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Whitepaper
Strategic Industry Clusters

Note: Parts of this Whitepaper originated in Prof Buckley's Columbia MSRED Center for High Density senior seminar, and have also appeared in the UTA CfMD Research Journal

Industry Clusters Defined

Industry Clusters are vertically integrated enterprises targeted to specific markets with distinctive products and process competencies.

Industry Clusters feature vertical specialized core activities, such as electronics, biotechnology, digital media, and software, which are powerfully reinforced by suppliers of both technical inputs as well as business services, such as financiers, lawyers, marketing specialists, and accountants. Successful Industry Clusters rely on policies which encourage cultural diversity and expanded links with other Clusters.

Located in intensive workplace environments with concentrated talent pools, Industry Clusters have broad vendor support, and services depth. The resulting critical mass in skilled employment creates a talent pool that retains brainpower, and creates a Multiplier Effect with economic and social components, which are major contributors to a region's Gross Metropolitan Product.

Similar to an Economic Eco-System, Clusters overlap and support one another exhibiting dynamic connectivity and interdependence. Supporting existing Industry Clusters leads to emergence of Advanced Industry Clusters driven by higher technology and innovative management processes.

Service Sector

Professional Services

Executives

Management Skilled Technicians

Vendor Base

Industry Cluster Multiplier

Industry Clusters have a base of vendors that support a vast network of businesses, which in turn require a variety of commercial and professional services.

San Juan Bio Science City

To reinforce a non-tourism Cluster, Capitalizing on extensive skilled Pharma manufacturing base already in Puerto Rico, concept features sustainable Live/Work environment. A new Public Partnership pays for Bio Labs close by the Centro Medico with proceeds from Parcel Sales of Residential and Commercial uses.

Industry Clusters Characteristics

- Vertically Integrated Specialties
- Intensive Workplace Environments
- Distinctive Competencies
- Infrastructure Targeted to Specific Markets
- Concentration of Workforce and Talent Pool
- Critical Mass Drawing Brainpower
- Frequency of Interaction Fueling Creativity

Industry Clusters Yield Positive Economic Benefits…

Clusters Defined:

- Co-located firms from similar industries
- A concentration of firms and professionals
- A concentration of unique competencies

Benefits:

- Maximized efficiencies
- Greater economic performance
- Industry-specific critical mass

Industry Clusters

Networking among firms in Industry Clusters has proven to promote both innovation and efficient resource use and is more fruitful when many like--type industries agglomerate in urban clusters.

Industry Clustering spurs innovation and allows firms to benefit from generalized economies associated with the availability of diverse skills and infrastructure, from the cross fertilization of ideas and learning, and from face to face executive and team contacts, generating benefits in productivity and innovation.

Skilled Labor Reservoirs

This deep pool allow firms to find better employment matches for their needs, and allows transmission of tacit knowledge between firms as employees move from firm to firm. World cities such as London derive some of their success from providing special-ized sector firms with the large supply of skills they need

Specialized Service Suppliers

Vendors that can customize services to meet Industry needs are critical support for Industry Clusters. Without a large potential market for specialist services, only generic service suppliers will remain.

Proximity to Universities and Multi-National Corporates

Proximity promotes interaction and generates the potential for knowledge spillovers. Large firms tend to be demanding purchasers, requiring constant improvements from suppliers, encouraging collaboration and sharing best practices. Clusters thus thrive on the density of informal networks made possible by proximity, further reinforced by new communications technology. High Tech Clusters depend on large, diversified, and efficient labor markets to draw and retain people with a mix of skills and discriminating knowledge work-ers. A successful cluster accumulates and continuously refreshes human capital.

Focus on Niche Strategic Industries

A select set of Technology Enabled Growth Industries we believe to be "Footloose"—that is they are mobile as to location—requiring new Incentives matched to these Industries:

- Digital Media---emphasis on interactive and motion graphics in support of Internet sales and marketing

- Medical Equipment Expos-- the display and training for high tech Diagnostic and Surgical equipment

- Aqua Science-- focus on water Quality, management, and supply /conservation applications

- Digital Transaction Support -- services and systems for volume transactions including clearing, account servicing and due diligence functions

- Alternative Energy -- services aligned with energy supply + conservation + alternative generation and transmission applications

- Logistics Analysis + Support---Addressing Supply Chain Management challenges with optimization and crisis management applications for Air / Sea Shipping , container evolution and handling technologies, warehousing and land based distribution systems

- Targeted Workforce Training with deliberate focus on specific business applications for accelerated concerted learning will be required

Cluster Value Proposition

Clusters evolve with technology and if maintained and supported, become economic engines which define a Region's Competitive Advantage , become contributors to regional skilled Jobs Gross Regional Product, while inducing new private investments. Cities and Regions should create special focus groups to Identify and track the rapidly changing Cluster needs to insure their continued presence and value-adding attributes.

**Emerging
Advanced Clusters**

Chart illustrates Existing Industry Clusters in no particular order. The right side shows Advanced Clusters which should emerge over the next decade.

These rely on product and process innovation, new technologies, and will need a skilled workforce to germinate.

Emerging Advanced Clusters will also require special incentives and supportive Economic and Workforce initiatives

Chart originated by Prof Buckley— Previously published in UTA CfMD Research Journal #2

Existing Industry Clusters	Advanced Clusters
Agriculture Farming, Equipment, Ag. Chemicals	Chemical + Biological Engineering
Food Processing Packaging, Distribution	Advanced Nutrition Science
Manufacturing Heavy + Light Industrial + Prototyping	Precision Manufacturing, Robotics, Digital Fabrication
Logistics Distribution, Shipping, Air-Freight	Advanced Transit, Airlift Capacity
Retail Restaurants, Groceries, Shopping Centers	Internet Shopping, Interactive Media
Automotive Sales, Repair, Auto Supply	Hybrid/Electric, Specialized Electronics, Driverless Vehicles
Aerospace/Defense Research, Engineering, Manufacturing	Remote Sensing, Unmaned Vehicles, C3 Systems
Information Technology Computer Systems and Support	Cloud + Media Applications
Communication Hardware, Software, Satelite, Tower, Data	Wireless, Microsystems, Cloud Software
Business Managment HR, PR, Marketing, Insurance	Social Media, Electronic Commerce, Digital Marketing
Professional Services Legal, Accounting, Architecture, Engineering	Advanced Institutions, Cloud Based Methodologies
Finance & Banking Institutional Finance, Private Capital, Trading	Hyper Trading + Transactions, Consumer Clearing
Real Estate Developers / Agents / Property Mgmt.	Prefabrication, Systems Integration
Home Decor Furniture, Hardware, Paint, Appliances	Pre-built Components, Digital Systems + Equipment
Cultural Museums, Performance Halls	Cultural Districts, Online Institutions
Hospitality/Tourism Attractions, Sports Centers, Venues, Hotels	Interactive Entertainment, Electronic Booking Resources
Education Public, Private, Trade, Publishing	STEM/Charter, Digital Arts + Publishing, Online Education
Healthcare Hospitals, Medical Offices & Equipment	Bio-Tech Cluster, Advanced Equipment, Smart Hospitals
Pharmaceutical Research, Development, Sales	Bio-Science Cluster, Advanced Research Institutions
Construction Commercial / Residential / Infrastructure	Digital Fabrication CAD-enabled Automation

Results of Columbia University Corporate Roundtable Series

A series of Corporate Roundtables at Columbia University with CRE's and Workplace designers have identified several significant shifts to be expected I the Workplace—influenced by Communication Technology , changing expectations about shared Facilities and the unproven and unpredictable collision between Three Generation of workers. Panelist observations included---

The Future of Work

- Digital Revolution---Portable Video Conferencing
- Intelligent Systems—Concerted Individualistic Learning
- Self-Correcting Program Applications
- Team Tasking---collaboration re-invented—Quiet Rooms
- Compressed Time to Market means Guidelines not Procedures
- Web-base Interactive Sales
- Road Warriors Redux—with Modular Home-Based Work

Align Corporate Facilities with Business Mission

- Focus on Business Issue with Real Estate Consequences
- Footprint + Tech Preferences
- Triple Bottom Line –---Society + Environment + Economic Performance

Flexible + Green Facility Trends

- Sustainable +Green response to Societal goals and absenteeism
"Sick Building Syndrome"
- Mandate for High Performance Buildings + Systems
- Required Flexibility + Interoperable Layouts + Modular HVAC
Co-Generation of Utilities on site

Talent Gap == Talent War

- Create Environments that are "Places of Choice"
- Create Shared Collaborative space—recognizing that Millennials are looking for mentoring and "seasoning experiences"
- Attract The Next Generation –and accommodate a three generation Workforce

Corporate Facilities—The Urban vs. Ex-Urban Challenge

Corporations have a stake in the study of density as they sort the advantages and limitations of Urban vs. ex-Urban locations. Corporates have inherently a broader set of concerns as their Business Missions are Regional –if not Multi-National . Hence fixed traditional Locales are not necessarily absolute requirements as populations disperse and Info Technology permits greater accessibility and group productivity

Further Cities have a vested interest in their highly organized and environmentally supported Core Districts---and must address the inherent Challenge to ex-urbanization as often induced by dispersion of Corporate Facilities---

Ex-Urban	Urban Core
Larger available and less expensive sites	Scarce Land with Site Assembly required
Large Floorplates	Urban Fabric constrains Footprint
Automobile Dependent	Transit advantage
"Talent restricted to the Park"	Creatives attracted to Urban amenities
Residual Value limited to like kind user	Higher Values + Multi-Tenant prospects
Work Culture impact by Suburban values	Increased Pace and Productivity

Columbia CHDD Corporate Real Estate Executives Survey
Columbia MSRED Student Researchers Natasha Brown and Thomas Schneider conducted the survey under direction of Columbia Professor Michael Buckley. Director of the Columbia Center for High Density Development.

Conducted with selected Corporate Real Estate Executives (CRE's) from a set of Financial, Business Service and Professional enterprises—including Large to Medium sized firms all of which place special emphasis on the Office Workplace as a prime producer of value.

The CHDD Survey respondents included:

Advance Realty Group	The Economist Inc.	NorthMarq Capital
Archstone-Smith	Ernst & Young LLP	NorthStar Capital
Bank of America	JP Morgan	PriceWaterhouseCoopers
CB Richard Ellis	KPMG	Robert Martin Co
Credit Suisse	Morgan Stanley	Rockefeller Group
CW Capital	NDC Capital	Starwood Hotels
DTZ Rockwood	Newcastle	Twining Properties

Benefits of High Density Workplace
Corporate End Users are highly influenced by the latest Workplace thinking. Corporate Real Estate Executives (CRE's) have witnessed a complete make-over of Office formats within the past decade with the application of Space Standards and new ---layout protocols which emphasize reduced space per person as a result of shared work areas, divisible Conferencing and small Teaming spaces, and various concepts including Hotelling for frequent out-of –office personnel. The super--sized "Legacy" office with power desk and deep cushioned armchairs has collided with ergonomic furniture and the Just--in--Time workspace.

The often conflicting desire to co--locate shared operations has similarly led in the past to rapid suburban expansion and sacrifice of the urban workforce. Large corporate "Campuses" arose as testament to this de-centralized ideal and lower density solutions

The Sustained Hunt for Talent
CRE" s have discovered that scarce Human Capital cannot so cavalierly be deployed to suburban locations without consequence, as many talented knowledge workers prefer a more dense and urbane workplace. There is growing recognition of the urban competitive environment which nurtures interaction, and that interaction fuels innovation. Further Industry Clusters have consistently proved intense and productive working environments that are not easily simulated in remote suburban areas.

The Columbia CHDD Survey suggests that a very different alternative in convening the corporate workforce is now apparent, and it is more efficient and more effective in a mission- critical sense. The high Density Workplace is now emerging as a preferred venue –as these facilities have been shown to exhibit distinctive advantages of solid appeal to both management and to talent –the definitive components of Human Capital

Industry Clusters
The CHDD Survey was a very focused approach to Location Drivers which reflect the competitive environments such as Industry Clusters exhibit. Clusters offer certain advantages such as Access to skilled Workforce; Client proximity and Transit systems; Vendor depth and availability; Diverse and deep special Talent pools; and fast--paced Business processes, hence the pendulum swings to High Density Locations----

- <u>Access to skilled workers (95%) and access to mass transit (63%) are the largest concerns</u>, where occupancy costs, proximity to decision makers & competitors are secondary.
- Location Decisions show that <u>Availability of Skilled Workforce is the Primary Driver (91%)</u> for locating in high density environments and another important factor is ease of client access 77%.
- For Retail and Foodservices as employee amenities, the Survey illustrated recognition of what most office workers already know— that real -world <u>city-centered retail and foodservice amenities are perceived as better than those supplied by the company.</u>
- Even more importantly, the Survey illustrated that <u>high density offers a strong platform for Corporate Brand recognition.</u>
- Survey Respondents clearly favored <u>High Density occupancy as offering a better Cost/Revenue spread</u> ---and further indicated that Demand for office space in high density areas will increase.
   The Survey also shows the intentions <u>by Corporate End Users to pursue these intensive, clustered environments as solutions to house skilled Professionals and Knowledge Workers in the future.</u>

CRE Survey Conclusion

The Columbia CHDD survey of Corporate Real Estate Executives revealed that

- High Density Industry Clusters within cities improve ability to recruit and offer significant advantages to the Corporate Workplace.
- High Density also has cost advantages in lower transportation costs, and increased operation efficiencies.
- The High Density Work place improves Productivity, Innovation, and Career Growth.

The Survey demonstrated that High Density Workplaces were shown to have clear and compelling advantages—surprisingly so in subjective views by CRE's on Productivity and Information Sharing, with very high marks for Recruiting and Retaining a Skilled Workforce