



Shanghai Manual

**A guide for sustainable urban development in the
21st Century**



Science, Technology and Innovation for Sustainable Cities

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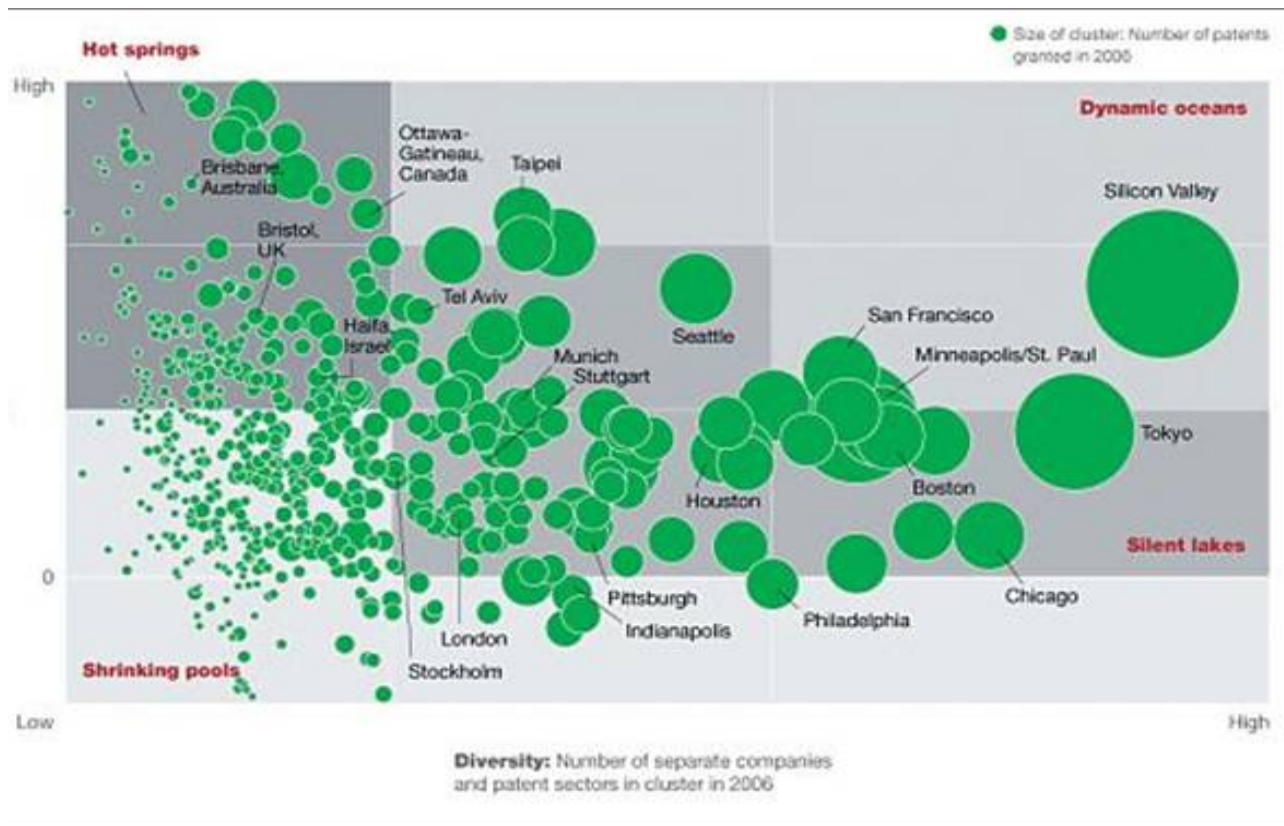
- Consultations
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- Design (project and site)
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3. Case Studies

Innovative cities

“The urban environment acts as the primary locus for innovation, industrial and technological progress, entrepreneurship and creativity”
(UNHABITAT 2011)





Where are the developing country cities?

Source: McKinsey and Company

Indicators of 'innovative' cities

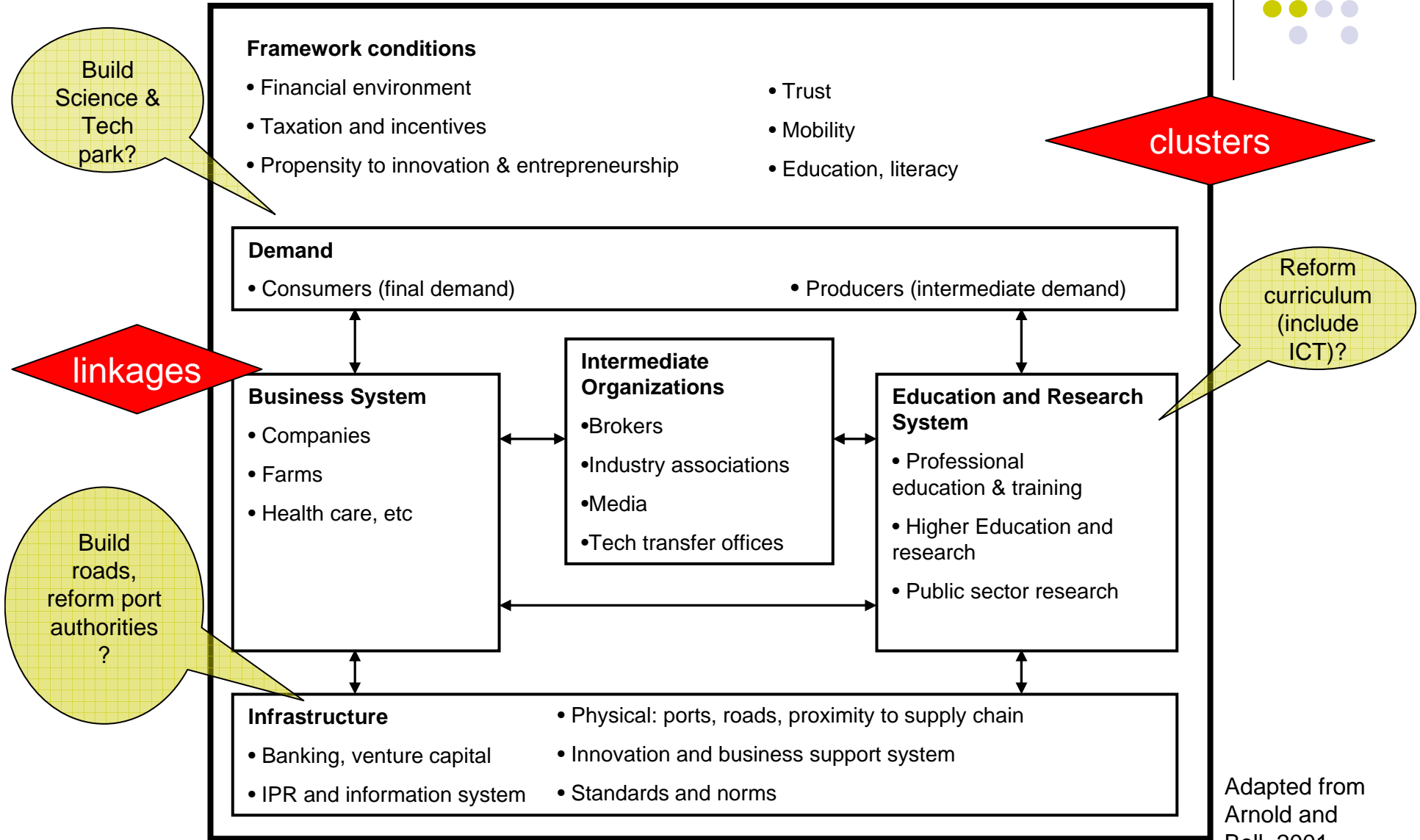
TECH HOTSPOTS AND THEIR RATING (ON A SCALE OF 1-5)

	Startup Activity	Human Talent	Venture Capital	Global links	Univs. /R&D	Taxes/Regul.	Total
Britain/Cambridge	3	4	4	2	4	4	3.45
Finland/Helsinki	3	4	3	3	5	3	3.45
India/Bangalore	4	3	2	4	2	2	3.05
Taiwan province of China/HsinChu-Taipei	4	4	4	5	5	5	4.35

Source: Rosenberg, 2002.

Patents, growth, starts ups: where do they come from?

The Innovation System

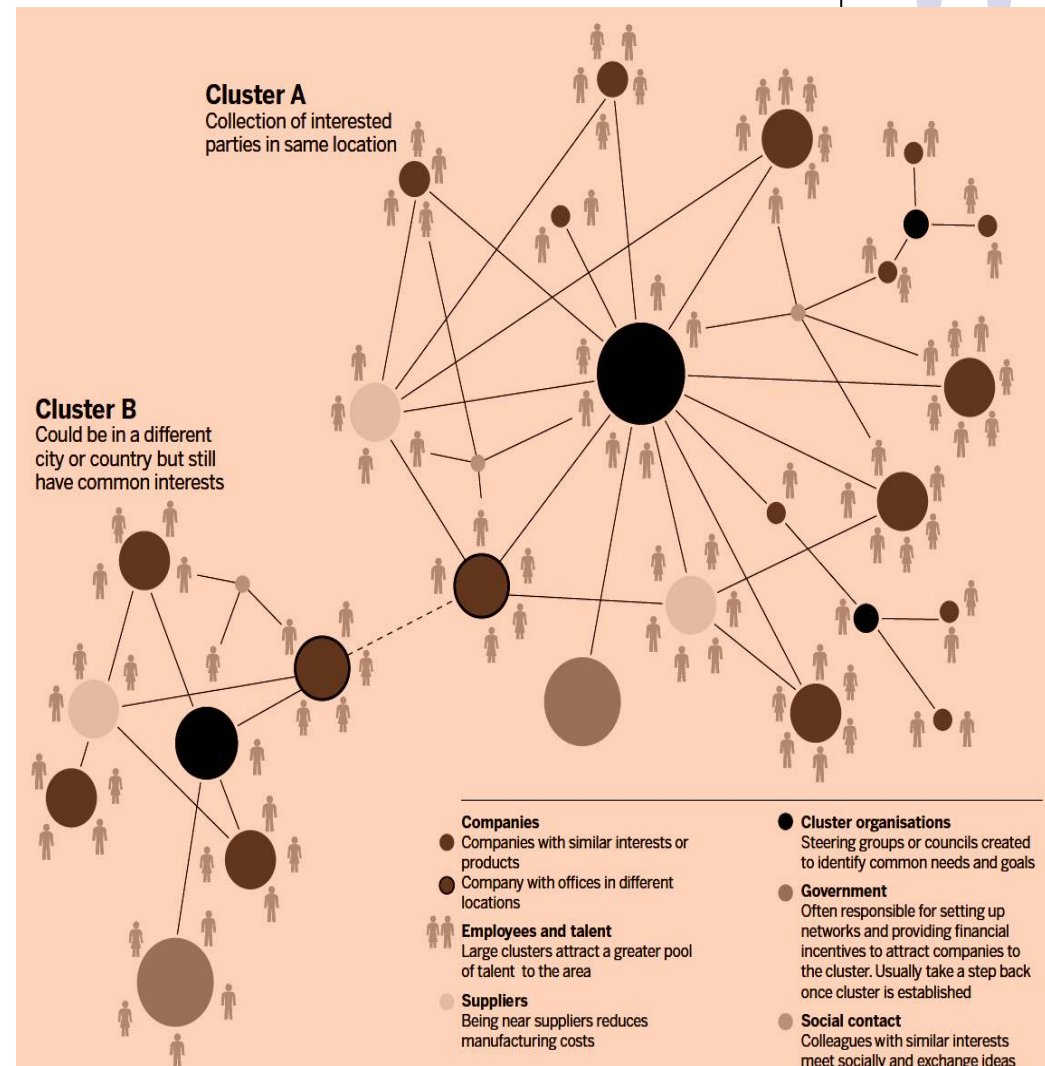


Adapted from Arnold and Bell, 2001

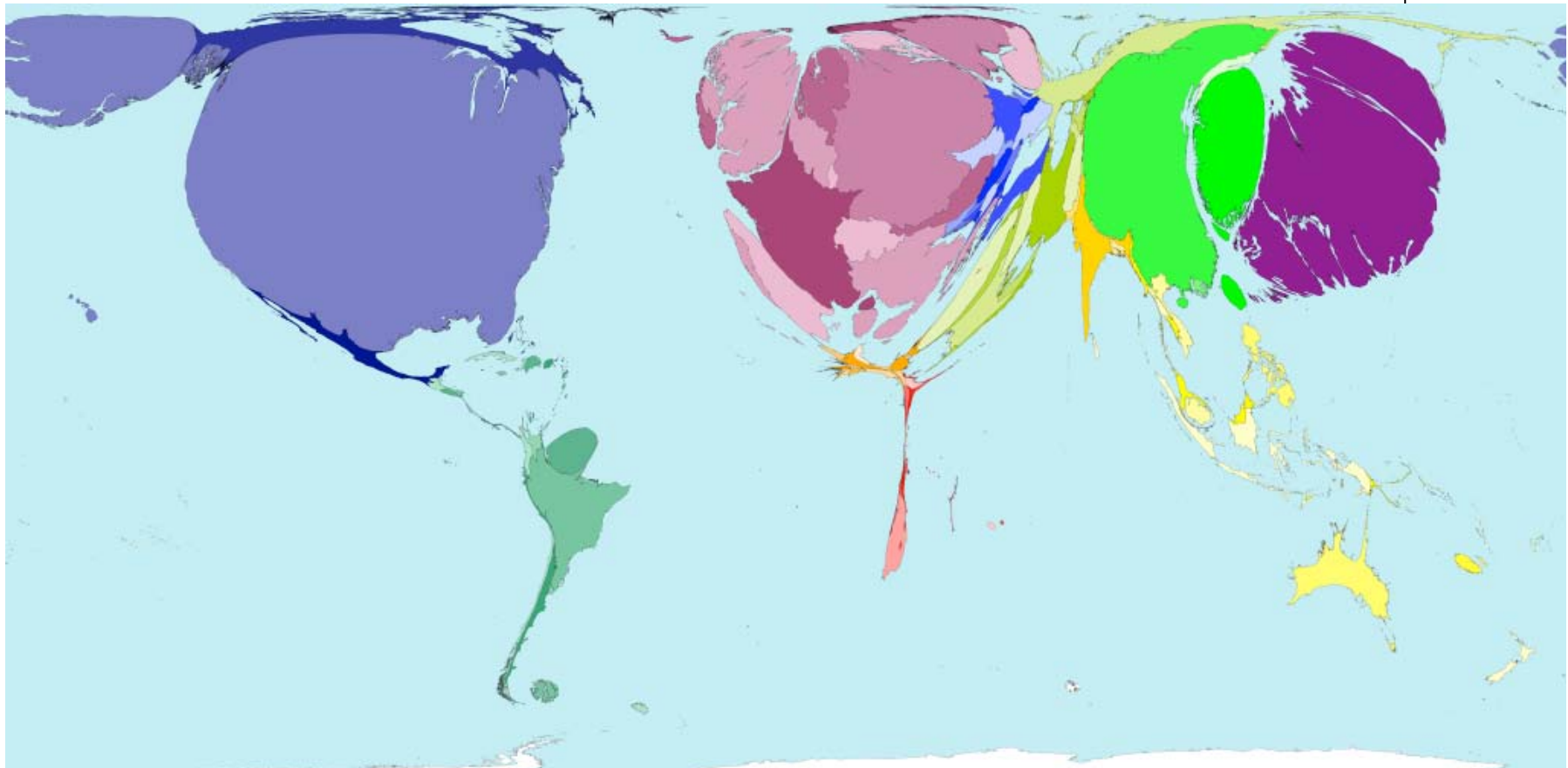
Knowledge based societies: opportunities for cities



- **Knowledge** as the principal component of value creation, productivity and economic growth
- **Innovation** as the creative use of knowledge, a continuous process, enabled by **innovation systems**
- **Clusters** of knowledge and expertise contribute to innovation systems
- Cities as dense, networked, knowledge producing hubs



Currently, many developing countries not on the map



Territories sized in proportion to worldwide R&D spending

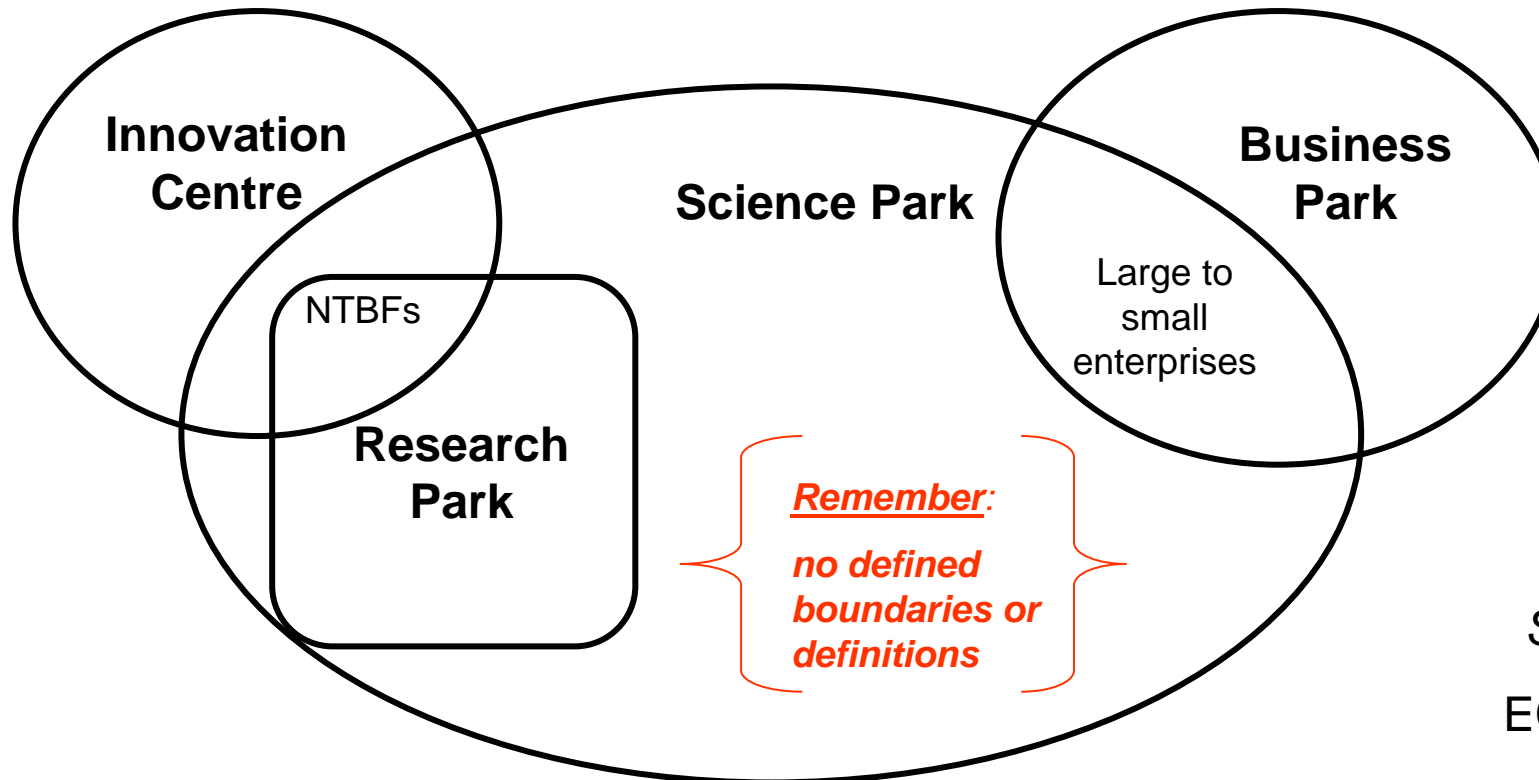
Source: www.worldmapper.org

Introducing science and technology parks



- One way to form a cluster is through science and technology parks (STPs)
- A STP can be defined as:
 - an organization whose main purpose is to improve the well-being of the community where it is located by encouraging a culture of innovation and competitiveness through knowledge-based institutions and related businesses.
- In general, STPs can provide:
 - Visibility
 - Advanced infrastructure
 - Complementary services and support
 - Strong networking opportunities
 - Easy access to capital – both financial and human
 - Favorable zoning and incentives

Types of STPs



Source:
EC 2008

- Different kinds of STPs offer different opportunities for improving the innovation system:
 - Ease of access to finance for start-ups
 - Linking firms with universities
 - Hybrid parks

Examples



Park	Date	Location	Genesis	Focus	Key points
Route 128	1950s	Regional cluster along highway	Organic	Electronics	Attractive to high tech firms; historically innovative area, good universities nearby. Government supportive but not involved in development. University links strong.
Stanford (Silicon Valley region)	1950s	On University Campus	Planned	Electronics., ICTs	Planned to build up area already rich in tech capacity and education. Spawned Silicon valley; networks and knowledge exchange encouraged. University links strong.
Oulu Technology Park Ltd	1980s	Park site, in area of tech cluster	Planned	ICT and Telecoms	Built on a solid knowledge and tech base. Science park built as intervention by local Gov and academics to stimulate more. Approximately 8,000 people, representing nearly 600 companies, work in its technology centers.
Thailand Science Park (TSP)	2002	Separate park site	Planned by Government	Multiple: including ICT, Electronics; Food & Ag, Biotech	Strong Government input, managed by Government body: National Science and Technology Development Agency (NSTDA). Home to NSTDA's HQ and National Research Centers.

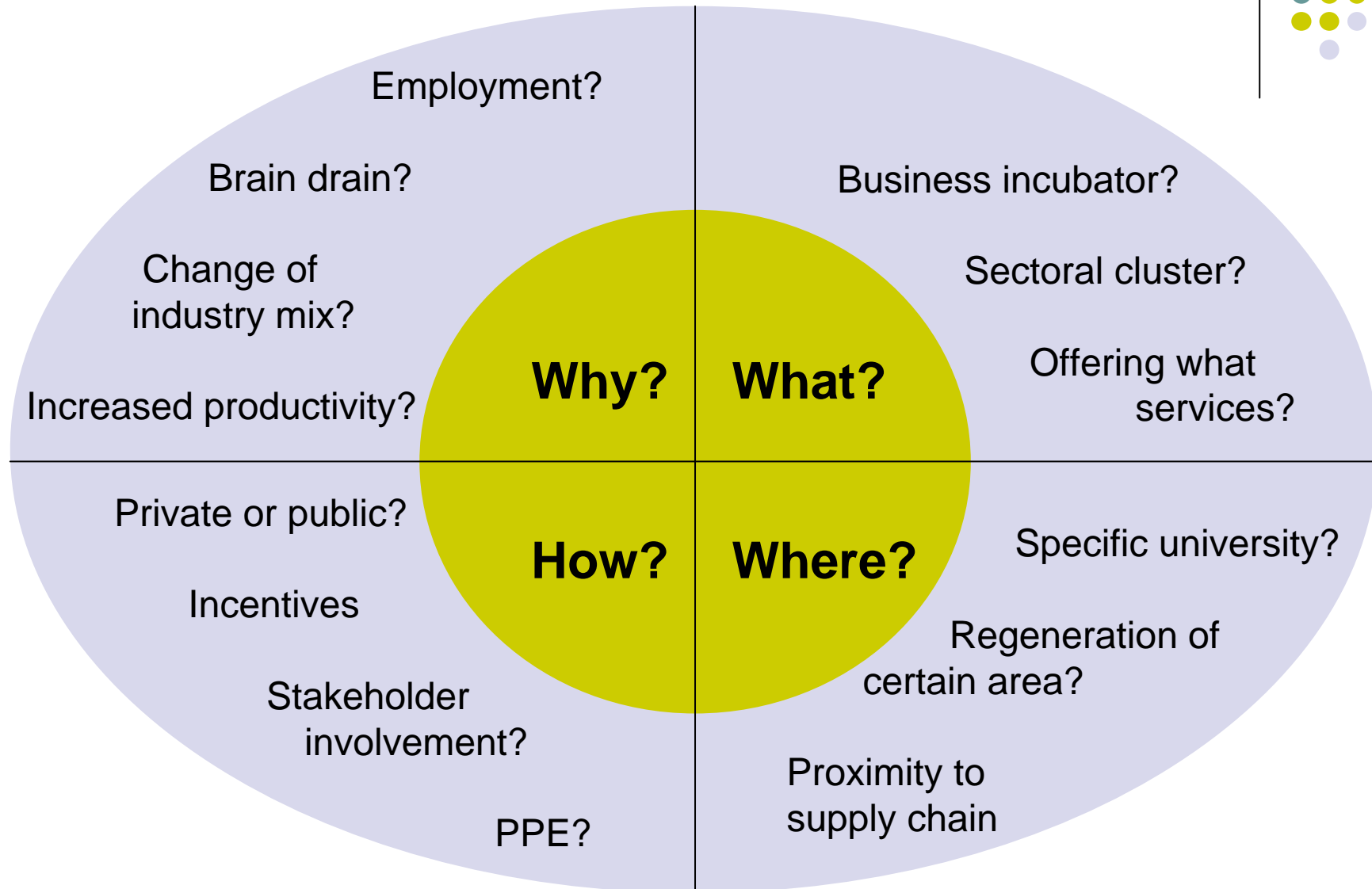
2. Designing and building a park



Before building anything:

- **Know your innovation system. Get data on local processes: links, supply, education, production, investment climate, weaknesses/strengths....**
- Identify potential fertile ‘frontiers’ or ‘avenues’
 - Foresight exercises?
- Make sure ‘frontiers’ and ‘avenues’ are realistic and appropriate
 - Should link back to innovation system and to institutional capabilities
- Get help:
 - UNCTAD (STIP reviews, ICT policy reviews); UNESCO (feasibility reviews); DESA training; UNIDO (ITPO)

Tailored designs



Consultation

- During concept stage, engage with:
 - Universities
 - Entrepreneurs
 - Firms
 - Investors
 - Technology transfer offices
 - Regional authorities
 - The public
 - Infrastructure providers
- Networking: attract investment and ensure design meets needs of users
- The inclusion of stakeholders in the planning process (and throughout) is imperative for sustainability



Identify potential partners



- Typical S&T park partners (and motivations) in the developed world:
 - Government – National, Regional and Local
 - Global competitiveness, and to facilitate economic development
 - ROI on education and R&D investment
 - Education /R&D institutions
 - Change the culture of academic and research staff
 - To increase research income and post-graduate student numbers
 - To enhance public image through demonstrated relevance
 - Business
 - Forming business relationships with SME technology companies
 - Commercialising internally developed technology
 - Forming research and strategic links to universities

Realities of countries building first STPs



- Major shareholder and initiator is probably Government
 - Which parts of government will be involved?
 - What resources are available?
 - Direct involvement or through a government agency?
- Embryonic innovation systems likely to be fragmented:
 - Universities have a limited research base or entrepreneurial experience
 - Business has limited links with universities
- Linkages not well developed - perhaps even scepticism between potential partners

Managing partnerships effectively



- Differences in motivations, visions & commitments of partners has potential for problems if alignment is not ensured at the start
- All partners must have a full understanding of intended STP concept
- Agree upon and document the role of each partner
- Identify a project champion to drive the initiative and negotiate these relationships?

Designing the project



- Conduct a feasibility study
- Agree principles upon which the project will be governed, institutionalized, managed and financed (ideally as an input into the feasibility study)
- Finalise the Institutional Format
 - Consider the implications of different institutional formats, taking into account that STPs can take 10-15 years to full evolution.
 - Tax implications, limits to financing, etc.

Designing the site



- The big budget item is the “real estate and buildings” and there is only one chance to get them right!
- Develop a Master Plan - must be aligned with the STP’s objectives
 - The core infrastructure (e.g. access, roads, bulk services, security, etc.)
 - Set the environmental, architectural and landscaping standards
- Anchor projects and public engagement can help generate a good reputation and ensure legitimacy
- Designing the buildings
 - Develop understanding of the tenant needs to ensure facilities meet their requirements
 - The first buildings set the tone for the whole STP
 - Design to ensure interaction of tenants and partners

Management



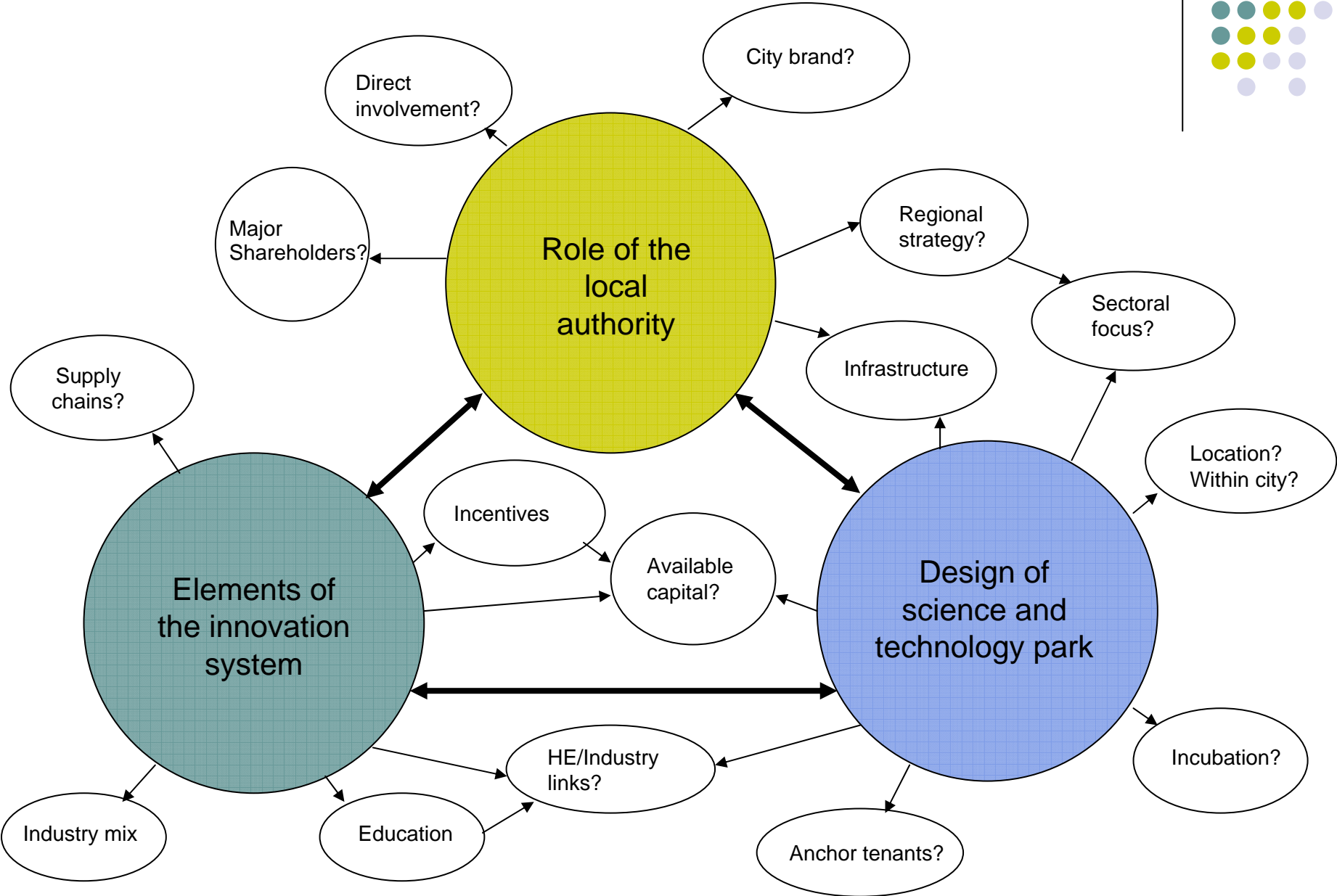
- Appoint competent CEO and project management team (PMT)
- The team sets the tone for the park's future:
 - Marketing and managing the park buildings and facilities
 - Developing and operating the added-value services to tenants
 - Incubation for start-up companies
 - Need support and leadership skills
- Plan for the launch throughout construction phase:
 - PMT to pilot added-value services, develop tenant relationships, generate interest
 - Aim for a 'running start'

Evaluation

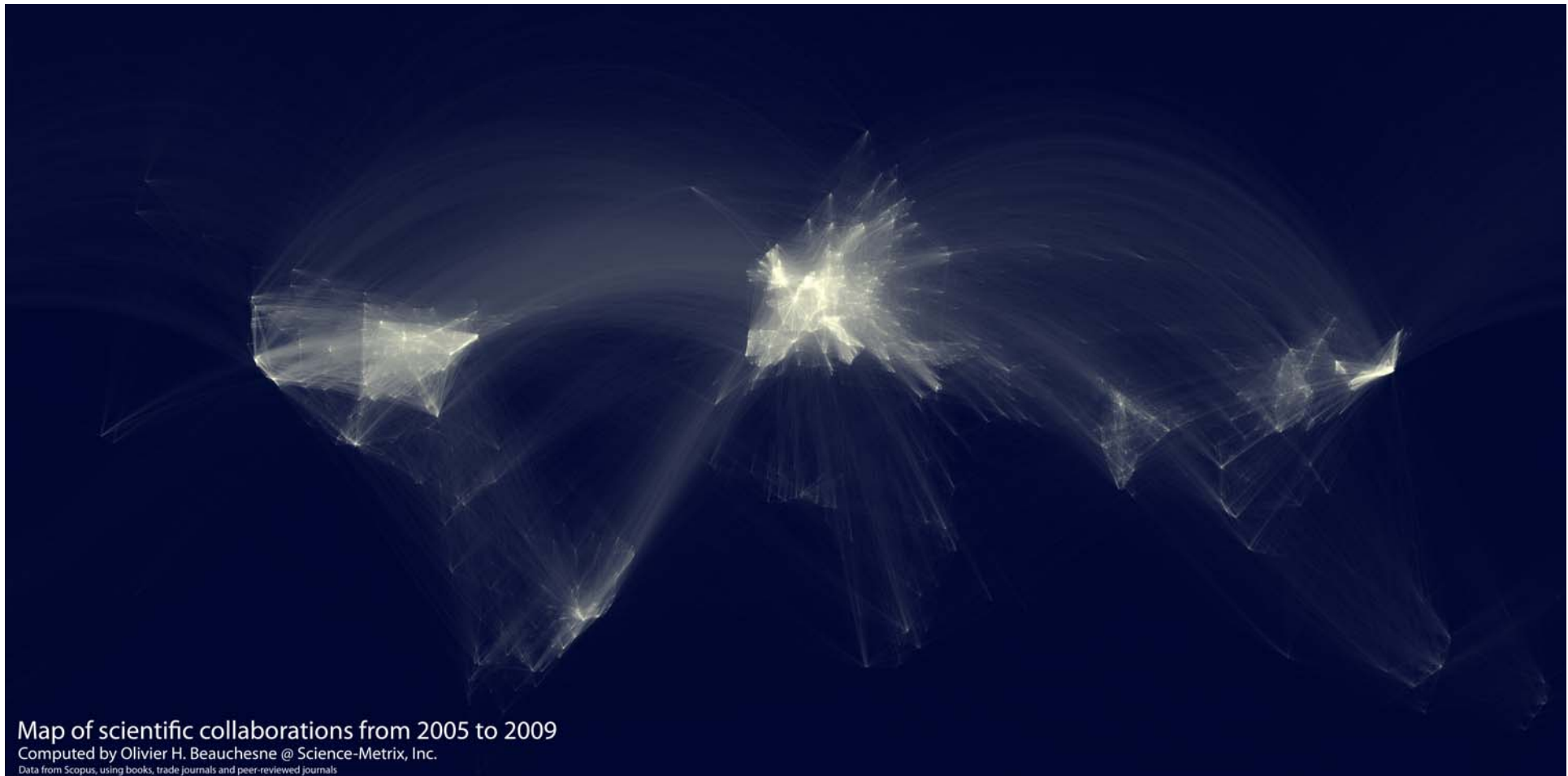


- Who is responsible for evaluation?
- Evaluation of what? Which indicators?
 - How STP is meeting regional objectives?
 - Contribution to economy? Job creation? Start ups?
 - Relationships: managing relationships and expectations of shareholders and tenants is key to the success of an STP
- Agree on performance measures and set up processes to monitor

No one size fits all



3. Case studies



Campus Biométrópolis Mexico City, Mexico



Campus Biométrópolis, Mexico



At a glance	
Focus	International medical hub (research and development, environment, urbanism)
Founder(s)	Mexico City government and National Autonomous University of Mexico (UNAM)
Established	Under construction (announced 2009)
Managers	Mexico City government, UNAM, Grupo FRISA
Organizational structure	Integrated within UNAM, mixed-use (academic, laboratories, hospitals, offices, residential, hotels, retail, amenities)
Area	71 hectares
Key members	<ul style="list-style-type: none">▪ State hospitals▪ Public health institutions▪ Center of Research and Advanced Studies (Centro de Investigación y Estudios Avanzados), Instituto Politécnico Nacional▪ UNAM
Target entities	Education and research hospitals; Labs and applied research facilities; New technology companies; Medical schools; Residential and commercial areas
Tenants, occupancy	N/A
Employees	N/A
Venture capital funding	N/A
Startups	N/A

Innovation system context



- Existing concentration of research and medical institutions but requires integration
- Strong regional university (UNAM)
- Significant brain drain
- Progress in Mexican research but not at international standards

Ambitious project:

- Large (74 ha)
- Seeks to become model for other developing countries
- International launch with endorsement of mayor, UN climate change expert
- First master plan by Foster + Partners in Mexico
- Start of project has been delayed

Vision and objectives

- Integrate existing institutions
- Elevate native medical and biology research to international standards
- Support leading research, especially Mexican research
- Encourage job creation



Implementation plan



- To achieve objectives, Biometropolis will:
 - Consider legal questions such as easiness of patent issuance
 - Ensure strong linkages with industry and risk capital
- Five priority research areas:
 - Oncology
 - Nutrition and diabetes
 - Geriatric
 - Cardiovascular
 - Infectious diseases

Sustainable design

- Unique location an inactive volcanic site
- Green building with integrated water management plan
- 50% of the project space set aside for natural reserve and enhanced landscaped areas
- Natural reserve to be administered by municipal environmental office and UNAM
- Preservation of indigenous plants and species
- Buildings oriented to capture winds from north
- Building arrangement navigates lava fields with some exposed for scientific investigation



Urbanism

- Physical space embodying the “city of knowledge”
- “new urban model” in which activities have a different relationship to the surrounding environment
- Integrated with urban surroundings by:
 - Promoting public transportation and intermodal centers
 - Facilitating traffic including use of solar-powered electric vehicles on campus
 - Short walking distances and bus connection to nearby university station with metro access



Lessons and aspirations



- Expected to inspire Mexican researchers to innovate and elevate research to world-class standards
- Biometropolis itself is sustainable and is accommodated within original environment
- Example of a physical space created for the “city of knowledge”: space where science and technology trigger new economic activities in harmony with the existing environment
- Despite high-profile, international launch, slow progress towards construction

Media 21 Singapore



Media 21, Singapore



At a glance	
Focus	Global media city (print, broadcasting, film, publishing, digital, on-line)
Founder(s)	Media Development Authority of Singapore (MDA)
Established	2003, Economic Development Board (EDB) allocated S\$1bn over 10 years to attract foreign companies and reputable media specialty schools; govt. also allocated S\$500mn over five years to grow interactive and digital media sector
Managers	MDA
Organizational structure	National strategic plan including multiple initiatives and development of a media ecosystem
Area	Media 21 is a natl. strategy; Fusionopolis & Mediapolis occupy about 30 ha of a 200 ha complex
Key members	<ul style="list-style-type: none"> ▪ MDA and EDB ▪ Junrong Town's Fusionopolis ▪ DigiPen Institute of Technology ▪ LaSalle-SIA's Puttnam School of Film ▪ RGM Holdings
Target entities	Education and research hospitals; Labs and applied research facilities; New technology companies; Medical schools; Residential and commercial areas
Tenants, occupancy	N/A
Employees	38,000 (in media)
Venture capital funding	Media investment fund, RGM Holdings US\$100mn media financing facility, seed funds for R&D in digital TV software and technology
Startups	N/A

Innovation system context



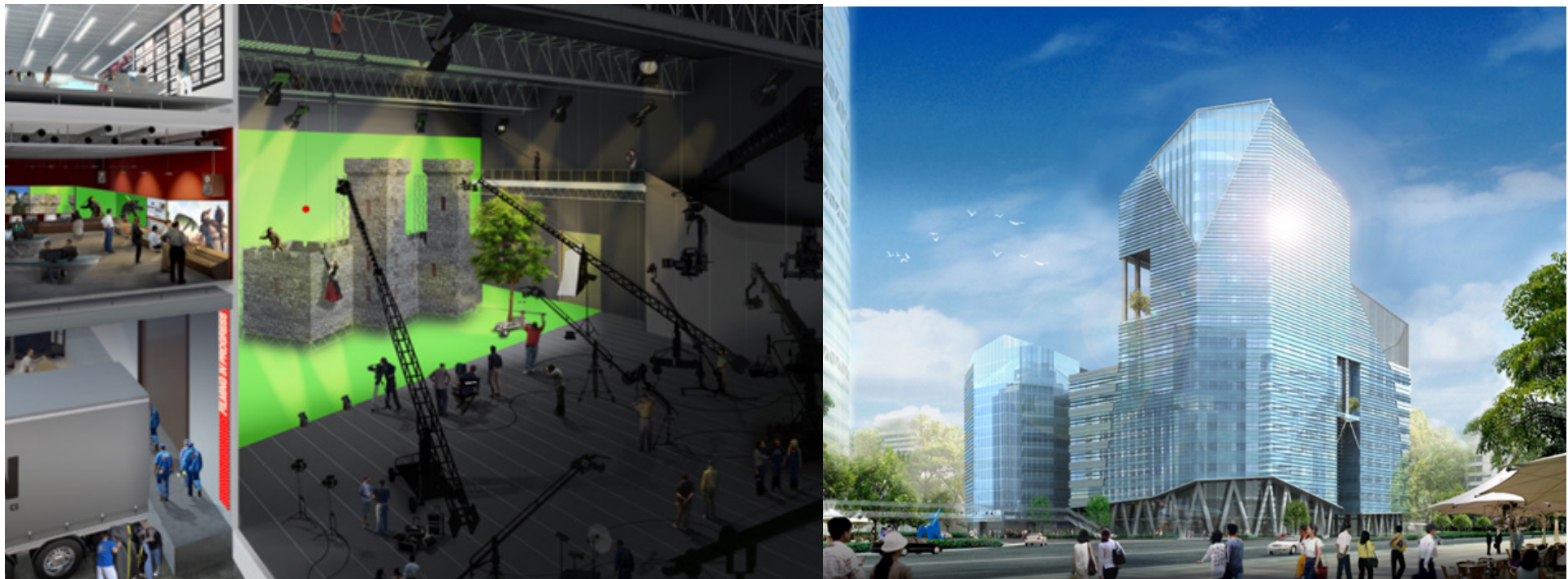
- Big market: global spending on entertainment and media US\$1.4 trillion in 2006
- Singapore recently formed Film Commission
- Developed Media 21
 - Guided by inputs from boards with international experts in finance and media
 - Coordinated, ambitious national strategy
 - Comprehensive, including all activities from content production (pre-production, production, post-production) to distribution (packaging, marketing, distribution)
- Media 21 is part of bigger initiatives under Industry 21 (I21), which envisages Singapore as a vibrant and robust global hub of knowledge-driven industries spearheaded by three key pillars: biomedical, ICTs, and media
- A master plan called 'one-north'
 - 200 ha mixed use development for "WORK-LIVE-PLAY-LEARN"
 - Conceptualized by Pritzker Price Winner Zaha Hadid in 2002



Vision and objectives



- Media 21 strategy aims to:
 - Increase GDP contribution of media from 1.56% to 3%
 - Create 10,000 new jobs (above existing 38,000 employed)
 - Increase value added per worker from S\$66,000 to S\$160,000
 - Ensure Singapore leads Asia as media marketplace
 - Nurture native media enterprises
 - Attract FDI



Implementation plan



Key initiatives:

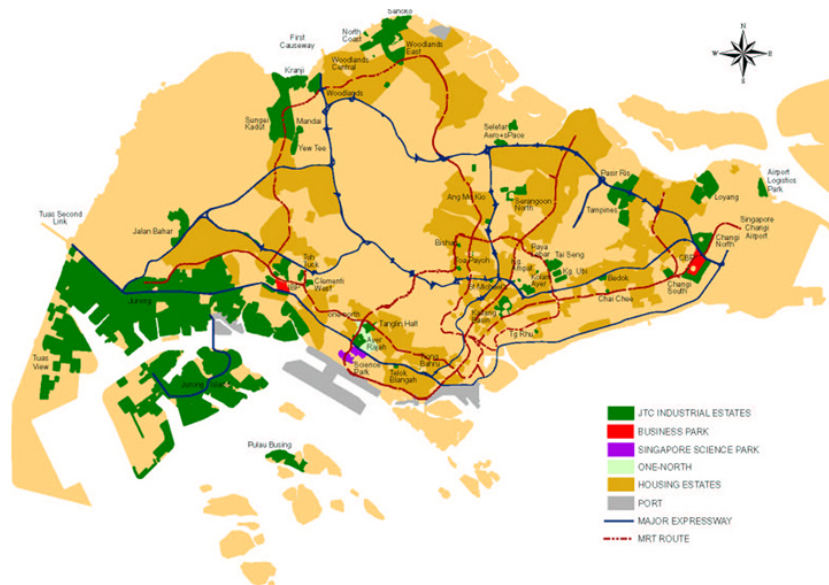


- **Establish Singapore as a media exchange**
 - Create focal events attracting trade professionals, buyers, and sellers
 - Establish prestigious Media Awards
 - Develop as a media financing hub
 - Set up a media investment fund
 - Enhance knowledge of intellectual property rights and digital rights management tools
- **Export made-by-Singapore content**
 - Establish Content Development Schemes to boost range and quality of local films and TV for export
 - Strengthen niche genres (digital animation, documentaries, business and education)
 - Increase bilateral co-production agreements
- **Deploy digital media**
 - Specialize in digital media production including creation of virtual film studio and multi-disciplinary digital post-production studio
 - Promote digital content creation
 - Expedite national deployment of digital media services
 - Develop as a digital cinema distribution hub (this alone will create 4,000-5,000 jobs)
 - Boost R&D in digital media technologies including a new digital R&D lab and a Digital Technology Development Scheme

Implementation plan (continued)



Key initiatives (continued)



- **Internationalize Singapore media enterprises**
 - Promote international market development
 - Facilitate internationalization of media enterprises by matching Businesses and assisting local companies with international distribution
- **Augment media talent**
 - Augment university and polytechnic training
 - Develop core competencies to support content development
 - create opportunities for media exposure
 - Integrate media training into school curricula in collaboration with Ministry of Education
- **Foster a conducive business & regulatory environment**
 - Promote Fusionopolis@one-north
 - Ensure policies and initiatives meet international best practices
 - Ensure regulatory consistency and clarity
 - Facilitate a production-friendly environment
 - Encourage industry responsibility and responsiveness, including possible formation of industry associations
 - Increase media literacy and appreciation

Implementation plan (continued)



- To date, they have developed approximately 40% of the entire one-north in three clusters (Xchanges):
 - Biopolis (Biomed and Life Science)
 - Fusionopolis (ICTs)
 - Mediapolis (Media)
- Have also developed other new clusters, such as Global Headquarters and Leadership Initiative for Network and Knowledge (LINK) where Unilever 4 Acre Asia campus is anchored



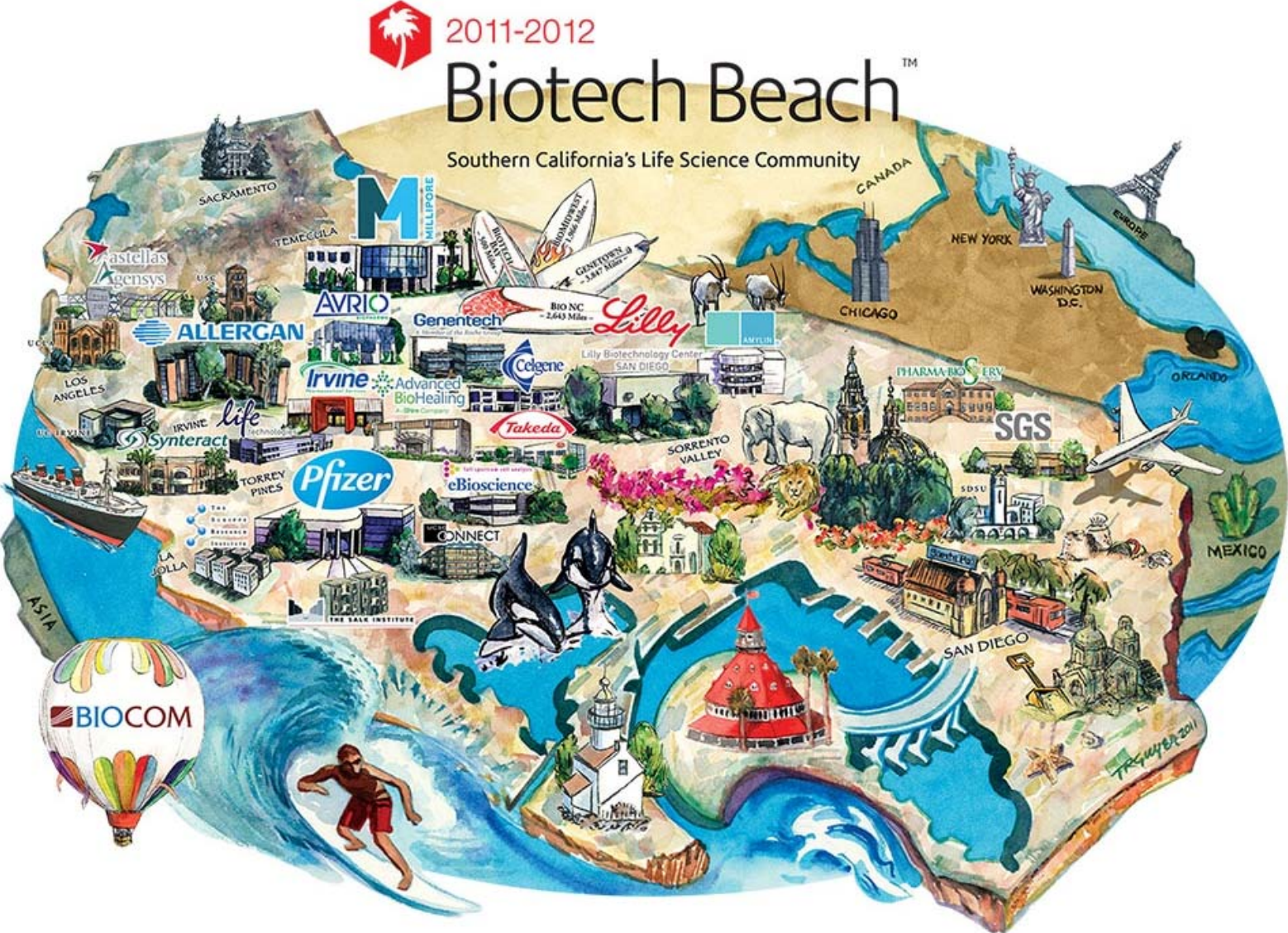
Lessons and aspirations



- Government identified a key market and proactively built a national strategic plan to target it
- Enlisted involvement of world-class industry leaders
- Moved government offices on-site
- Government strong industry orientation
- Did not neglect quality of life concerns



Biotech Cluster San Diego, California, USA



Biotech Cluster, San Diego



At a glance	
Focus	Biotech research and development and clinical testing
Founder(s)	University of California at San Diego (UCSD) and San Diego Economic Development Corporation
Established	1985
Managers	Two NGOs, CONNECT and BIOCOM, support connections among universities, investors, start-ups, and industry
Organizational structure	Mediating NGOs nurture local entities, advocate for them to investors and policymakers, and showcase them domestically and internationally
Area	(Entire city)
Key members	<ul style="list-style-type: none"> ▪ UCSD ▪ Scripps ▪ Salk Institute ▪ US Navy
Target entities	Education and research hospitals; Labs and applied research facilities; Medical schools; Biotech entrepreneurs
Tenants, occupancy	N/A
Employees	141,200 in technology companies; 727 new jobs from 277 tech start-ups in 2010
Venture capital funding	US\$301 million in 2009 (life science sector)
Startups	>2,000 ventures since 1985; >300 formed in 2009 alone

Innovation system context

A new biotech cluster

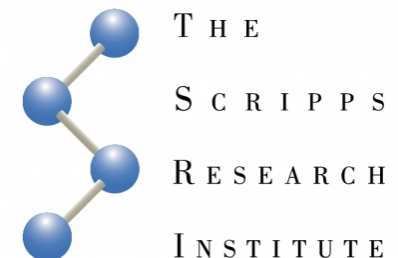
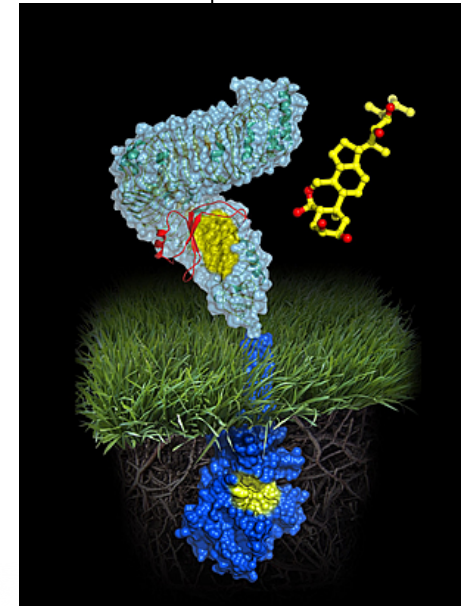
- Located outside original high-tech regions in Northern California and Northeast
- Focus on research following foundations of UCSD, Scripps, and Salk in 1950s and 1960s (now 5-10 sq. miles contain 26 research institutes)
- Now one of strongest critical masses of biotech R&D and clinical testing in USA

California

- Population base of 50 million
- Relative proximity to Asia
- Size: 8th largest Government, 5th largest economy
- 48% of US life sciences economy, 6 top medical schools
- US\$ 3 billion stem cell initiative

San Diego

- 8th largest city in USA
- No. 1 in US life science industry, top medical school and top NIH funding



Hybritech



Implementation plan



- **Successful mediating institutions that promote networks**
 - Close coordination among academia, local business, and political interests with minimal direct government involvement
 - Ease of communication among business managers, scientists, and students
 - Proactive connection with university, financial, and corporate interests
 - Effective showcasing of local research and businesses to investors worldwide
 - Advocacy to local, state, and national legislators and regulators
 - Attract investment and government funding and secure water availability
- **Benefits from clustering**
 - Proximity of companies and university labs give the cluster cohesion and give the city a collegial spirit
 - Concentration under one city authority facilitates deals on zoning and infrastructure
- **The pivotal role of research institutions and incubators**
 - Scientists from local research institutions have founded pioneering R&D firms, some of which have become incubators for new companies
 - Hybritech
 - Founded by two UCSD researchers
 - Founders' success attracted increased investor attention to local biotech R&D cluster
 - Former employees of spin-offs created core of local venture capitalists assisting other local start-ups

Lessons and aspirations



- Mediators can have a powerful role compounded with benefits from clustering
- Thriving clusters need adequate access to science, talent, money, and infrastructure
- **Other key contributors to success:**
 - Close coordination among academia, local business, and political interests with minimal direct government involvement
 - Ease of communication among business managers, scientists, and students
 - Significant investment in R&D
 - Effective mediators
 - Concerted actions of business and government leaders
 - Collaboration, funding, and procurement from US Navy

The Innovation Hub, Gauteng, South Africa



The Innovation Hub, Gauteng



At a glance	
Focus	ICTs; Engineering; Biotechnology; advanced materials and Manufacturing; Industrials; Clean Technologies; Aerospace
Founder(s)	Gauteng Provincial Government (GPG), Council for Scientific and Industrial Research (CSIR), University of Pretoria (UP)
Established	Begun in 2000; pilot phase 2000-2005; Park officially open 2005
Managers	Managed by The Innovation Hub Management Company ('TIHMC'), regulated by the 'The Innovation Hub Board'
Organizational structure	Pre 2003: 50% GPG (through Blue IQ Holding); 50% Partnership-CSIR & UP, with UP owning the land). Overseen by a Interim Steering Committee. Post 2003: 100% GPG (through Blue IQ holding), including land bought from UP.
Area	600,000m2
Key members	Sappi
Target entities	SME
Employees	N/A
Patents	N/A
Venture capital funding	N/A
Startups	N/A

Innovation system context



- Apartheid, protectionist trade policies and economic sanctions left depressed ‘inward looking’ economy aimed at self sufficiency (Kahn 2006).
- **Resourced based economy** attempting to transform to **knowledge based economy** (COFISA)
- Innovation system to be “restructured, re-scaled and re-oriented” (OECD, 2007, p10)
- Access to high quality education limited (Kahn and Reddy, 2001). High poverty and inequality.
- Innovation system fragmented: universities in particular not producing industry relevant research (COFISA, Al-Badar et al 2009).

Why a S&T park in Gauteng?



Research into local innovation system

- 1997 Gauteng's Trade and Industrial Strategy: 3yrs data collection & research
 - Positive: richest, most productive province; SA's highest educational & formal employment levels
 - Negative: unemployment rising, local economy stagnating
 - Opportunity: 'knowledge axis' and most of SA's engineers & high tech employment

Developed a strategic vision for the region

- Turn Gauteng into South Africa's 'Smart' province
 - Appropriate? Human capital and institutions available to develop knowledge based economy

Introducing the concept of science & technology park

- How to stimulate growth in a new (high-tech) sector?
 - Barriers and catalysts: Initially plans centered on improving connectivity in the province
 - Province wide success unlikely - idea of a science park as a focus for high connectivity
 - Learning: visits to international science parks and research on best practice

(Sources: personal communication with member of TIH board, and founding CEO of TIH, Neville Comins)

How? Planning The Hub (1)



“Learn from the best but then design what is relevant”

(Neville Comins, founding CEO of the Hub)

- **Design: ensuring interactions and coherence**
 - Where? Trade off: industry cluster Vs university links; determined by availability of land; offered a site near (and owned by) University of Pretoria
 - Entry criteria: based on feasibility assessment of industry in region & park strategy
 - Tenant mix: to include larger anchor tenants & SMEs, starts ups
- **Pilot phase**
 - Begun in 2000: gain to experience, exposure, reputation, build innovation community
 - Value added services operating before park officially opened: established a community, and waiting list!

(Sources: personal communication with member of TIH board, and founding CEO of TIH, Neville Comins)

Planning The Hub (2)

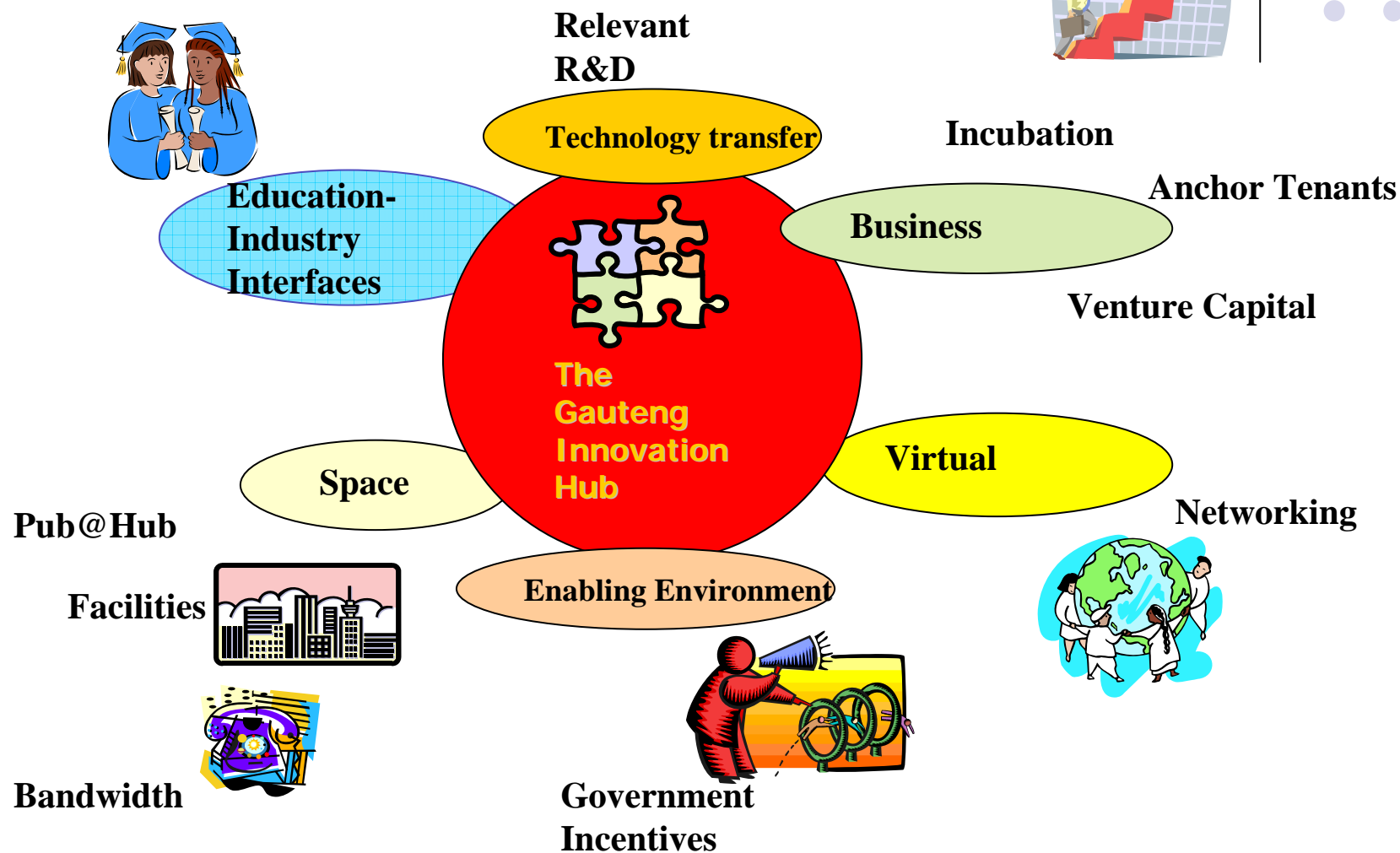


- **Governance: some hiccups**

- Created The Innovation Hub Management Company: responsible for operations.
- Original shareholders: GPG, University of Pretoria (own land) and Council for Scientific and Industrial Research.
- Review of governance in 2003
 - Issues with partnership cooperation and decision making bottlenecks
 - Resulted in shareholder renegotiation
 - Now 100% owned by GPG. Caused disruption, delay and extra cost

(Sources: personal communication with member of TIH board, and founding CEO of TIH, Neville Comins)

Key elements of The Hub



Source: Neville Comins (2), 'The Innovation Hub: a case study', workshop presentation, Senegal, 2008

Key Initiatives



Built Environment

- Large anchor tenants
- Multi-tenant buildings (both size and age)
- Shared resources
- Security
- Conference facilities

CoachLab

- Mentoring programme
- Linked to university

SmartCity

- Improve connectivity
- Building links with local community

INNOV8

- Community of practice

Maxim

- Business incubator

ACTIVATOR (pilot)

- Piloted with COFISA
- 'Multi-helix' methods
- Broaden stakeholders in large scale innovation projects



The Innovation Centre

- First IASP accredited park in Africa
- Finalist "Visionary Project of the year" 2004, in NY
- Fully occupied in 2005
- Park had a 'buzz'

Sustainability



Initially

- Government became 100% shareholders and land owners; working well, building momentum

Later

- Changes in land and finance policy impacted significantly on direction of the project
- Increased reliance on property rental
- Site development slowed
- Successive changes in management
- Shifts towards 'business park' model? Maintenance of added value services?

Lessons



- Assess and monitor sources of funding for change
- Avoid dependency on funding sources which are not sustainable or will narrow scope of project
- Encouraging investment and development critical
- Added value service for tenants not to be neglected
- Consistency is difficult: try to ensure commitment to original model can be maintained despite policy/personnel changes

SWOT analysis



STRENGTHS

- Part of a clear strategic plan
- Well planned and developed
- Good brand – pilot phases
- Many added value services (initially)
- Responsive management, i.e. changed initial governance
- Strong initial support from local government

OPPORTUNITIES

- Become a role model in South Africa
- International co-operation for strengthening the Hub, i.e. with Finland
- Build on links with local communities
- Strengthen added value services to nurture local innovation economic development

WEAKNESSES

- Innovation system fragile, in its infancy
- Concept of innovation systems not well understood
- University linkages not strong i.e. do not conduct businesses relevant research
- Recognition of park's value not ensured

THREATS

- Susceptible to changes in political environment
- Possible stagnation of the project – value added services?
- Lose of initial drive and enthusiasm
- Firms rate 'off park' knowledge exchange of higher quality than 'on park'
- Damage to brand identity and reputation

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