current needs of the industry is needed in order to establish whether the innovation is a viable investment. The incubator should have a successful launch record with successful people on the management team. Throughout the process the incubators are there to add value, champion the client as well as provide the support for the successful execution of the company's business objectives.

Incubators need to operate as a business and have their own source of sustainability. (Barrow 2001: 45) The incubator themselves should be viable and should therefore make a profit, in order to operate as a sustainable business. There should be equity involved through either implementing royalties, or the start-ups should offer enough of an incentive to the incubator to make it a worthwhile proposition.

The intellectual property should however remain the entrepreneurs', and therefore by keeping ownership when they leave, after the contract duration, they have the right to all profit. The contract duration would provide the fledglings a two to three years incubation program, depending on their development. Through undergoing the entire development program, it would classify them as mature enough to leave the nest and start flying.

incubator

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The conventional way of dividing internal spaces with brickwork in commercial and office buildings, inhibits changing or remodeling it according to the needs of the tenant and thus also restrain their progress and in the end their success. Some statistics in the United States (Department of Commerce) have shown that remodeling of existing buildings exceed the value of new construction each year. The trend of altering buildings and spaces according to the need of an occupant, occurs more frequently in buildings for commercial and office use as well as buildings for leasing purposes.

When considering the spatial relationships of a building, designers have to assess what is the current requirements and should predict what the need will be in the future in order for their ideas to last a lifetime. With every lease agreement, especially with office or commercial buildings, it is almost inevitable that there would be internal changes. Designers should therefore leave many options open for likely users and their requirements.

Stewart Brand explains in his book, How Buildings Learn (Brand 1994), that change in buildings are inevitable and that buildings learn from their owners, how to behave. Those who will live in a space need to be involved in its planning, and the building needs to be able to accommodate what cannot be foreseen (Habraken 1972: 42).

Open Building is a contemporary design and building method that recognizes and deals with this ever-changing social and technical environment in which we live and work. Open Building enhances the efficiency of the building process through an innovative approach to design, whilst increasing the variety, flexibility and quality of the product (Bensonwood Homes 2008: 1).

spatial requirements

People's needs change and different people have different needs and requirements. Permanent places of occupancy, whether commercial, office or residential have always been changing through remodeling, renovating and updating it according to the current needs of the occupants. Most buildings have numerous layers of wallpaper or paint, new additions or had their floor plans altered in order to suite the peoples requirements. In our capitalist society today, it is only the industries which are changing and adopting quickly to our modern world that is is thriving and making a success (Benson 1997).

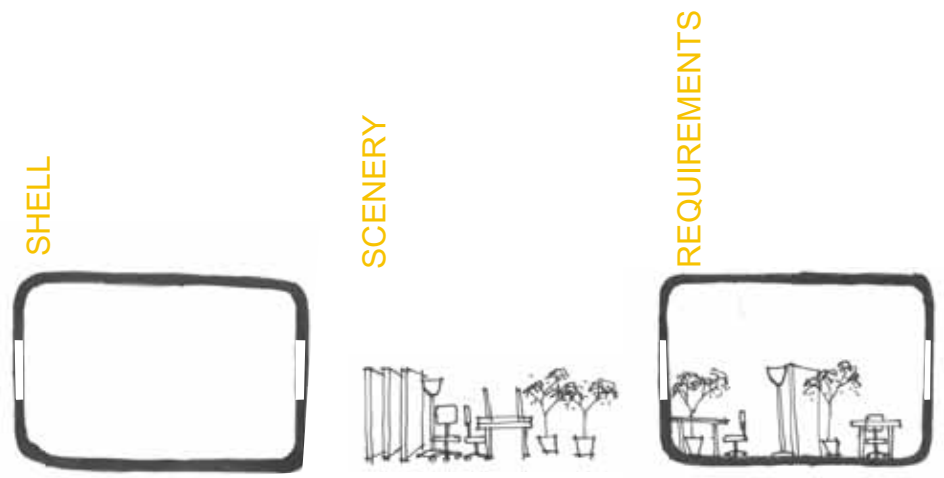


FIG 3-2: SHELL, SCENERY AND REQUIREMENTS

The concept of Open Building is described as a well-organized combination of systems and sub-systems, which can be coordinated to form a better process and product for the tenant. (Bensonwood Homes 2008: 1) The key systems involve the building site, structural frame and envelope, the internal space divisions as well as the services and furniture. Open Building allows for the ability to disconnect and reorganize the systems and sub-systems in order to create a more efficient space with increased control through quality, variety and flexibility. Open Building addresses the need of present and future occupants, which makes the remodeling of the space easier and more affordable.

When referring to the shell of the building it is "all that is provided for the duration of the life of the building: the structure, the envelope and the basic services." (Duffy, Cave & Worthington 1976: 8) "A scenery has a much shorter life than a shell. Its role is to take up the tolerance between the precise needs of the tenants and the loose fit of the building shell" (Duffy, Cave & Worthington 1976: 10) The shell should be extremely versatile and loose fit with well thought through positions of openings, structural elements and services which can work for the different scenes. The successful design of the shell is determined by how useful the space will be to the tenants throughout the life of the building. (Duffy, Cave & Worthington 1976)

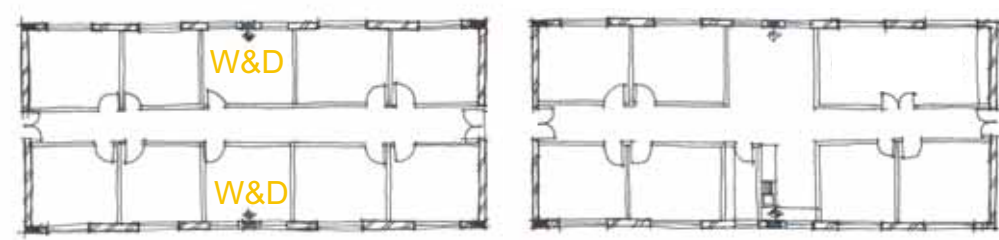


FIG 3-3: INTERNAL PARTITIONING

Through predictive planning inevitable change can be accommodated for in order to make changes affordable and much less complicated. One of the options that should be implemented where possible, is changing the material of internal space divisions from brickwork to partitioning. Partitioning is constructed by using a lightweight aluminium frame which is clad with lightweight gypsum board. By incorporating partitioning future internal changes can be done with less complications, more affordable and more sustainable.

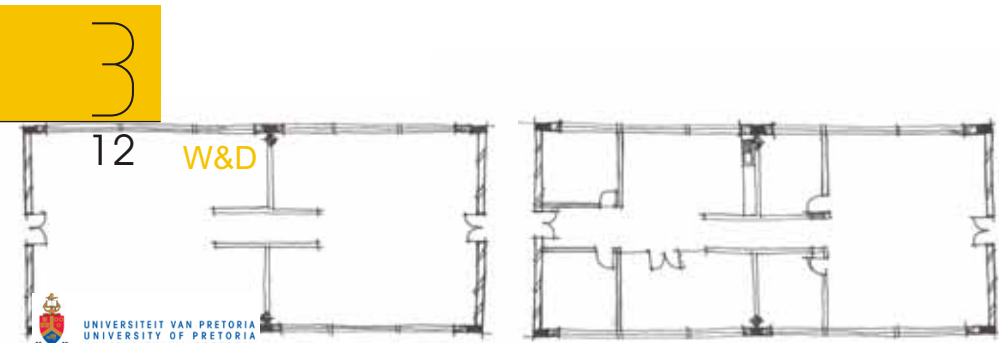
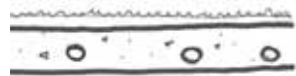


FIG 3-4: OPEN BUILDING

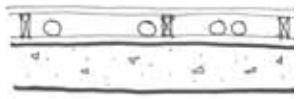
spatial requirements

The diagrams in the middle indicates how the plan of a space could be changed from just offices into a boardroom, a kitchen and lunch room etc., through the use of partitioning. The services also accommodates the changes by providing water and drainage points in the walls. The diagrams at the bottom indicates how the technique of Open Building could be applied to the partition layout in order for the tenant to change his/her environment according to their needs. The shell accommodates the partition changes through mullions in the windows and by arranging the structure as not to restrict the changes.

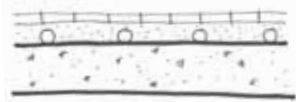
CONVENTIONAL WAY



SUSPENDED FLOOR



RIVER SAND



SUSPENDED CEILING

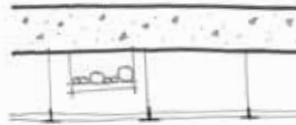


FIG 3-5: SERVICES FOR OPEN BUILDING

The other conventional way of building, is by placing service pipes and conduiting in the concrete floors which prohibits any changes to the services of a particular space. "Open webs between the floor and ceiling for electrical, plumbing, and heating ducts make installation and later renovations relatively simple" (Bensonwood Homes 2008: 2). Therefore with Open Building, service changes is accommodated for by using suspended timber or laminated floors where conduiting and pipes could be placed. Through this concept many changes of the tenant could be accommodated for.

Suspended floors can however not work in all spaces such as the mechanical workshops, due to the load of the machinery. Therefore river sand is used to accommodate the pipes with interlocking concrete pavers on top. Suspended ceilings should also be used to accommodate adaptable services. The grid system also allows one to put lights in any position as well as rearranging it according to any need. The ceiling panels could also be change into different colours or textures.

Incubators for innovative purposes should create an environment and a atmosphere which stimulate innovative ideas. The environment should therefore be extremely creative, innovative and continually changing in order to inspire and motivate the individual which is being incubated. The incubators accommodates for laboratories, studio space and workshops, as well as offices, presentation rooms, lecture rooms and exhibition spaces.

Incubators would need to provide for new tenants every year, which would all have different spatial requirements. The spaces in the incubator will have a large degree of flexibility and variety not only for practical reasons of leasing agreements but to stimulate the entrepreneurs' creativeness.

spatial requirements

We as designers and architects should recognize the human need to constantly upgrade and alter our living environments. Creative people especially prefer to setup and change their own environment, which is tailored to their own liking in order to perform optimally. Buildings in general and specifically incubators, should therefore accommodate and not complicate this phenomena to allow the industry to reach their full potential. It is therefore an important aspect to consider when designing buildings to be sustainable.



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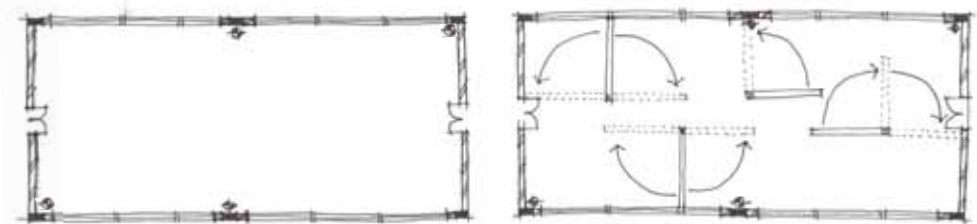


FIG 3-6: OPEN BUILDING - CREATIVE SPACE

The individuals should be able to move furniture around, rearrange spaces as well as changing the colours and textures. "Screens and furniture are now used to divide and define space" (Duffy, Cave & Worthington 1979: 10). Scenes are tailored to the tenants needs and requirements by installing adjustable and moveable screens. Furniture is used to define and divide scenes rather than making use of demountable partitions. Within the scene the worker have then the opportunity to manipulate and change his/her own workspace. The furniture used in the Incubator for Innovation should also not be conventional furniture but highly innovative in order to inspire and stimulate the entrepreneurs' creative thinking.

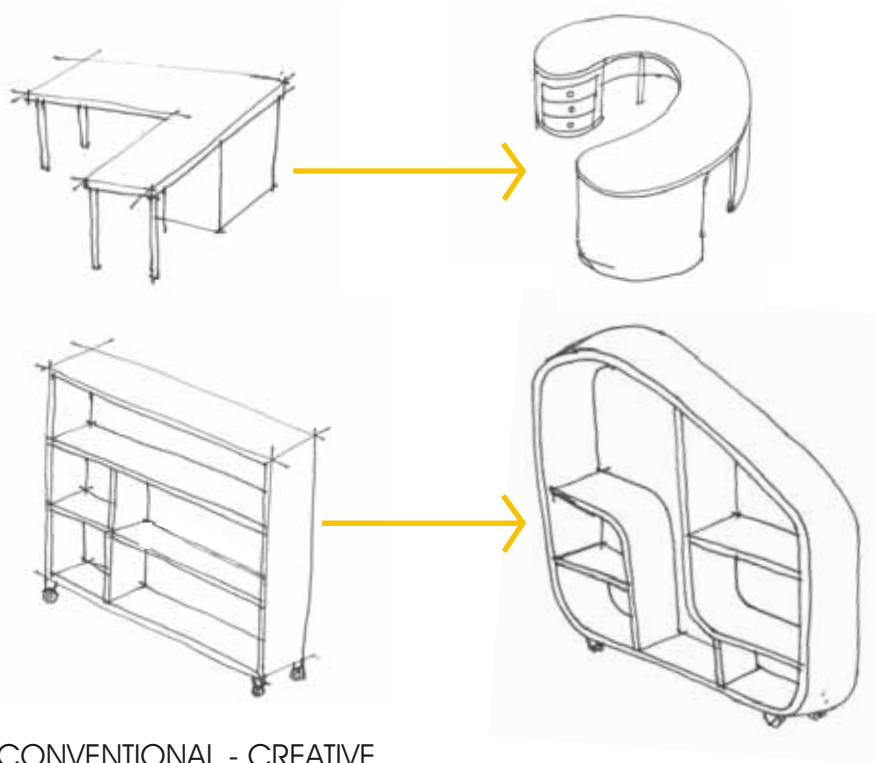


FIG 3-7: CONVENTIONAL - CREATIVE

The exhibition space will also be constantly changing which means the space should be extremely loose fit. It should have high ceiling volumes and large open spaces without columns to affect the ambiance of the space or restrict the flow of people. Again by applying the concept of Open Building there shouldn't be any fixed internal division but the space should be divided by movable screens which can be removed to increase flexibility. Services can again be accommodated in suspended ceiling and floor voids.

The spaces of the Incubator of Innovation would constantly be altered and remodeled, either for new tenants or by existing tenants executing their creativity for their own comfort. Therefore by implementing the concept of Open Building, create flexible, loose fit spaces which allow spaces to change according to needs. The creative individual can be incubated in a creative inspired and ever-changing environment. Change can now also be economically affordable, socially unproblematic and environmentally sustainable.

spatial requirements

How can Pattern Language (Alexander, Ishikawa & Silverstein 1977) assist with the regeneration of the urban environment?

Alexander states that where fast moving cars and pedestrians meet in the cities, the cars overwhelm the pedestrians. The car is king, and people are made to feel small (Alexander, Ishikawa & Silverstein 1977: 286). He explains that although cars increase peoples opportunities and give them freedom, they can also destroy the social life of an environment. We have grown so dependent on cars that one can't imagine an environment without them, and people refuse to give up the degree of freedom a private high speed car offer. It is undoubtably so that cars ruin their environment, ecologically and socially to create places where people don't feel welcome.

This occurrence of cars destroying the social environment of an area, is extremely apparent in many places including the University of Pretoria alongside Lynnwood Road. Cars not only destroy the social character of the areas but also the social interaction between neighborhoods. As a result of this dividing power cars have, areas get cut off from the rest of the urban fabric. For this problem to be solved, car volumes would have to decrease drastically through implementing a well functioning public transport system.

Roads should be dominated by public transport and not by private vehicles. One wouldn't be able to lessen the amount of people that utilize Lynnwood Road, but one can most certainly lessen the amount of private vehicles by introducing a well functioning public transport system. One of the reasons which give cars such a destructive character is as a result of the speed at which they commute. Speed limit signs and speed traps alone is not enough to restrict people from driving to fast.

urban design

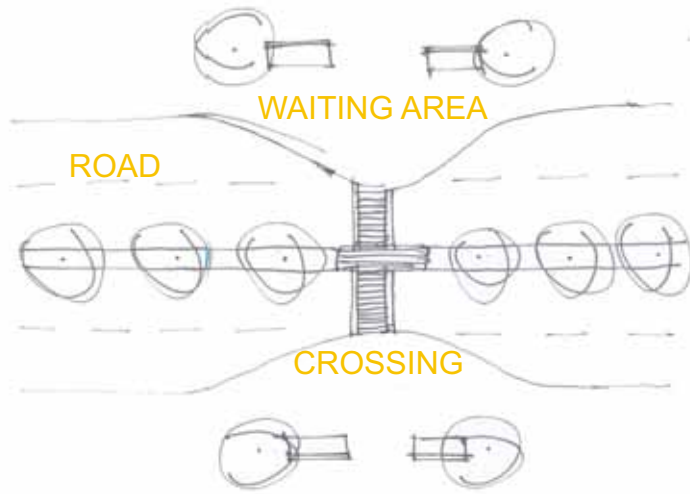


FIG 3-8: ROAD CROSSING



FIG 3-9: PEDESTRIAN PATH AND BICYCLE LANE

Therefore one should apply pattern (54) Road Crossing (Alexander, Ishikawa & Silverstein 1977: 280) which suggests narrowing the road and providing a waiting area for the pedestrians on either side of the road. It should be a raised walkway with a different base material, which will not only slow the cars down and emphasize the crossing but would give the pedestrians a sense of domination over the cars.

There should also be an island in the middle which would allow people to watch the cars coming from the other direction making it less terrifying for people to cross. Through the implementation of these road crossings, traffic would slow down to an inconvenient pace, which would discourage people to use private vehicles and utilize a well managed public transport system. This will assist in the integration process between the university and the Brooklyn area.

Bicycles should rather be used, they increase peoples health and are environmentally sustainable and urban friendly. As explained in pattern (56) Bike Paths and Racks (Alexander, Ishikawa & Silverstein 1977: 289), people are discouraged to use them as they are threatened by cars and trucks on the road. The same applies to pedestrians, they are also threatened by bicycles when they share the same path. There should be designated bike paths with a distinct surface material which can be easily recognized and should be kept separate from the pedestrian path.

The city should be designed in such a way that people are able to distinguish their part of the city from the rest. It should have a unique character and sense of place to create the 'genius loci' that a certain individual can identify with and feel comfortable to live there. In the pattern (14) Identifiable Neighborhood (Alexander, Ishikawa & Silverstein 1977: 80) it is stated that people need that identifiable spatial unit in order to belong.

urban design

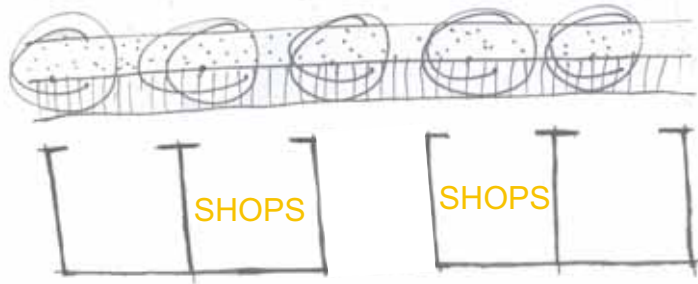


FIG 3-10: SHOPPING STREET



FIG 3-11: FOUR STOREY LIMIT

When considering this there should be a distinct character around the university, which portrays the social culture of students. A student social culture can be depicted spatially by high density student accommodation on top of shops, coffee shops and restaurants linked by shaded pedestrian and bicycle lanes. Through incorporating restaurants, coffee shops and street cafes, create some quite night life alongside Lynnwood Road, which can during the day form a shopping street similar to pattern (32) Shopping Street (Alexander, Ishikawa & Silverstein 1977: 174).

These mixed-use blocks should be knit together, and as described in pattern (33) Night Life, it should be well lit, safe and lively places (Alexander, Ishikawa & Silverstein 1977: 179). This would increase pedestrian activity at night. These buildings should not be higher than four stories according to pattern (21) Four Storey Limit (Alexander, Ishikawa & Silverstein 1977: 114), as buildings higher than that, can destroy the social life and promote crime. Through this, serve to create the 'genius loci' which a student can identify with, feel comfortable in and have a sense of belonging.

The different parts of the town all have boundaries, which is usually in the minds of the inhabitants, marking the end of an activity or a kind of place. According to pattern (53) Main Gateways (Alexander, Ishikawa & Silverstein 1977: 276), any part of town identified as a precinct should be reinforced by gateways. The identity and the activity of a place is emphasized more when the boundary in the minds of people, are also physically presented. These gateway boundaries can be represented in a number of ways, rather than having to physically drive under or through something. A boundary can be indicated by a change in the base material or the gateway could be marked by a landmark in the form of a building. The Administration building serves just that, with the proposed Incubator of Innovation being the other gateway.

urban design

How can Kevin Lynch's Image of the City (Lynch 1960) improve the image and legibility of the area?

Kevin Lynch describes that the image of an area is defined by the character and portrayed by the main elements of the city such as paths, edges, districts, nodes and landmarks (Lynch 1960). Paths are channels along which the observer moves to experience an area, which include streets, walkways, canals or railroads. Lynch states that providing a concentration of a certain unique activity alongside the path would give it prominence in the minds of the observer (Lynch 1960).

It is also the unique spatial qualities expressed by the architecture and landscape as well as the visual exposure and topographical qualities of the street itself, which gives a street its significance. On the southern side of Lynnwood Road, which is an extremely public road, there isn't that unique spatial quality which enriches the university and it should therefore be created. According to Lynch (Lynch 1960), a path can also derive its importance from being next to or within close proximity to a special feature such as a park, river or an university such as the case of Lynnwood Road. Lynnwood Road also has clear and significant origins and destinations, which help tie the city together and orientate the city users.

Edges are linear elements which is considered as boundaries between two areas (Lynch 1960). These boundaries are sometimes perceived as being barriers which closes off one area from another. These edges could also act as seams along which two related areas are joined together or could act as organizing features in holding together related areas and presented as a outline of a region or city.

urban design

The image of an area is influenced by the social meaning, the function, climate, aesthetics in both architecture and landscape, as well as the name or history of the area. This image is different to most individuals but some of these images is shared by a number of individuals. There should be an image or a sense of place created for the university which can be easily recognized as the university precinct. A space where a student social culture is created in order for them to feel comfortable.

Lynnwood Road, due to the amount of private vehicles as well as the speed at which they travel, is perceived as the edge of Brooklyn area, with the university being in another area. Through the implementation of urban design principles Lynnwood Road should be a seam which knit the two areas together. There should be activities alongside the road to form the feature that integrate the two areas with each other, in order for the areas to be perceived as one.

Districts are medium-to-large sections of the city, which an observer mentally enters inside, recognized by an identifiable character (Lynch 1960). The physical characteristics that determine a district are the texture, space, form, detail, symbol, building type, use, activity inhabitants, degree of maintenance and topography. These elements are used to create a sense of place which make people want to enter in or stay away and should therefore be carefully managed. These elements should be used to define the area around the university, in order for it to be recognized as the university precinct or district.

Nodes are points in a city into which an observer can enter, which is the intensive foci to and from where he is traveling (Lynch 1960) These could be primary junctions, a crossing or convergence of paths but can also be concentrations gaining importance from being a condensation of a certain use, function or character, such as an enclosed square. Some of these nodes, such as the University of Pretoria, could be the focus of the district, which govern the concept or character of the area in order to influence the surrounding functions of the buildings and spaces.

Currently when driving along Lynnwood Road, there is no indication of what the focus is of the area. The vehicles are driving at such a high speed, one would consider the fact that the cars are the focus of the area.

urban design

Lynnwood Road, as well as the architecture and urban spaces alongside it, should indicate that the university is the focus of the area. Everything in the area should therefore support a 'genius loci' which can easily be recognized as being an area for student social culture.

Landmarks are external point-references which are physical objects such as buildings, signs or stores including natural elements such as a mountain or even a large tree (Lynch 1960) These landmarks are singled out of a number of possibilities and therefore it should be prominent and easily identifiable. Towers or tall buildings are used to orientate oneself and symbolizes a constant direction through their extreme prominence and visibility. This is the case with the Administration building at the University of Pretoria. This building with its extraordinary architectural design, symbolizes the start of the university and with the proposed Incubator of Innovation symbolizing the end.

How can Responsive Environments (Bentley, Alcock & Murrian 1985) assist in the urban integration?

The book discusses the design of places with regard to their permeability, variety, legibility, robustness, visual appropriateness as well as the richness and personalization. Permeability deals with the degree of accessibility or the number of alternative ways to move through an environment (Bentley, Alcock & Murrian 1985). For an environment to function successfully within the rest of the urban fabric it should have good permeability.

With the University of Pretoria on Lynnwood Road, traffic restricts pedestrian permeability moving across Lynnwood Road to the southern residential area and 'visa versa'. Due to the connectivity the road establishes between the N1

urban design

highway and the central business district, the road cannot be closed off and used solely for the university, but the road can be altered and the amount of private vehicles could be lessened by implementing a well managed public transport system in order to increase permeability with the university.

Variety considers the different types of uses or the number of choices available to the people in order to get a diversity of experiences. (Bentley, Alcock & Murrian 1985). Through the variety of uses of one specific area, different people from different places with a different desire can utilize one area. Through this array of options integration between different areas can be achieved.

When considering the area to the south of the university, there is no diversity present. It is a single use residential area, although it is close to Hatfield Business and Brooklyn business center, there are no shops or coffee shops alongside Lynnwood Road to offer some variety to the area. With the student being the focus of the area, there is very little options attracting them. Therefore by creating variety focused on students alongside Lynnwood Road, such as high density housing, shops and nightlife, integrate the Brooklyn area to the south of Lynnwood Road with the university.

The degree of changeability of a place, in order to be used for different purposes, is identified as robustness. (Bentley, Alcock & Murrian 1985) The buildings to be built on the edge of the residential area, forming the threshold between the university, should have spaces on the ground floor which are extremely robust. There would be student housing at the top floors, but the ground floor will be ever changing. The space could be a restaurant the one year and the next year a tenpin bowling space. The appearance or image of the place should inform the user of the different choices the place has to offer.

urban design

The different sensory experiences offered to people using a particular space is termed richness. (Bentley, Alcock & Murrian 1985) When driving down Lynnwood Road, one is disappointed to witness single use dwellings on the opposite side of an university. Therefore by providing mixed-use four storey building, serve to increase the richness of scenery adding to the 'genius loci'.

Humans are creative beings and the term personalization, investigates the degree to which a space could be modified to their own taste (Bentley, Alcock & Murrian 1985). Students especially enjoys not only customizing their space but changing it often. This could be accommodated for through creating a robust space and incorporating the concept of Open Building, but it should be controlled as not to be eclectic.

The relative ease with which people can understand an area or layout is defined by the legibility of that area. (Bentley, Alcock & Murrian 1985) The area the thesis would be based in should be defined as a university precinct. Due to the fact that the Lynnwood Road is the front facade of the university, the area should depict the university social culture. There are currently just single dwellings which doesn't provide a sense of place to the area. Therefore the buildings to be built alongside the road should depict student social culture, creating an image which is legible.

urban design



FIG 4-1: REBECCA EMERY/ UNIVERSITY OF PRETORIA

There are incubators internationally as well as locally and almost none of the incubators provide the same services, facilities or incubation program. The Innovation Hub will be studied, as one of their departments is an incubator, in order to serve as a South African example. International incubators will also be analyzed to get a holistic idea of what to incorporate and what to provide to innovative graduates of the University of Pretoria requiring incubation.

Architectural precedents will be studied with regard to the aesthetics suitable for an incubator of innovation, in order to indicate a successful design product. Precedents for the internal spaces of the incubator will be analyzed. These spaces should incorporate the concept of Open Building in order to accommodate the phenomena of inevitable change. Precedents will also illustrate creative internal spaces which provide an environment where innovative entrepreneurs can flourish.

introduction

The Massachusetts Innovation Center (MIC)

The Massachusetts Innovation Center (MIC) offers growing businesses access to the required space and facilities which would have otherwise not been available to the young start-ups. The MIC affiliates have access to conference rooms and flexible and affordable business space. These spaces can be customized and expanded according to the business needs and growth of the tenant. All the office spaces have direct and high-speed internet connections through OC48 fibre optic cables as well as successful telecommunications system. They also provide office reception services as well as the use of the latest office equipment including copiers, fax machines and audio-visual equipment.

The MIC, situated in Fitchburg, is well located and within close proximity to central business districts namely Boston and Worcester and near important corridors such as Massachusetts Route 2 as well as major highways being Route 495 and Massachusetts Turnpike.

Panasonic Digital Concepts Center (Wu 1999)

The Panasonic Digital Concepts Center (PDCC) incubates companies that provide emerging technologies in order to create partnerships that provide value for the next generation of networked consumers. The organization consist of a corporate venture arm which offers funding to the incubator companies, the Technology Partnerships unit that filters strategic opportunities and an incubator that grows startups. The PDCC's mission is "to form partnerships with startup and private technology companies in order to create new technology." (Wu 1999) Companies find PDCC ,as a community of entrepreneurs, an enriching experience where they can learn from one another.

incubators

Entrepreneurs sharing ideas with each other has always been the core of building strong companies. It is during this incubating period, and within this safe environment, where you learn from others' mistakes and successes in order to reach maturity. PDCC's incubator offers market rate rent with furniture included and shared common spaces. They provide mentoring programs as well as getting professionals to come in and give advice to the young entrepreneurs. The management team introduce the entrepreneurs to possible partners, investors and customers in order to startup their company.

San Jose: Software Business Cluster (Erickson 1994)

This is an incubator supported by the city of San Jose in order to create software companies that will infiltrate their tax-base infrastructure after graduation. At that stage the incubator have already graduated about 60 companies into the world where most of the companies have remained and contributed to San Jose. The reason for setting up an incubator there, was to create an environment in downtown San Jose that would attract technology companies in order to make San Jose the capital of Silicon Valley.

The incubator not only provides the usual amenities such as office space, furniture, shared conference rooms, and a internet line but also consultation with the SBC director, advisors and executive associates. They provide business development seminars as well as business assistance through a network of business professionals. In order to get the startups going, they provide introductions to business resources including the capital investment community.

The Nidus Center for Scientific Enterprise (Calcaterra 2000)

The Nidus Center is developed by many people and organizations which had one thing in common, which is to make St. Louis the hub of all agricultural

incubators

biotech and life sciences research and companies. Their vision is enriching lives through applied technology and in order to achieve this, they nurture entrepreneurs, protect and grow innovative ideas as well as commercialize new technologies and attracting investment capital.

This incubator offers business plan development, coaching, management expansion, consulting services as well as business seminars and data networking technology. The Nidus Center also offers wetlabs and the required equipment through charging over and above the normal rent fee, an additional monthly fee, which is not nearly as much as obtaining the services on their own. They provide equipment and product testing services, hazardous waste removal, Nuclear Regulatory Commission Radioactive Materials licence, scientific photographic film development facilities as well as a growth chamber.

Applicants were only admitted to the Nidus Center if it is a technology-based in the plant science/life science industry and which has a novel product or manufacturing process. They only admit companies to the incubator if they have business models that make sense and whether the company will be a self-sustaining company.

Enterprise Development, Inc. (Zeman 1988)

Enterprise Development, Inc. (EDI) is a catalyst for economic growth in Northeast Ohio which assist entrepreneurs to find, assemble and effectively employ the four main ingredients for a business to be a success, namely technology, capital, facilities and personnel. EDI provide programs to help entrepreneurs achieve their goals through offering education courses and Minority Assistance Programs in order to start and grow their business.

incubators



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The sole purpose behind the program development of the EDI is to grow companies in Ohio which would sustain and feed the state's economy. Their mission is to "incubate, educate, and recognize entrepreneurs and growing businesses that have potential to have a significant impact in the region" (Zeman 1988).

When looking at what they are offering, one of the most valuable is flexible incubation space which can be customized or expanded to accommodate companies' high growth potential. Entrepreneurs interact a lot amongst themselves, they share ideas, learn from each other and also make deals with one another. Therefore networking and making introductions is extremely important when it comes to innovative thinking and the space should allow for these kind of relationships. They provide educational programs through inviting business professionals and CEO's of successful companies to come and share their experiences in order to ensure the startups rapid business growth.

The Cambridge Science Park (Cambridge University 1973)

The Cambridge Science Park incubator is located on the university's premises in the city of Cambridge. This development was proposed by the university's committee in response to the Whitehall who had urged UK universities to increase their contact with the industry. Their objective was to increase technology transfer, increase payback from investments made in basic research as well as functioning as an expansion to higher education, specifically for new technologies.

It was then developed close to Cambridge to take maximum advantage of the scientific expertise, equipment and libraries, in return to increase feedback from industry into the Cambridge scientific community.

Accompanying this development was St. John Collage's incubator, which

incubators

provided business support and accommodation to start-up companies. They provided free advice to tenants on business issues as well as engaging them to partake in university department programs which would promote the knowledge of wealth creation. The incubator assists the entrepreneurs in order to get access to funding and also act as a catalyst in promoting technology development.

They offered flexible accommodation and shared communal facilities including conference rooms and a restaurant. It offers advice on sources of assistance in the university; product innovation, design and manufacture; human resource management; finance, venture capital and grants as well as marketing and public relations. They also provided company administration, secretarial and accounting services, which would assist the young entrepreneurs.

Innovation Hub (Blue IQ 2000)

The Innovation Hub is a project of the Gauteng Provincial Government's Blue IQ Investment Holdings, to invest in economic development infrastructure in Gauteng. It is situated in Pretoria next to the N1 highway close to the CSIR and and next to the University of Pretoria's experimental farm.

The Innovation Hub's guiding vision is to grow the wealth and quality of life of the people of Gauteng by the full implementation of The Innovation Hub as a Science Park, founded upon innovation and collaboration, and driven by a 'cluster' -centric focus. Their core values include innovation, integrity, teamwork and partnerships as well as having an entrepreneurial approach and mind-set, in order to create high value concepts and products.

incubators

BUSINESS PURPOSE

- Developing and growing entrepreneurs in high-tech sectors within the Province
- Acting as a catalyst in bridging 'the commercialization chasm' to significantly increase local innovative technology development and its business application
- Becoming the centre of gravity of innovation knowledge economy initiatives and thereby entrenching The Innovation Hub brand
- Supporting the sustainable growth of the provincial economy through the development of a critical mass of knowledge workers in a cluster of innovative businesses
- Assisting in the creation of a Smart Province and connected community in the Global City Region of Gauteng.

The Innovation Hub harnesses and nurtures a networked flow of knowledge and information to enable and drive national growth, and helps to create the global competitiveness needed to successfully build Gauteng as a global city region. The Innovation Hub facilitates the interface between the research and development and its business community.

The Innovation Hub's Science Park environment harnesses the exploitation of innovation through co-location, infrastructure design and management, and nurtures vibrant interaction and the cross-fertilization of ideas to create networks, and to share learning and experience. (Mashatile 2007) It is mandated to develop knowledge-intensive business clusters as a foundation for the generation of intellectual property in order to support entrepreneurship and thus their impact on the economy. The emphasis of the development of the Innovation Hub has been on creating a balance between the provision of infrastructure and value-adding services to residents. It is designed to stimulate collaboration, interaction and networking, and by providing exhibition spaces,

incubators

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to showcase new developments. Business support services are aligned with the needs of precinct occupants. Conference venue and restaurant form part of the infrastructure to stimulate interaction and provide facilities for events, workshops and seminars.

The Maxum Incubator at The Innovation Hub continued its focus on attracting technologically innovative companies with high growth potential by offering them the following:

- flexible leases,
- appropriate infrastructure and services
- business mentors which provide advice and coaching
- networking with established companies
- access to sources of funds
- media exposure
- shared common spaces such as meeting, restaurant and catering facilities

The CoachLab attract postgraduate students to be part of a year-long leadership development program, in order to breach the gap between the academic and business worlds. Coach lab offers the following:

- Opportunities to work on projects with industry leaders
- Networking with business leaders
- Action learning and leadership development
- Mentorship on technical and business skills

incubators



FIG 4-2: LANDSCAPE FORMATION ONE - SECTION 1

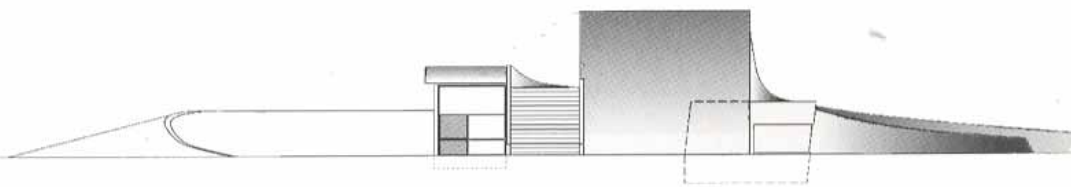


FIG 4-3: LANDSCAPE FORMATION ONE - SECTION 2

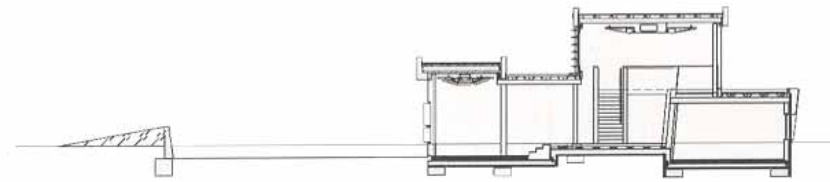


FIG 4-4: LANDSCAPE FORMATION ONE - SECTION 3

Hadid, Zaha. 1999. **Landscape Formation One**. Weil am Rhein, Germany. This building, designed by Zaha Hadid, serves to be an event and exhibition space. The building's tectonics and especially the curvilinear and flowing lines makes it a highly innovative building. The building respects the existing network of paths by emerging out of the ground and making it part of the landscape as well as being interwoven with them through the fluid form.

Zaha Hadid used concrete extensively, purely for aesthetic reasons, making the building high in embodied energy and unsustainable. The more sustainable alternative to the concrete would have been stabilized earth compaction. Aesthetically it would have also been more pleasing to use the soil from the terrain in order to increase the connection with the landscape and thus strengthening her concept of being a landscape formation.

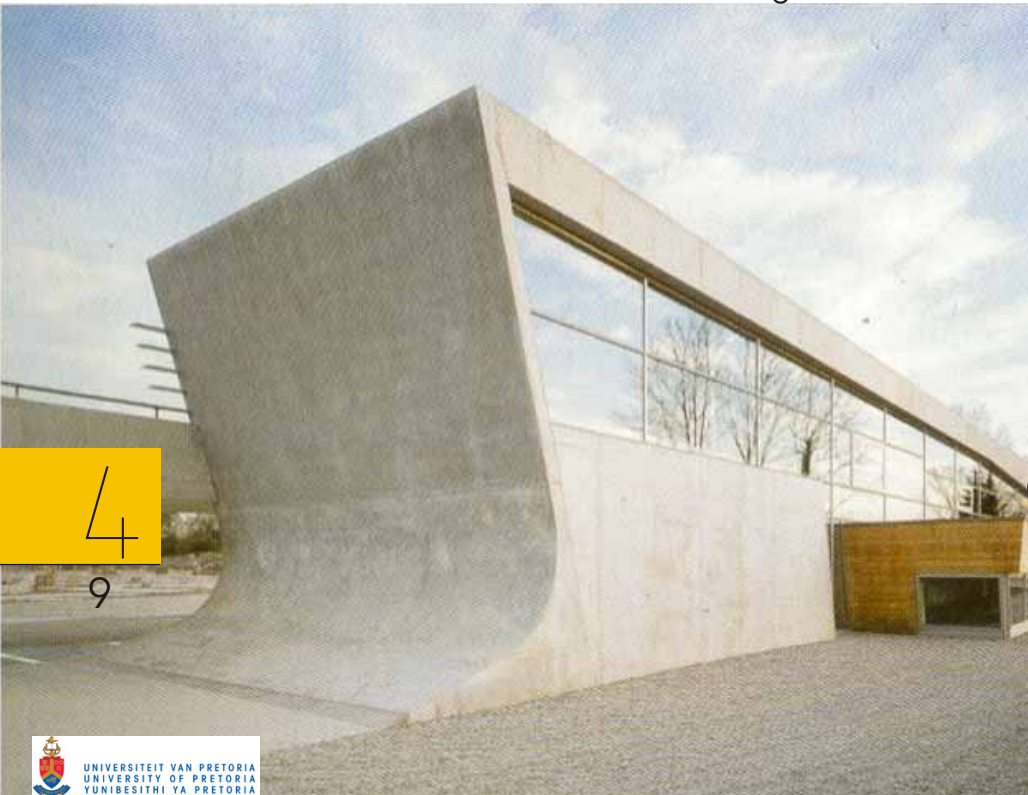


FIG 4-5: LANDSCAPE FORMATION ONE - FRONT PERSPECTIVE



FIG 4-6: LANDSCAPE FORMATION ONE - REAR PERSPECTIVE

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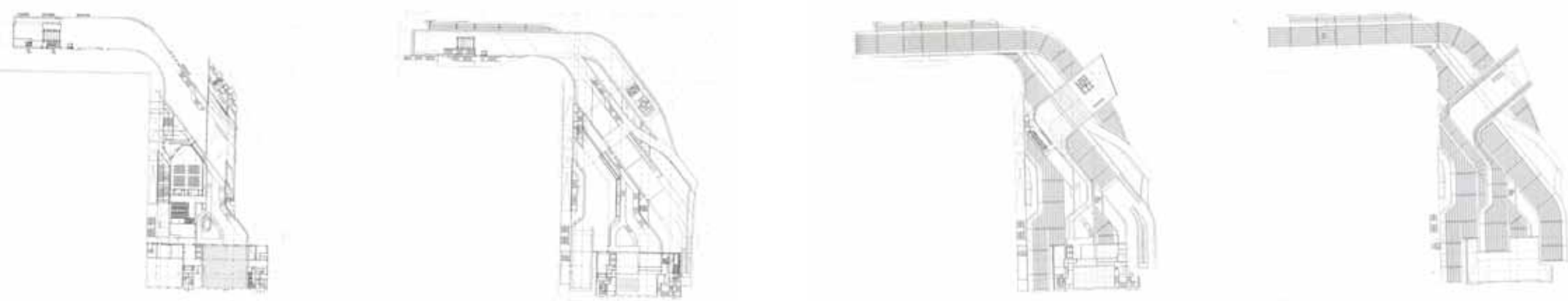


FIG 4-7: NATIONAL MUSEUM OF XXI CENTURY ARTS - PLANS

Hadid, Zaha. 1997. **National Museum of XXI Century Arts**. Rome, Italy. The building, designed by Zaha Hadid, is a museum for contemporary arts. The building is a response to the urban context to form curvilinear lines, which is derived from imitating a nearby river. Again it is the building's curvilinear form which makes it extraordinary and innovative. The fluid shape of the building guides people from the road into the building.

The glass roofs would however not work in South Africa due to the climate we experience by being so close to the equator. The buildings built in South Africa should not have exposed glass facades on the northern, western or eastern side without adequate sun protection or the correct overhangs.



FIG 4-8: NATIONAL MUSEUM OF XXI CENTURY ARTS - PHYSICAL MODEL

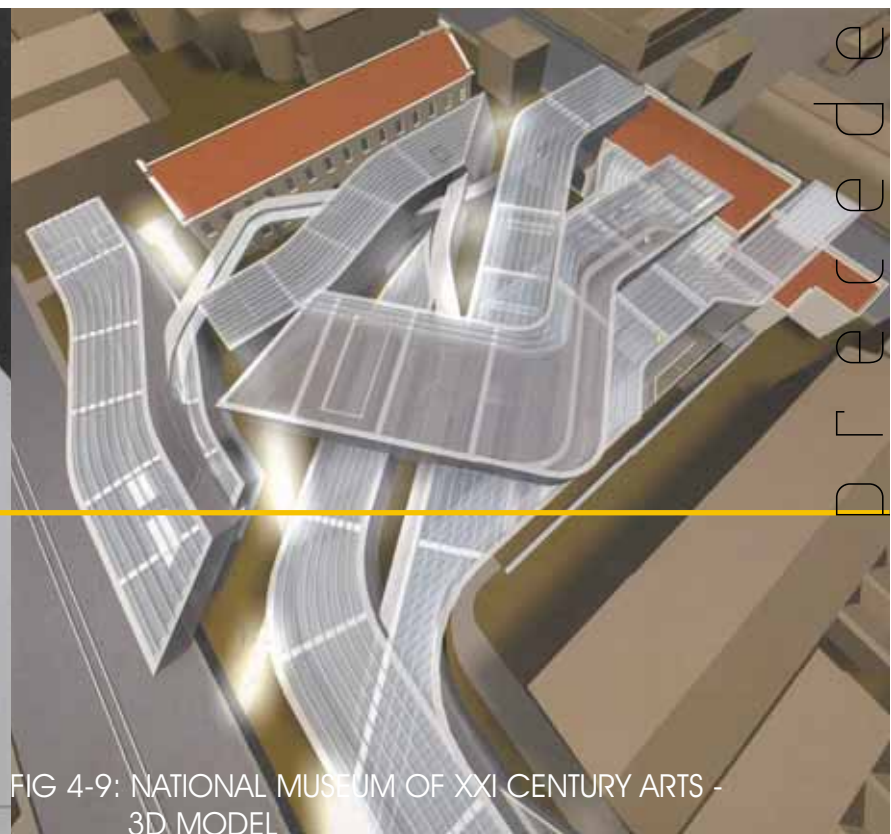


FIG 4-9: NATIONAL MUSEUM OF XXI CENTURY ARTS - 3D MODEL

precedent
 study

It is not necessary to have internal divisions within office spaces. It could just be a large open space where everyone works. Through this open plan method, people are not isolated from each other, which means that people could not only assist each other with work related problems but social interaction can take place, making work less tedious. The loose furniture that where chosen can be arranged to form some enclosure, but it is however too rigid and repetitious, forming an uncreative environment..

Miralles, Enric. 2007. **Benedetta Tagliabue**. Palafolls, Spain. Work shouldn't be a place that is despised, but a space where your passion could be outlived amongst people who have the same enthusiasm and drive. The individual should be able to customize his or her own workspace in order for the person to feel comfortable. The space and the furniture should be able to be rearranged with relative ease, in order to make a space flexible and creative.

Adjaye Associates. 2004. **Idea Store**. London. The office should be fitted with a durable floor to allow a suspended floor to be fitted and again removed if required. The furniture placed in these spaces should be highly innovative in order to assist in establishing a creative environment for the entrepreneurs.



FIG 4-10: OFFICE SPACE



FIG 4-11: OFFICE SPACE



FIG 4-12: OFFICE SPACE



The open plan of this studio space allows people to rearrange the current furniture as well as bringing in other furniture such as coaches to form new spaces. It is in such spaces, where people are constantly interacting with each other and where creative ideas are born.



FIG 4-13: STUDIO SPACE

Again it is not necessary to have internal divisions within the laboratories, it could just be a large open space where everyone can assist each other. Where the space doesn't require services to be moved for future changes, suspended flooring isn't necessary and the floor can be made extremely durable by tiles or a pigmented screed.



FIG 4-14: LABORATORY

Spaces can be divided by using furniture rather than partitioning, which makes interaction between individuals easier. The dividing furniture provides some privacy but more importantly it creates a space for the individual. A creative person enjoys customizing their own space, making themselves not only feel comfortable but in control of their own environment.



FIG 4-15: STUDIO SPACE

spatial requirements

The stairs and circulation leading from the one exhibition space to the other should form part of the exhibition journey. Every space should be loose fit in order to be custom designed at any given time.



FIG 4-16: CIRCULATION SPACE

Art is not just canvas on a wall but multifaceted and multidimensional. Therefore projectors with screens could be used in the exhibition spaces as well. When using a suspended ceiling, the colour of the ceiling tiles could be changed to create different scenes.



FIG 4-17: Architecture and Design Exhibition

Suspended timber flooring can be used at certain places to create a change in level or to provide space for needed services.



FIG 4-18: EXHIBITION SPACE

exhibition spaces

The shell of the building should be a creative and timeless design. The spaces should be versatile with high double volume spaces where people from other spaces can look from.

When the shell of the building is long life and loose fit, the scenery of the exhibition space could be changed by using and molding gypsum plaster board. This can then be removed again to make space for yet another make-over.

Again a loose fit shell provides a space which allows artist and set designers to do anything in order to present the scenery highly creative and innovative.



FIG 4-20: EXHIBITION SPACE

FIG 4-21: EXHIBITION SPACE

exhibition spaces

FIG 4-19: Yokosuka Museum of Art

Here in this exhibition space partitioning is used to divide the internal spaces. It is however tedious to take down if one should decide to use the two spaces for one large open space. Therefore movable screens should be incorporated which will make the space more flexible.



FIG 4-22: EXHIBITION SPACE

The exhibition space should have high volume ceilings in order to accommodate large pieces of art, models or sculptures. Other spaces should be able to look onto the exhibition space to make them part of the excitement.



FIG 4-23: IMM COLOGNE

The presenting of an exhibition space shouldn't just be the dividing of spaces through the use of moveable screens but should be innovative and exciting.



FIG 4-24: EXHIBITION SPACE

exhibition spaces