Attachment B

Camperdown-Ultimo Collaboration Area Innovation Study – Final Report

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HillPDA
CONSULTING

CAMPERDOWN-ULTIMO COLLABORATION PRECINCT
Innovation & Collaboration Study

CENTRAL BUSINESS DISTRICT

ENTERTAINMENT QUARTER

TAFE

University

Uni

Transport hub

University

Hospital

Business park

IF YOU CHANGE NOTHING, NOTHING WILL CHANGE.

2016–20 Strategic Plan

Prepared for City of Sydney

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Report Contacts

Martin Hill

Director

Master Real Estate (UNSW), Masters Property Development (UTS), BSc (Hons) Sydney University, Certified Practicing Valuer (Unrestricted), FAPI, MRICS

Martin.Hill@hillpda.com
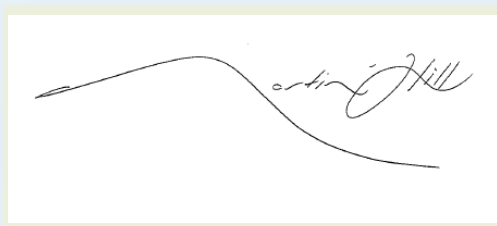
Quality Control

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Reviewer

Signature	Dated
	11/06/19

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1.0   EXECUTIVE SUMMARY

Purpose of the project

HillPDA has been engaged by the City of Sydney (**CoS**) to undertake in-depth research and stakeholder consultation into the spatial drivers of innovation and associated industry clusters within the Camperdown-Ultimo Collaboration Precinct (**the Collaboration Precinct**). The goal of this research is to identify existing barriers within Collaboration Precinct and potential catalysts to support growth in innovation, creativity and knowledge-intensive jobs. The findings of this report will be used for the CoS' internal strategic planning purposes as an evidence-base to assist in the preparation of the Sustainable Sydney 2050 (**SS2050**) strategic plan.

This research paper (**the Study**) should be read in conjunction with this study's consultation report and the earlier baseline report that reports on the significant body of work already prepared by the CoS, The Greater Sydney Commission (**GSC**), Sydney Innovation and Technology Precinct Panel (**Panel Report**) and the NSW Innovation and Productivity Council for the Study Area. Also contained in the earlier baseline report is a literature review with case studies on emerging innovation districts along with preliminary baseline data for the Study Area.

Principles of place-based innovation

How do businesses innovate or become innovative?

Most innovation occurs as the result of an incremental process of collaboration, convergence and a critical mass of talent. Innovation has long been a process of entrepreneurs and companies coming together to solve problems in groups where they can mingle with other problem solvers. In these creative spaces, they have efficient access to everything from new ideas, financing, business advice, legal advice, sophisticated lab equipment, etc.

Our research and consultation have found there is an increasing shift towards the 'hyper-localisation' of innovation. That is, there is a trend for innovative industries towards co-location and densification with other like-minded industries, universities and research institutes helps drive collaboration and foster innovation within a tightly defined geographical area and a mixed and vibrant urban community.

This is in stark contrast to the earlier 'isolated campus' model deployed by R&D firms like IBM, Microsoft and Apple, who sought to put walls up between themselves and their competitors, in an effort to protect their intellectual property and build a sense corporate loyalty to stop their staff from being poached by competitors.

The innovation ecosystem (i.e. the broader environment in which the business of innovation is being conducted) is becoming more reliant on the physical convergence of industries, government and institutions. This raises two key questions: 1) what are these *spatial drivers* of innovation, and 2) how can they be leveraged to support innovation and growth?

To answer these questions, we canvassed leading thinkers and seminal research papers in the field of place-based innovation. Based on our review of the literature, we have isolated a set of spatial elements common across the research. Further, we supplemented these insights with our professional insights and expertise with respect to property development and land economics. The result is a set of principles to guide our analysis and frame our recommendations.

Table 1: Innovation assessment principles

Theme	Principles
Quality of Place	**Quality of transport and connectivity:** residents and workers have access to quality transport options and a good walking experience within and between nodes; there are few barriers that inhibit or segregate innovation clusters.
	Quality of amenity: workers and residents have a range of amenities than enhance the way they live, work and play. This includes quality internet access and availability of the latest digital innovations.
	Distinct urban character: nodes have a unique history and character. Creative industries and cultural organisations are supported and encouraged; this enhances the liveability and sense of community.
Economic Fundamentals	**Distinct industry / employment clustering:** there are distinct clusters of innovation workers – a critical mass; these group according to industry and occupation that complement one another.
	Residential / commercial development potential: there is enough commercial and residential space to accommodate future demand; land zoning is flexible and supports a changing economy.
Governance and Support Services	**Anchor institutions or firms:** there are large scale institutions or firms that lead and drive collaboration within and between nodes; a governance body (bodies) exist to coordinate and facilitate innovation programs, activities and services across the precinct.

Baseline assessment

Based on 2016 NSW Government Transport Performance and Analytics (TPA) data, there are roughly 96,934 full and part time workers that work in the **Precinct**. Table 2 provides a breakdown of industry employment. As expected with an innovation precinct, Education, Professional Services, Health Care and Information, Media and Telecommunications are among the largest employing sectors. It is important to note that Commonwealth Bank is relocating some 18,000 staff to ATP since the TPA analysis was undertaken. This means that, as of 2019, Financial Services is among the largest employer.[1]

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[1] We have denoted the change in industry employment ranking since the 2016 TPA analysis using the following notation ** in the table below.

Table 2: Summary of top 15 industries in Precinct, 2016

Industry	No. Workers
Financial and Insurance Services **	1,143
Education and Training	14,978
Professional, Scientific and Technical Services	13,970
Health Care and Social Assistance	10,889
Public Administration and Safety	9,581
Information Media and Telecommunications	8,871
Transport, Postal and Warehousing	7,385
Accommodation and Food Services	5,747
Retail Trade	4,436
Administrative and Support Services	3,822
Construction	3,470
Other Services	3,442
Arts and Recreation Services	3,251
Wholesale Trade	2,396
Other	3,554
Total	**96,934**

Source: ABS Table Builder; 2016 Census of Population and Housing

In terms of forward-looking estimates, the NSW Transport Performance and Analytics (TPA) baseline growth projections (inclusive of the CBA relocation) is anticipated to grow to 122, 149 by 2026 or an average of 2.3% per annum.

Table 3: TPA baseline growth projection

	2016	2026	10 Yr %Avg	10 Yr Chg
Total	96,934	122,149	2.3%	26.0%

Source: Source: ABS Table Builder; NSW Transport Travel Zone Projection 2016 (TZP2016) model

To understand where these industries cluster within the Precinct, we analysed them visually using the CoS floor space survey data. Figure 1 illustrates a heat map of employment densities based on CoS FES data.

Figure 1: Heat map key employment density by industry
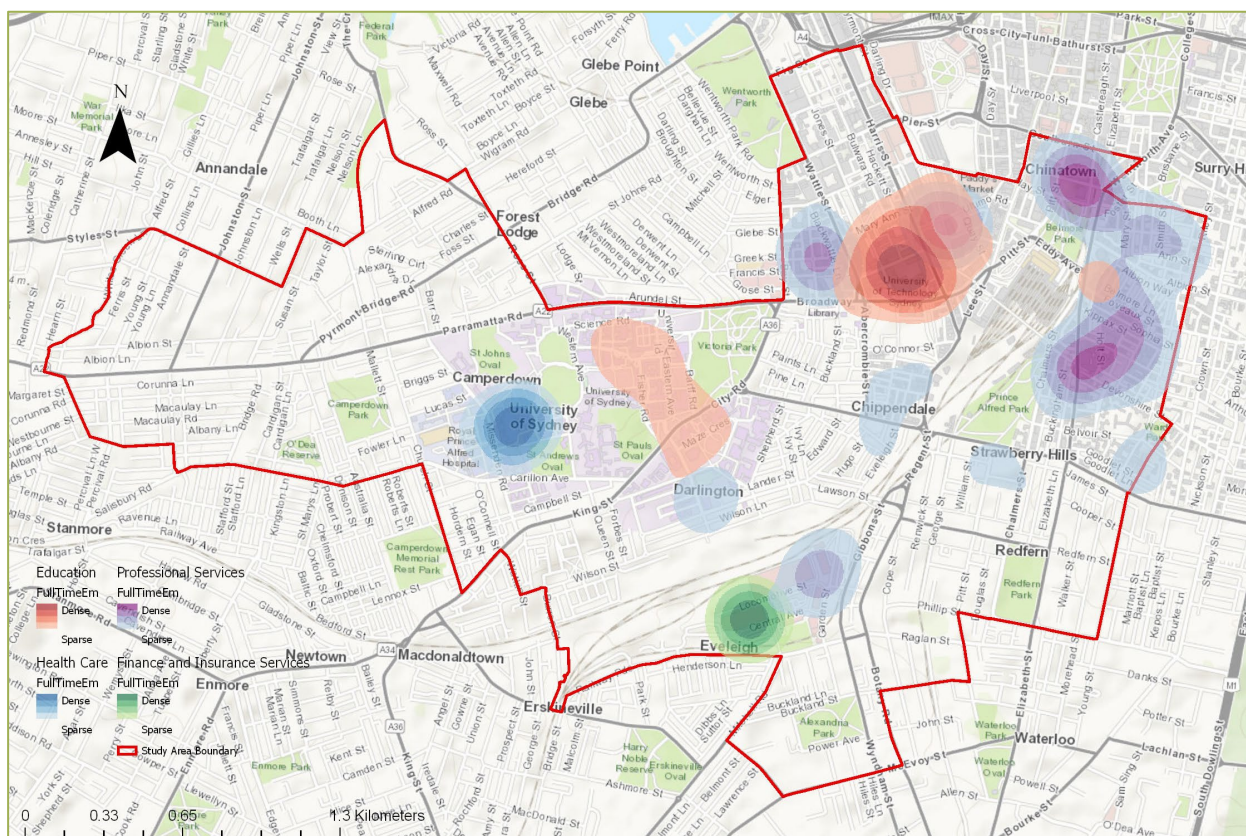
Source: CoS FES data; HillPDA analysis

From this analysis, we can observe that the collaboration precinct[2] contains a mix of uses including a network of employment nodes and innovation activity. These nodes form a smaller subset of the entire Precinct. For the purpose of this study we have defined the following nodes:

- **Camperdown-University Biomedical Node** - A long-standing collaboration between Royal Prince Alfred Hospital (RPA) and Sydney University biomedical research and institute located in proximity
  - This includes the Darlington Sydney University Engineering Node

- **South Eveleigh Business & Technology Node** - the former Australian Technology Park with a cluster of research and a recent commitment by CBA to foster and financial support innovation in the Park

- **Ultimo to Central Innovation & Technology Node** - incorporating the city campuses of UTS and TAFE in Ultimo along with ABC and various Start-ups connecting back to the Central Station

- **Surry Hills Creative Node** - with clusters of creative and professional services blended in a mixed-use community.

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[2] Our research also considered secondary linkages such as the existing FinTech and Start-ups Hubs in the Sydney CBD, Health/Education Cluster at Randwick with POW and UNSW collaboration, the Sydney University Campus at Westmead, Macquarie Park and Macquarie University and the emerging planned Sydney Innovation and Technology Precinct (**Central**) at Central Station.

Figure 2: Study area activity nodes and area of influence
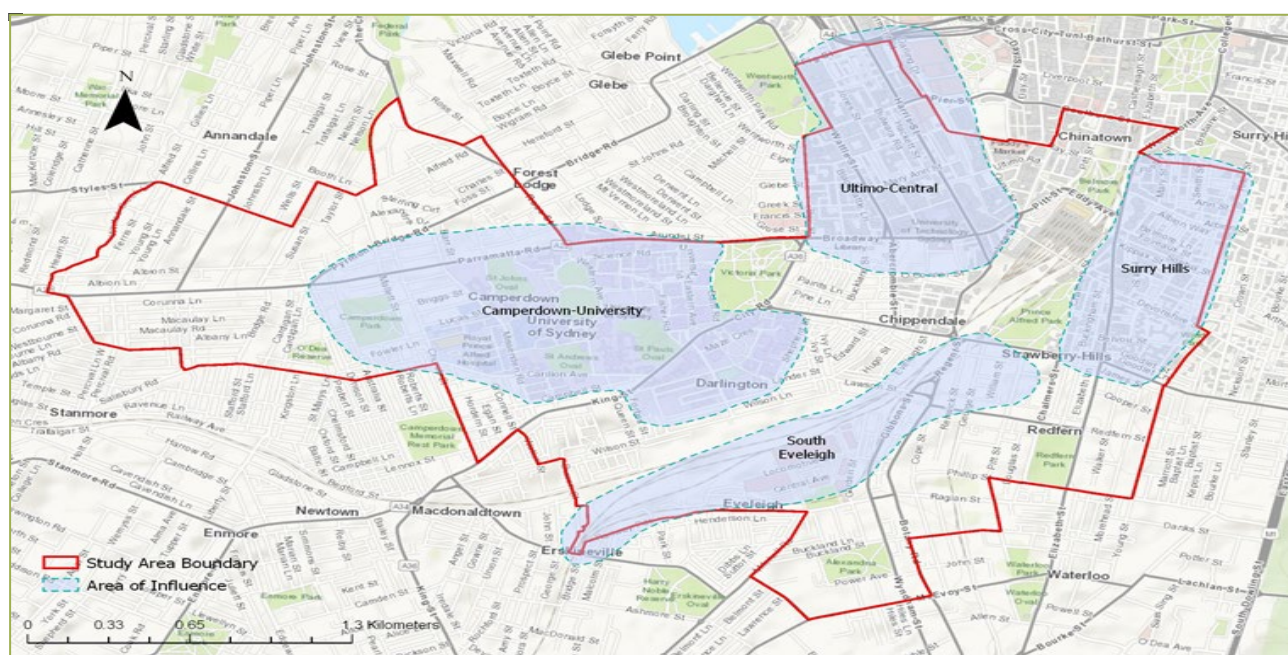
Source: HillPDA and Arc GIS

The innovation nodes themselves, being smaller than the Precinct as a whole, contains roughly some 49,776 workers as of 2016. Going forward, NSW Government Transport Planning and Analytics (TPA) baseline forecasts suggest that the fastest growing area in the Precinct is anticipated to be the South Eveleigh node. This is likely due to the considerable land development in and around the Sydney Metro as well as the relocation of the Commonwealth Bank offices to take up space being developed at Australian Technology Park.

Table 4: Summary baseline projected node growth

	2016	2026	10 Yr % Avg	10 Yr %Chg
Ultimo-Central	9,201	9,678	0.5%	5.2%
Camperdown-University	16,306	17,460	0.7%	7.1%
South Eveleigh	3,242	18,000	18.7%	455.2%
Surry Hills	21,026	22,183	0.5%	5.5%
Total	**49,776**	**67,321**	**3.1%**	**35.2%**

Source: TPA employment projections 2016; HillPDA analysis

Based on consultations with key stakeholders, there may be additional pent up demand with limited ability to provide for additional capacity.

For example, in a "high case" scenario, South Eveleigh is currently at capacity, but there might be additional capacity through redevelopment of Eveleigh North and the Metro corridor, which would add capacity for an additional 4,000 workers.

Further, the NSW government is planning for an additional 25,000 workers through the Ultimo-Central corridor, which will be accomplished through redevelopment of existing stock. The University of Sydney estimates that it is at 85% capacity, which is an implied 17,000 workers if developed to full capacity. UTS has no additional plans for expansion. All together this represents an additional 46,000 potential workers in the precinct under an optimistic scenario where the existing capacity and planning is developed to its fullest extent.

We supplemented the above quantitate data with a qualitative assessment against the innovation principles derived from the literature review. This assessment is meant to identify strengths and weaknesses of each node and help formulate specific recommendations for improving innovation and collaboration. This assessment was

based on stakeholder input and our own judgment with respect to the nature of each node. The following table is meant to summarise the analysis in the body of the report.

Table 5: Summary node assessment

Theme	Principles		Camperdown-University	Ultimo-Central	South Eveleigh	Surry Hills
Quality of Place	Quality of transport and connectivity	Transport Access	Train: Poor	Train: Excellent	Train: Good	Train: Good
			Bus: Good	Bus: Very Good	Bus: Poor	Bus: Good
			Car: Poor.	Car: Poor	Car: Good	Car: Poor
		Pedestrian Experience	Good	Poor	Poor	Good
	Quality of amenity		Good	Good	Limited	Good
	Distinct urban character		Strong. Heritage Campus	Moderate. Modern Office	Weak. Business Park	Strong. Village / Mixed Use
Economic Fundamentals	Distinct industry / employment clustering		Strong. Education / Hospital	Strong. Education	Strong. Financial Services	Moderate. Creative / Professional Services
	Residential / commercial development potential		Limited	Good	Limited	Minimal
Governance and Support Services	Anchor institutions or firms		Strong. University of Sydney	Strong. UTS and TAFE NSW	Moderate. Commonwealth Bank	Weak.

In support of the above qualitative assessment, we have summarised the key features (pros and cons) for each node in the table below.

	Pros	Cons
Camperdown-University	• Large public amenity and green spaces • Historic precinct with unique architectural character	• Limited public transport options • Large dispersed campus
Ultimo-Central	• Excellent proximity to central station and transport options • Good access to shops, services, night life and recreation options • More flexible zoning for future development	• Physically limited by major roadways • Limited open / green spaces
South Eveleigh	• Large anchor tenant located within the node • Curated space and amenities	• Physically distant from other nodes with limited connectivity • Lack of distinct urban character • Anchor tenant undertaken limited incubator / R&D activity
Surry Hills	• Strong urban character and good access to urban amenities and transport options • Distinct character	• Limited potential for future residential or commercial development • Few large-scale anchor tenants

Stakeholder engagement process

To further supplement our own assessment and analysis, we drew on the expertise of a range of stakeholders relevant to the precinct to inform recommendations for boosting collaboration and innovation as part of a broader study.

To limit the potential for duplication and overlap, we first carried out an analysis of key studies and strategies previously developed to assess where there may be gaps or opportunities for further consultation.

Next, we undertook initial rounds of consultation in late March to early April with the objective of gathering high level thoughts and ideas on how to drive collaboration and innovation in the precinct. Consultation activities included workshops, focus groups, roundtables and interviews with key stakeholders.

We sent a proposed invitation list to each organisation targeted for consultation and worked with them to determine the most appropriate and relevant representatives. We kept the groups small so that discussion could be targeted specifically at innovation and collaboration and to ensure all voices were heard equally. The workshops focus groups and roundtables involved lively participation, with robust discussions regarding the current situation in the precinct with many new and creative ideas suggested to drive collaboration and innovation forward.

We also received several proactive requests from people keen to participate in the Study, based on conversations they had had with colleagues about the Study and the positive feedback from the consultation activities.

Lastly, we created an online survey to businesses both within the precinct and relevant businesses outside of it who might be attracted to move there. Responses ranged from multiple choice, ranking and free form. A total of 38 responses were received and the results of this survey are provided throughout this report.

Key stakeholder engagement findings

Feedback was extensive and overwhelmingly positive. Many stakeholders were keen to progress discussions further on specific issues and volunteered additional time to participate in targeted interviews to further refine the Study's recommendations.

Based on the input from stakeholders, we then worked to consolidate these insights into key themes, which have been summarised below.

Current nature of collaboration and innovation

1. **Collaboration is happening ad hoc and in silos:** Silos both within (and between) industries are also problematic. Stakeholders from the creative industries said there is a tendency for people to seek opportunities 'within their own tribe' and not beyond. Stakeholder respondents to the online survey on average ranked the current status of collaboration and innovation as "low" – 45% of respondents ranks collaboration as low while and 55% of respondents ranked innovation as low.

2. **Universities play a key role but competitive tensions can limit collaboration:** There is a need for the universities to support each other and collaborate together; however it was noted that competitive pressures – such as competition for students and protection of ideas and IP - can somewhat limit opportunities. Stakeholders believed that these barriers could be reduced or overcome with the appropriate governance structure in place and/or formal agreements.

"The universities should be supporting each other and recognising their differences. We need to look at who is shining in what area and be open to collaboration and a willingness to share ideas. Governance is critical and will provide a framework for this to work." – University of NSW

3. **Industry participation is desired but sometimes lacking:** Across the precinct and throughout its nodes there is a strong desire to see industry participate in and provide funding for collaboration and innovation activities. However there appears to be a lack of awareness, understanding and/or acceptance from industry that investing in these types of partnerships will bring mutual benefits.

"There has been growth in translation of health and medical research, but the missing link is industry partnerships. To attract industry, you need to understand what's important to the big industry players. We need to look at more ways we can integrate industry into our campuses." – Sydney University

"Universities don't talk to people working in creative industries much about how and what they are teaching their students. Partnering with industry would no doubt improve their courses so people can have both artistic and commercial success" – Art Pharmacy

Opportunities to boost collaboration and innovation

4. **Harnessing the power of new and emerging technologies:** Many stakeholders have found that technological capability across all precinct nodes can be poor, with slow internet speeds and poor phone reception with many blackspots. Fixing this was a key priority, given that it creates the atmosphere and experience that you would expect from an innovation district.

"The advent of 5G is very exciting but even providing free WIFI is a start. In emerging countries like Vietnam it is prevalent and is helping their economy to flourish" – Sydney Business Chamber

5. **Creating a vibrant atmosphere with better public amenity and a 24/7 offering:** The need to create a vibrant atmosphere for the precinct, with an exciting day and night-time offering is seen as a key opportunity to drive collaboration. For example, the provision of services such as retail shops, gyms and childcare, alongside cafes, restaurants and a thriving night life were all seen as factors that would help attract people to the precinct and encourage them to stay.

"Precincts are successful when people know that there will be something going on at any time, day or night. There needs to be events on all the time, or at least something happening so people know that when they get there, they are more than likely to find like-minded people." – South Sydney Business Chamber

6. **Providing activated spaces and events that foster collaboration and innovation:** Stakeholders believe that a combination of activated spaces that encourage 'bump in' encounters and formal events are required in order to foster collaboration and innovation in the precinct. Both these spatial drivers allow people to connect whilst also providing amenity and recreation to those in the precinct.

"It's not easy to get events up and running due to the cost and number of approvals. The City could definitely make this process easier to encourage more events." – South Sydney Business Chamber

"It's what happens in between the buildings that is most important." – Atlassian

"We could hold some of the most innovative events in the precinct. The opportunities are endless – we just need the right type of space and for the City and State Government to come on board and provide some funding. The return they would get would far exceed the value of their investment." – Stalker Theatre

7. **Curating, attracting and retaining the best mix of tenants:** The curation of these tenants must be carefully managed to ensure the mix is complementary and diverse in order to create the right atmosphere for collaboration and innovation to flourish. Each node therefore needs to be made up of businesses that support each other to collaborate and include a mix of retail, hospitality and other services that create a place where people want to work and play in order to attract tenants.

   "It's like building a shopping centre – you want the mix of tenants to complement each other so they can bring out the best in each other. This means putting like-minded people together, but also ensuring you have diversity to bring the right vibe to the precinct." – Fishburners

8. **Opportunity to highlight Indigenous history and culture to invigorate the precinct:** Redfern is seen as the birthplace of the Indigenous rights movement and is a critical part of indigenous history and culture. Stakeholders believe there is a great opportunity to draw on this history to invigorate the precinct, noting that there are strong synergies between the movement and the way it innovated Australian society and the current tech startup tenants who are also driving innovation.

   "The more we see ourselves and our cultural representation in the community the more comfortable our people will be and the more opportunities there will be for the broader community to collaborate and learn about Indigenous culture." – National Centre for Indigenous Excellence

<u>Key barriers to collaboration and innovation</u>

9. **Availability and affordability of floor space**: Lack of available floor space was cited as a key threat to future collaboration and innovation. Researchers and start-ups rely on subsidised rent to carry out their activities, particularly in the early stages of a project. This is currently provided by various groups including the Universities, who offer subsidised space to researchers, and by start-up incubators and co-working spaces who receive rent subsidies and/or discounts from government which they then pass on to their tenants. Lack of affordable, available and appropriate space is also a key issue for the creative arts industry, who are increasingly finding themselves priced out of precinct.

   "Research, particularly in its early stages, doesn't tend to generate income, however it is essential for driving innovation. Industry should come to the table more and provide funding for this to thrive" – UTS

10. **Competition for funding and lack of prioritisation for innovation:** Inadequate and inaccessible funding was repeatedly cited as a key barrier to innovation, with competition for limited funding and grants hindering the ability of many organisations to collaborate.

    "There is a huge opportunity to drive more clinician-driven research, which will provide major economic benefits to Sydney. The challenge is securing funding and ensuring research is prioritised in the mix." – RPA Hospital

11. **Poor pedestrian connectivity and accessibility to public transport:** With traffic congestion a major issue for the area, improving pedestrian connectivity is seen as key to unlocking innovation and collaboration. There was support expressed for creating an 'innovation spine' – a walkway that connects various parts of the precinct – for example from Sydney University to ATP – which could also be activated to showcase innovative projects and/or host events.

    – Congestion on public transport and lack of a heavy rail connection to the Camperdown node is seen as an issue that will only grow as Sydney University and RPA expand their campuses and attract more students and workers to the precinct.

12. **Lack of a coherent shared identity and known brand:** There is a lack of shared identity or 'branding' for the precinct is hindering its ability to attract and retain talent and funding, in contrast to other places such as the Melbourne Innovation District (MID) which is internationally recognised as a premier innovation district.

13. **Lack of governance and differing views on the best model to drive innovation and collaboration:** Developing and implementing an effective governance model for the precinct was also seen as key to achieving innovation outcomes and was seen a precursor to obtaining the necessary funding to drive its growth. At present, there are small and fragmented structures and strategies governing innovation activity which creates inefficiencies and crossovers and limits opportunities for collaboration.

    "The entire Sydney ecosystem feels fragmented as initiatives have started from the ground up. There is little governance that ties everyone together to work meaningfully. Most collaborations are one-offs and for specific events rather than long-term partnerships and initiatives that bring people to work together and create real value." – INCUBATE

14. **Challenges with attracting and retaining international talent:** Stakeholders acknowledged that there is great competition on a global scale to attract and retain the talent required to drive innovation and there are various factors that make the Precinct (and Sydney in general) less attractive. The cost of housing and education is cited as a major barrier for many people, particularly those who have families or wish to live close to the precinct/Sydney CBD. There are ongoing issues around securing visas to enable talented researchers to work in Australia.

Big ideas and prioritised actions

Based on our combined literature review, quantitative analysis, qualitative assessment and stakeholder input, we formulated a list of potential initiatives that could feed into the SS250 strategy development process. Some of these initiatives may require a multi-stakeholder approach over longer periods of time, while others may face other technical challenges or funding constraints. As a result, we have separated our list of initiatives into two groups.

The first group represents our "big ideas". These are initiatives that may more complex to complete and would require a longer time frames to complete. Potentially they would require multi-level stakeholder involvement from different levels of government or industry.

The second group represents specific initiatives that could potentially be undertaken by fewer stakeholders over a shorter timeframe; these represent specific projects or initiatives that could be undertaken more immediately.

Table 7: Summary big ideas

Innovation Principles	Precinct 'Big Ideas'	Report Ref.
Residential / commercial development potential	Explore avenues to increase commercial space throughout the Precinct (changes to land use zoning, development joint ventures, development incentives etc.).	Section 2.3, 2.7, 6.3.3, 6.3.4 & 6.4.1
	Provide subsidised housing for researchers and visiting academics.	
	Provide more affordable commercial space for creative industries	
Distinct industry / employment clustering	Attract industry to co-locate and expand R&D	Section 2.4 & 6.3.3
Quality of transport and connectivity	Implement a precinct-WiFi or 5G digital connectivity program to enhance the availability and quality of internet across the Precinct.	Section 2.10 & 6.3.1
Quality of transport and connectivity	Revisit the north-south metro rail line link that followed the proposed path from Macquarie Park Metro Station to the new metro stations at White Bay and Glebe/Camperdown.	Section 2.5, 6.4.3 & 8.0
Governance and Support Services	Form a governance body to coordinate and facilitate innovation activities across the precinct (i.e. branding, innovation events and programs, etc.)	Section 2.11 & 6.4.5
	Leverage a newly created governance body to actively curate and manage a mix of uses in the Precinct to meet the need and add vitality.	Section 2.11, 6.3.4 & 6.4.5
	Develop a new special innovation business zone that would provide certified innovative / creative businesses and workers with the following benefits and support services: • Priority access to Visas for key workers and their families for 5 years • Accelerated accreditation for Health Workers relating to medical research (certain restrictions to apply) • Support and flexibility to claim R&D Tax Concession • Business start-up package (like the City of London) with tax breaks and legal support to register a business and all the associated start-up red tape streamlined • Free legal advice on business formation and IP partnership structures • IP Bank that lends money to start-up for a share in their IP with the option to buy back later • Business collaboration matching service for research projects.	Section 2.11 & 6.4.5

Additionally, the following are a list of specific node level priority actions that could be undertaken by individual stakeholders alone, or in coordination, to immediately remedy some of the known innovation barriers.

Table 8: Summary priority actions

Innovation Principle	Priority Action	Report Ref.
Quality of transport and connectivity	• Extend the Goods line all the way to the Camperdown Campus providing a connection to North and South Eveleigh and back to Darling Harbour. • Create a legible and highly connected network of major pedestrian connections through the precinct (i.e. Surry Hills Tunnel to Goods Line to Darling Harbour; evaluate pedestrian axis proposed by GSC as possibilities (Highline, Beltway) • Address pedestrian and public space issues through the development of an ultra-low emissions zone • Creation of an active transport zone with complete connectivity for micro-mobility (bikes, scooters, skateboards). This could be adopted for the extended Goods Line concept with electric bikes available for hire. • Trial of on-demand shuttles connecting precincts main institutions and commercial centres. Address major issues with pedestrian connectivity such as Haymarket to Darling Harbour, around Central Station and so on.	Section 2.5, 6.4.3 & 8.0

Quality of amenity	Undertake initiatives that could be combined to create a new 'healthy city precinct':
	
	• Significantly increase urban tree canopy in streets and open space, to support pedestrian amenity, climate amelioration and distinctive placemaking
	• Invest in major iconic public spaces to act as a central focus for sub-precincts and their community identity.
	• Develop a Wonerf, or shared path concept (e.g. a living street, as originally implemented in the Netherlands), for smaller and more residential streets
	• Leverage public parks as more active community spaces not only for the daytime but for the night-time as well.
	  – Sydney University is investigating in partnership with the CoS to open the public connection between the University's Law Building and Victoria Park.
	  – Connect the Powerhouse Museum along the Goods Line offers an opportunity for the existing public spaces and laneways adjacent to the campus to become more pedestrian-friendly and support neighbourhood activities for residents, workers and students.
		Section 2.5, 6.4.3 & 8.0

KEY STRATEGIC PLANNING CONSIDERATIONS

2.0 KEY STRATEGIC PLANNING CONSIDERATIONS

2.1 Demand for floor space is hyperlocal and exceeds supply

Innovation districts tend to flourish in clusters of self-contained communities within 10–15 minutes walking distance radius, however the demand for space within these areas is already exceeding available and affordable supply.

Figure 3: Study Area Heat Map Key Employment Density by Industry
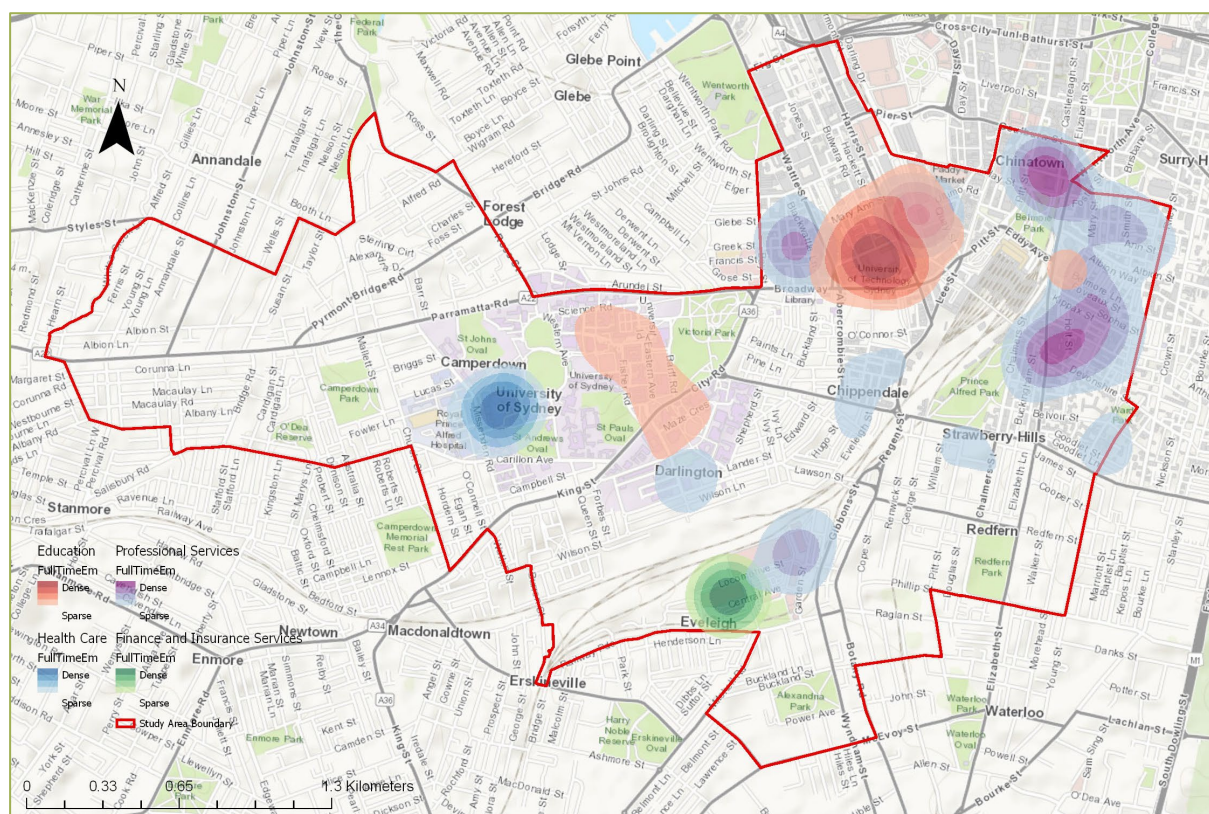
Source: HillPDA Analysis City of Sydney FES data

The term 'hyperlocal' refers to activity that occurs within small community or tightly defined geographical area. The term was originally used in sales and marketing circles to refer to techniques that help drive foot traffic to specific physical locations and capitalise on "near-me" digital interactions. For example, many telecommunications companies often prompt their customers to purchase overseas travel passes for data and voice calls when their mobile GPS shows they are near an international airport.

Increasingly this term is being used in economic and land use planning circles to describe the mechanisms that drive urban economic growth due to the close presence of physical infrastructure, businesses, services and amenities that facilitate meeting, interacting, transacting and generating new ideas and economic activity.

For example, research conducted by Carlino and Hunt (2012) found the clustering of research and development labs to cluster at a smaller scale such as distances of about one-quarter of a mile. This means that the clustering effect could quickly dissipate as distance increases. This suggests that knowledge spillovers to be a "highly localized" phenomenon. Thus, localised critical mass (e.g. the clustering of enough workers) is an important consideration when spatially planning for innovation.

This concept of hyperlocalism is especially relevant given the current high demand and limited availability of floor space within the Study Area. Without enough floor space businesses and institutions are forced to move their

facilities to satellite locations, which poses considerable challenges for generating the benefits that come with a denser innovation cluster.

For example, our consultation with each innovation cluster including Surry Hills indicates they are at close to floorspace development capacity. The Sydney University Campus is heavily constrained by heritage and height controls in its campus. Sydney University have said their campus is close to 80% of its potential floorspace capacity. The UTS is similarly constrained as they seek to consolidate their campus in Ultimo.

A direct outcome of their floorspace constraints has been the establishment of their Botany Campus for Engineering and their Spinal Research Unit lead by Professor Bryce Vissell. South Eveleigh has also reached its floorspace capacity, although the redevelopment of the Locomotion Sheds will alleviate this somewhat as it will provide a mix of commercial office and retail uses. Space for innovation though is likely to be limited.

Similarly, HillPDA notes the NSW government has announced the provision of additional 250,000sqm of dedicated technology space at Central Station as part of its Innovation Strategy. While this is no doubt highly valuable, based on our research we estimate that supply will only partially satisfy floorspace demand for the universities and creative industries.

It's also important that floorspace demand is considered at a cluster level and at a collective precinct level. The demand for the type of space required is specific to each cluster, its anchors and the existing partnership and research networks. To apply a universal policy for the precinct poses the risk of some industries being neglected to accommodate others.

To address these capacity restraints, the first option for policymakers is to maximise the existing building envelopes that are currently located in each cluster. This means a review of existing building efficiencies, built form controls and considering increasing building heights over expanding the footprint. It also means looking at the flexibility of zoning to provide a self-contained community with a broader range of services, land uses and social diversity to foster social cohesion and sustainable urban and economic development. Although a more compact model, the higher density can be matched with improved quality of urban space and amenity.

The second option is to look at floor space capacity and amenities within walking distance of established clusters and transport nodes. There are several expansion opportunities that exist, including east to the Waterloo Metro Quarter as an extension of the technology cluster or at North Eveleigh as per the unsolicited proposal submitted by Mirvac's and the University of Sydney late last year.

Sydney University has also considered options to expand its campus to North Eveleigh and for its biomedical precinct to extend along Parramatta Road to Glebe and Annandale. In consultation with Sydney University, we understand the Camperdown Ultimo Alliance is looking at the potential for lower value existing zoning can be leveraged to support the growth of space suitable for biomedical research and local area demand for creative and innovative uses.

A strategy for further consideration is the example of the Barcelona @22 innovation district where floor space bonuses provided to developers for additional innovative workspace and loft apartments built as have subsidised space for creative and research workers. The mix of uses adds to the vitality of the area which can drive wider economic benefits thus not undermining the project's commercial viability.
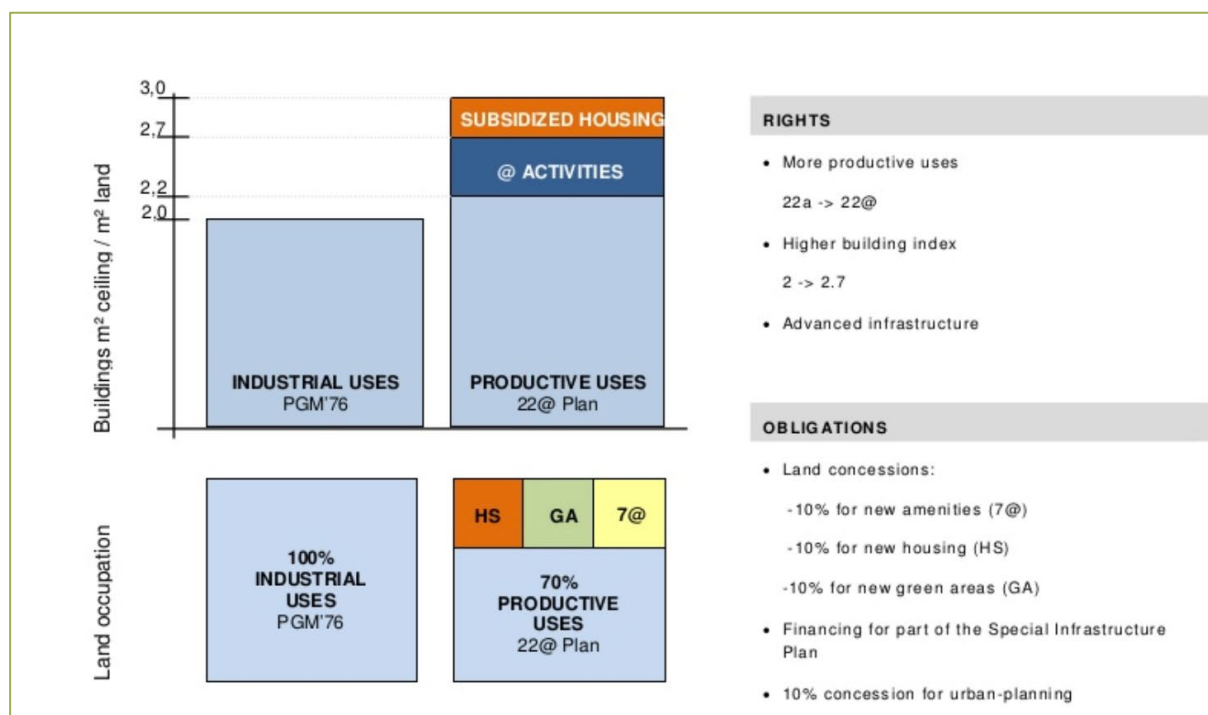
Source: 22@Barcelona Plan June 2012

A key consideration for SS2050 is not only the quantum of floor space for the Precinct but also the optimisation of floor space around the existing clusters providing an equitable distribution of floorspace to all the existing clusters as required. This should be done in consultation with the cluster landowners and governance bodies.

The supply of commercial space must also be suitable to meet the demand for specific types of space including wet labs and communal space for events and teaching.

2.2 Curate a mix of uses in the Cluster to meet the need and add vitality

Innovation districts operate on a 24/7 basis and like all good urban communities need a range of services including childcare, gyms, restaurants, short-term accommodation and retail offerings including supermarkets. They also need to provide attractive employment spaces including access to suitable workspaces, public transport and open space for recreation, relaxation and reflection.
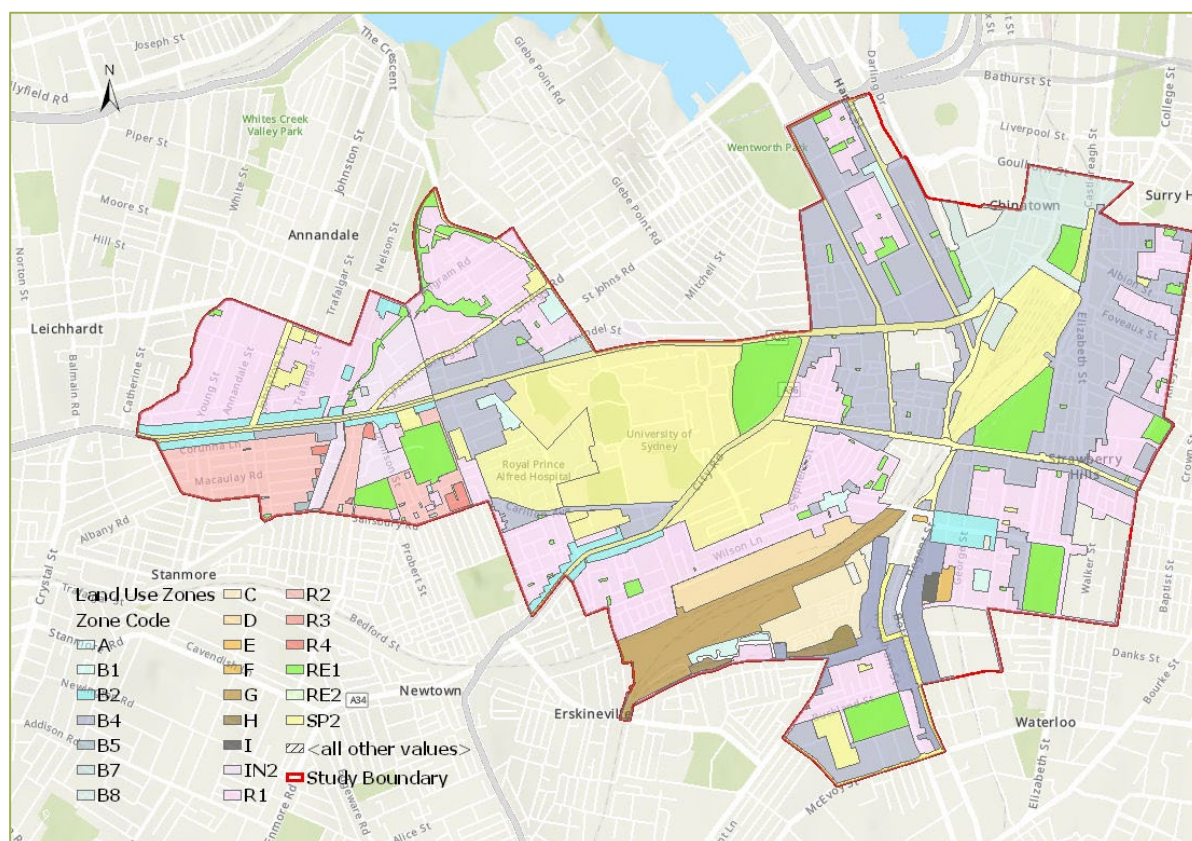
Source: HillPDA

Our review of planning controls shows for the Camperdown Node a dominance of the Infrastructure (SP2) zoning as it reflects its uses as a hospital and a university campus. The surrounding uses are a mix of B4 and R1 Residential. From a perspective supporting innovation, land use planning controls can support the node to be adaptable and a more self-contained city by providing for a range of uses that are increasingly accessed via a pedestrian focus and centred around the public space.

The UTS campus is predominately in a B4 zone which provides for a flexibility of uses but also potentially higher land values which impacts their ability to consolidate and expand the campus. The Central Station falls under SP2 zone reflecting its use for transport.

It is not the scope of this study to undertake a comprehensive review of planning controls, but we do make the following comments relevant to spatial drivers for innovation being:

- Planning controls will need to support place-making with a range of services and uses in a compact built form

- Expansion of existing clusters is constrained by both the availability and cost of land acquisition. Except for government land, the market price for a development site will be set by the highest and best land use value set by the planning controls. Land zoning use and capacity, therefore, has a direct relationship to the site's value.

- Innovation clusters may benefit from an incentive approach targeted to the provision of floor space for research, education, Start-ups and creative users only. Incentives such as a floorspace bonus reduce the land value per square of GFA in the acquisition. If the incentives are universally applied this will negate the cost benefit to innovative uses and their ability to subsidise rents.

A key consideration for SS2050 and the new Local Strategic Planning Statement is a review of the planning controls to ensure that these areas support a range of uses that add to the diversity, vitality and social cohesion of the cluster.

2.3 Affordability and availability of suitable space

Our literature review shows Start-up Hubs, Research Institutes and Accelerator Businesses require subsidised rent, at the very least in their early stages of development. Responsibility for the provision of subsidised space is likely to fall to government unless industry is obligated or incentivised to provide it.

Our consultation has reinforced the key barrier to establishing and expanding research ventures and Start-ups is finding affordable space within the innovation precincts. This is somewhat unsurprising given the clusters are located close to the CBD where competition for floorspace is higher and has an impact on rental rates. This makes it difficult for research institutions and start-ups to locate to the innovation clusters and/or expand as they have limited commercial income and rely on grants and seed funding.

Increased expenditure on rent decreases their available expenditure on research/staff and hence rent cost has a direct correlation to innovation output. Our research suggests Start-up like Fishburners offer desk space membership at about 50%– 60% of market rent. Fishburners rely on a subsidised head-lease from Government to offer this discounted rent to their members. Research institutes typically rely upon a gifted building with a nominal rent and even then, they find the cost of their outgoings a significant drain on their budgets. Likewise, even established tech companies like Atlassian, Microsoft and Google who can afford to pay market rent seek to reduce costs by locating their headquarters outside of prime CBD locations.

The need for subsidised rent to encourage innovation is clear, however questions remain around who should fund this and for how long? Start-ups should ultimately strive to be self-sufficient as this a clear indication of innovation success.

Our consultation with industry places responsibility for providing these subsidies firmly with government, not the market. Indeed, there are examples of this working effectively, for example direct subsidisation at the Tech Start-up Hub at Wynyard or indirectly as a condition of the release of land at ATP to Mirvac.

An alternative option is negotiating such space as is done with affordable housing through inclusionary zoning provisions in the LEP or as an incentive with a floor space bonus through a planning agreement. Suitability of space and of the desirability of location is likely to limit this latter approach but it remains relevant in the existing clusters for consideration.

A key consideration for SS2050 is ensuring there is a balance of suitable and affordable space is in the nominated innovation clusters. This may be provided for example, through covenants on the sale of land or conditions of consent for its release.

For existing landholders like Sydney University and UTS planning bonuses at a campus-wide level may be applied to recognise the benefits that will flow to the broader community when it comes to collaboration and innovation from opening and expanding their campuses for public and community use.

2.4 Attracting industry to co-locate and expand R&D

Our research of international case studies shows successful innovation clusters tend to have a large proportion of private industry co-locating on campus sharing and collaborating on R&D. This needs to be encouraged using incentives and/or marketing the precinct as a premier innovation district.

When curating anchor and other research tenants, it is critically important to ensure they intend to use the space for legitimate R&D purposes, as opposed to hosting, for example, their sales and marketing teams under the guise of being a research firm.

Our consultation with research institutes suggests that most large companies tend to locate their research arms in the USA, Asia and Europe as opposed to in Australia. It was noted in the consultation that in Australia R&D is mostly D (development) with very little R (research). Exceptions do exist, including the Qantas Jet Lab research at Sydney Uni and the biomedical partnership of Cochlear with the Macquarie University, however these are few and far between. Indeed, Macquarie University has been reaching out to local pharmaceutical companies in Macquarie Park to partake in R&D but with limited success to date we have been told by experts in this field.

A solution for greater industry participation might be directly targeting multinationals to locate R&D in Sydney.

A recent example of this is tech company Dolby Laboratories who chose to locate its R&D activities in the Pacific in North Sydney. Its primary reason was because the location provided easier access to local PhD talent from Sydney's universities with a higher likelihood of retaining that talent due to less local competitors. The attractive liveability of Sydney to overseas talent also ranked high in its decision-making criteria, although this can be sometimes offset by issues regarding affordability of housing and lifestyle.

There are also other programs which encourage research development which should be supported to help drive industry participation and collaboration. For example, the UTS 2027 Vision has a significant focus on working with industry on and off campus. Parts of this vision include industry contracting out research activities to the university, co-location of industry on campus for specific projects and internships for students and scholarships provided by industry for further studies for PhDs and R&D.

Jobs for NSW under NSW Treasury are also pursuing an active program to attract tenants to the new Central Technology Precinct. There may be a role for the CoS to provide a targeted program to attract industry with real R&D outputs to Sydney's innovation clusters, like the way the UK Trade & Industry does with the City of London.

A key cornerstone of the strategy for this precinct is to secure five technology firms as anchor tenants to provide the critical mass to attract start-ups and associated services. It was noted in consultation that these anchors must be legitimate R&D tech firm. Not "fake-tech" companies that only use the space for sales and marketing

Our consultation with industry experts identified Asia as the greatest opportunity to attract industry R&D, however they noted Sydney has strong local competitors with Singapore and Melbourne both considered premier destinations for this activity. A strong business case needs to be made for potential firms to choose Sydney, with the provision of support services and direct marketing likely required to compete effectively against clusters interstate and abroad.

A key consideration for SS2050 maybe to consider the Camperdown Ultimo-Collaboration Area as an innovation economic zone in which locating industry are offered a series of Start-up packages, including visa for key staff and families along with social and housing options. Assistance in finding office accommodation and collaboration partners would all form part of the governance model within this economic zone.

2.5   Better connectivity to attract and retain talent and drive collaboration

Connectivity is a critical factor in creating an ecosystem for innovation districts to flourish. They help attract and retain talent and drive collaboration, creating an ideal ecosystem for innovation.

Whilst there is some degree of connectivity throughout the precinct and within its clusters, the need for this to be improved was a consistent theme throughout the stakeholder consultation.

For example, for the Darlington and Camperdown campuses there was consistent feedback that accessibility is poor for both public transport and pedestrian connectivity to and from these nodes[3]. Suggestions for how this could be improved include:

- New north-south metro link from White Bay to via Green Square to Randwick
- Removal of through traffic leveraging off Sydney Metro City and SouthWest (Waterloo Station), WestConnex, Western Harbour Tunnel and Metro West
- Mass transit option down Parramatta and City Road to Central
- Cycle /Pedestrian dedicated path connecting Sydney University to Central and new Metro Station at Waterloo
- Improved public pedestrian connectivity through the Sydney University campus.

For the Ultimo Campus, the congestion of Parramatta Road for buses and barriers for the pedestrian to access Central for trains is well known and key pain point for stakeholders in this district. Opportunities to upgrade the Goods Line and improved access to Central and down to Darling Harbour could be explored along with a dedicated/improved bus, cycling and pedestrian area along Parramatta Road.

Access to South Eveleigh will be improved once the southern concourse at Redfern Station is built. There will be in the future also access to the new Waterloo Metro Station which will mean SS2050 will need to consider how South Eveleigh will connect to this new Metro.

A key consideration for SS2050 is for improved transport accessibility and connectivity for each of the nodes and pedestrian connection from the transport nodes to the clusters.

2.6   Foster collaboration by integrating uses and ownership

Our research and consultation show a need and appetite for a greater sharing of physical and functional resources between the CoS, universities and industry.

In consultation with the universities and industry, there was a mutual agreement that more university events should move off campus and occur closer to the CBD, for example to locations such as Carriageworks and the PowerHouse Museum. Likewise, the universities should open their campuses to the public and develop more as cities themselves with greater public access and events.

This shift away from closed academic communities and towards a greater mix of public and private uses on campuses creates opportunity for shared ownership with shared goals. This ultimately drives innovation outcomes by broadening the idea-base via an urban network of functions that are facilitated by university partners. Local communities can also benefit from the presence of university communities of students and knowledge workers, adding to the vitality of areas neighbouring the campuses.

A key consideration for SS2050 is to identify partnership programs with the university to shift from monofunctional to multifunctional campuses with greater public access and interaction on campus.

Opportunities may include public access and sharing of university opens spaces, community facilities such as libraries, sports facilities and an expansion of pedestrian networks connecting rather isolating neighbouring

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[3] Additional detail and analysis concerning connectivity provided in section 7.0 and section 8.0.

communities. Campuses in this public/private transition can be used as living labs to exploit the opportunities and test the ways stakeholders may act on these trends.

Figure 6: UTS Campus Building 2 Open Plan Collaborative Space & Library

Source: UTS City Campus Masterplan. FJMT Architects

2.7   Subsidised housing for researchers and visiting academics

Our research and consultation have shown there is a need to provide affordable housing for low-income researchers as well as subsidised executive housing to attract talent interstate and internationally.

Access to affordable housing is a key factor highlighted both in the literature and throughout our consultation with stakeholders. Many researchers and start-up employees have relatively low incomes, however given they work long and irregular hours, they need to be located close to their workplace and/or research facilities.

Our consultation highlighted housing affordability as a major barrier to talent attraction. Availability and affordability of executive housing is poor in Sydney by most interstate and international standards. Given demand, supply and cost of housing is driven by market forces, there is a need for intervention to ensure we can attract this talent to our innovation districts. For example, innovation centres in Kyoto offer packages to research and innovation talent that include subsidised rental accommodation and access to schools for the family's children. The policymaker planning model for the collaboration precinct should consider a broader view of affordable housing to cover not just low- and mid-income households but also offer executive market housing at a subsidised rate to compete to attract talent from existing places of excellence for research and innovation.

A key consideration for SS2050 is the supply of affordable housing for low to mid-income housing working in the Collaboration Precinct. This may be extended to higher income bands where those workers are employed by the university or research institute as a researcher or academic. The housing model might be like the CityWest Housing mix of low moderate- and high-income workers. Other options include the sale of public lands to universities to build and provide affordable housing for students, researchers and visiting academics. Potential locations include North Eveleigh, Waterloo Metro Quarter and extensions of the rail corridors.

2.8   Culture and social diversity

Our literature review and consultation all strongly reinforced the important role of culture and social diversity to build social cohesion and vitality in the community.

The importance of culture and social diversity in creating an attractive atmosphere and environment for the precinct to flourish is seen as critical for driving innovation.

South Eveleigh owners see this as an important element to make their investment more attractive to their tenants and their willingness to remain in that location. The same views are expressed for the placemaking at Central and feedback from the industry.

There are some areas of the precinct where there is already a strong sense of culture and identity. For example, stakeholders stated Chinatown acts as "a call to come home" for Asian students and their community. Improving the pedestrian connectivity and night safety access to Central and UTS campus is an important consideration to drive this forward.

Similarly, Redfern is seen as the birthplace of the Aboriginal Rights Movement – a movement that disrupted the status quo of society at the time and drove innovation in human rights for the indigenous community. There are strong synergies between this and the tech start-up community, who are focused on disrupting traditional industries with innovative thinking. Funding programs that help drive this cultural focus could help define a vision and sense of identity for the precinct, boosting participation and collaboration which will lead to innovation.

A key consideration for SS2050 is to continue to build culture and social diversity, recognising that it brings people together to share ideas leading to innovative outcomes.

Figure 7: High-Line New York, USA.
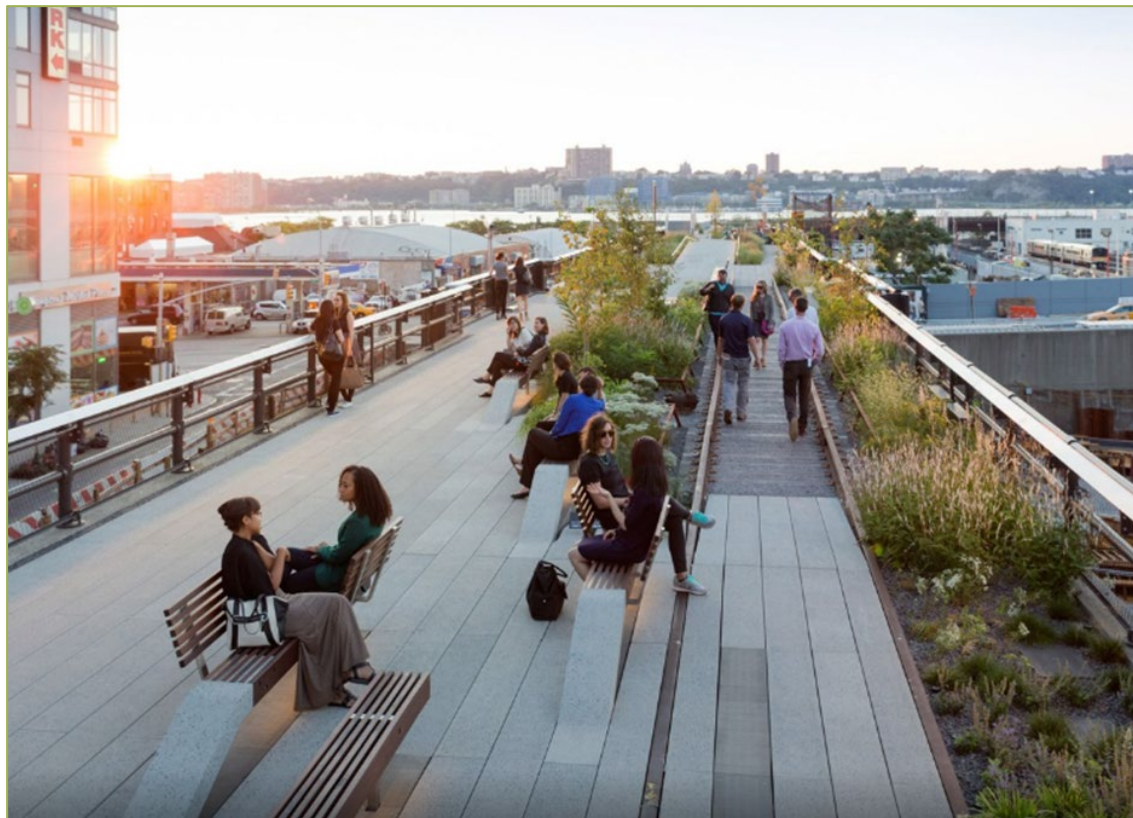
Source: Conde Nast Traveler

2.9 Support cultural and creative industries in the innovation precinct

Stakeholders suggested that the creative industry could play a pivotal role in building a distinct identity, creating a vibrant atmosphere for the precinct, and substantially contributing to the new and daring technological innovations. For example, numerous commentators have remarked that the iPhone (its success over comparable products) is best viewed as a triumph of innovative design over technical achievement (e.g. size shape, user interface, etc.) (Elgan, 2010).

However, stakeholders expressed concern about the vicious circle of creativity – the inclusion of creative industries improves a community's appeal, but over time tends to price them out of the local area as rents increase. Like the value-add research and start-ups create for an innovation precinct, so do creative industries as they can increase vibrancy and identity. The argument is that such creative industries requires long term support to remain in the CBD and CBD fringe locations. They may also require funding support to display and perform their creativity for the community benefit and appeal.

For example, the CoS in partnership with industry could provide funding for artists for public murals and exhibitions, street performances and events that activate the space, attracting more people to venture and stay there, boosting opportunities for bump in encounters that facilitate collaboration.

Figure 8 Visual art fronting the street – source UTS

Further, as with inclusionary zoning for research/incubation space, consideration should also be given for an inclusionary approach for creative industries in specified locations. Other considerations could include reduced rates reflecting their community benefit. Other funding opportunities might be directed through BID levies (Build Improvement Districts) as done in the USA or direct funding from the key stakeholders in the emerging innovation districts. Our literature research and stakeholder feedback strongly support the role that creative industries play in building a successful innovation precinct in both market appeal and social cohesion.

Finally, stakeholder consultation identified a lack of shared identity and branding for the precinct (Camperdown-Ultimo Collaboration Area). Often Melbourne Innovation District (MID) was provided as an example for shared identity and marketing to match and be improved upon for international recognition.

A key consideration for SS2050 is to identify creative industry clusters and potential emerging areas with a plan to support these uses through a range of planning and funding measures. This may include an inclusionary zone within specific zones to provide and retain creative industries, other planning measures like floorspace incentives. All measures should seek a long-term rental subsidy (or dedication of space to the CoS) solution to avoid these creative uses being squeezed out by market forces. The business case for intervention is justifiable.

2.10 Digital connectivity

Digital connectivity is critical for innovation districts, with two key factors being the speed/quality of internet and phone services and the ease of access/flexibility. There is significant evidence to support the notion that the digital infrastructure provided in the innovation district should be open and free.

Our consultation identified the benefits a fast, reliable and free Wi-Fi network can bring to the innovation districts. It will enable people to network and interact within each cluster and to collaborate with other innovations hubs outside the precinct such as Westmead, UNSW and MID in Melbourne. Our consultation

feedback is that due to increasing travel times, with city congestion, meetings outside the cluster are likely to be increasingly done digitally. It is thus an essential tool for business and collaboration.

The speed and quality of digital connectivity within the Camperdown-Ultimo innovation district is generally quite variable, with the broader community reliant on Wi-Fi networks that suffer pockets of poor reception in and around the inner-city suburbs. The introduction of 5G technology is likely to create massive opportunities for the precinct. There is merit in investigating setting up a 5G network as a living lab for the Collaboration Precinct that provides high speed/quality digital connectivity across the board spectrum, free of charge to all in the community including visitors.

Integrating the community of stakeholders, participants and residents adds to the social dynamics that are so critical to the growth and sustainability of an innovation district. Community building is a critical function of the digital infrastructure of an innovation district.

A key consideration for SS2050 is considered an open free 5G network for the whole community in the Collaboration Precinct. This free Wi-Fi network would also provide a free App to provide what's on for events and entertainment in the Collaboration Precinct. The App could also provide useful wayfinding tools, travel information along with support services to find anything from housing to office space to legal support with IP. assistance.

2.11   Governance to form and maintain the cluster

The role of governance is not simply to form the innovation cluster but to ensure it remains competitive, adaptive to change and remains true to its founding vision as an innovation ecosystem.

The Camperdown Ultimo Alliance has been effective in bringing key stakeholders together to drive precinct-wide collaborative initiative. However, our consultation suggests there is still work to be done to drive this forward, particularly at a cluster level. It is likely that each cluster will require its over governance body to oversee their specific policies of tenancy mix and rental subsidy, curation of public space and local events and overall cluster master planning.

At a minimum there will need to be a governance body for UTS Campus, Central Technology and Innovation Precinct, South Eveleigh and Sydney University Campus. This reflects the key finding of our research that these clusters best function at the hyperlocal level and require a high degree of self-sufficiency both in floor space and services to function independently.

At this local level, their management structure would be involved in curating a range of business services like offered by MaRS Toronto Innovation Cluster including the following:

- Workshops
- Market intelligence reports
- Group advisory
- Event discounts
- Curated opportunities
- One to One expert mentorship
- Networks of investors, customers and partners

- Access to talent and recruiting help
- Media and PR promotion
- Priority access to MaRS office space
- Peer-to-peer groups
- Connections to the network of corporate partners
- Soft-landing space in foreign markets

In addition to this local cluster place management there is also a role for an overarching governance body for the Collaboration Precinct including Central and possibly Surry Hills. The governance body would have representatives from all the key stakeholders as well as State Government and possibly Federal Government.

The CoS, Universities and State Government may provide the seed funding to set up the overarching governance body; however, over time this body should become self-reliant, and find opportunities to generate revenue to fund its ongoing operations, for example by a levy placed on businesses within the district.

The roles of this Collaboration Precinct Governance body could be to:

1. Establish the framework for collaboration, reporting and transparency of actions for each cluster to disclose

2. Create branding for the Precinct without undermining the branding messaging of the individual clusters

3. Provide ongoing national and international advertising campaigns to put the Sydney Collaboration Precinct on the Global Map of Innovation recognition

4. Monitor activities and ensure messaging from all the Clusters inconsistent and supportive of the whole Precinct

5. Develop and maintain a webpage that provides a concierge service to direct people for further help including what's on; where to find help to get space; how to find a job and opportunities for contract research and/or collaboration

6. Promote and curate of events that apply to the whole precinct and control a timetable to ensure events don't clash between the various representative cluster

7. Provide a fast track visa assistance if located in the precinct

8. Provide a public list of scholarships and internships available

9. Promote awards for excellence, community support and innovation

10. Facilitate through the universities and Austrade access to IP advice and potentially referrals to form Cooperation Research Consortiums

11. Facilitate a range of funding options for research starting from government grants; scholarships; crowd funding; donations; angel investment; venture capital; private equity and traditional debt

A key consideration for SS2050 is the CoS' role in forming the Governance body and defining its powers and responsibility. The CoS will have an important stewardship for the cluster's long-term prosperity.

BIG IDEAS FOR INNOVATION & COLLABORATION

3.0 BIG IDEAS FOR INNOVATION & COLLABORATION

In this section, we detail some of the big ideas we received and developed during our consultation and case study research. Some of these ideas may be relevant to CoS strategic planning and others may be appropriate for government and governance groups in the study area to consider and act upon.

3.1 Goods line of innovation – extension of Goods rail line

The existing Goods Rail Line provides a wonderful and symbolic pedestrian connection from Ultimo to Darling Harbour. There is an existing closed tunnel that joins the Goods Line back to the Mortuary Station at Central.

Figure 9: Overview Goods Line
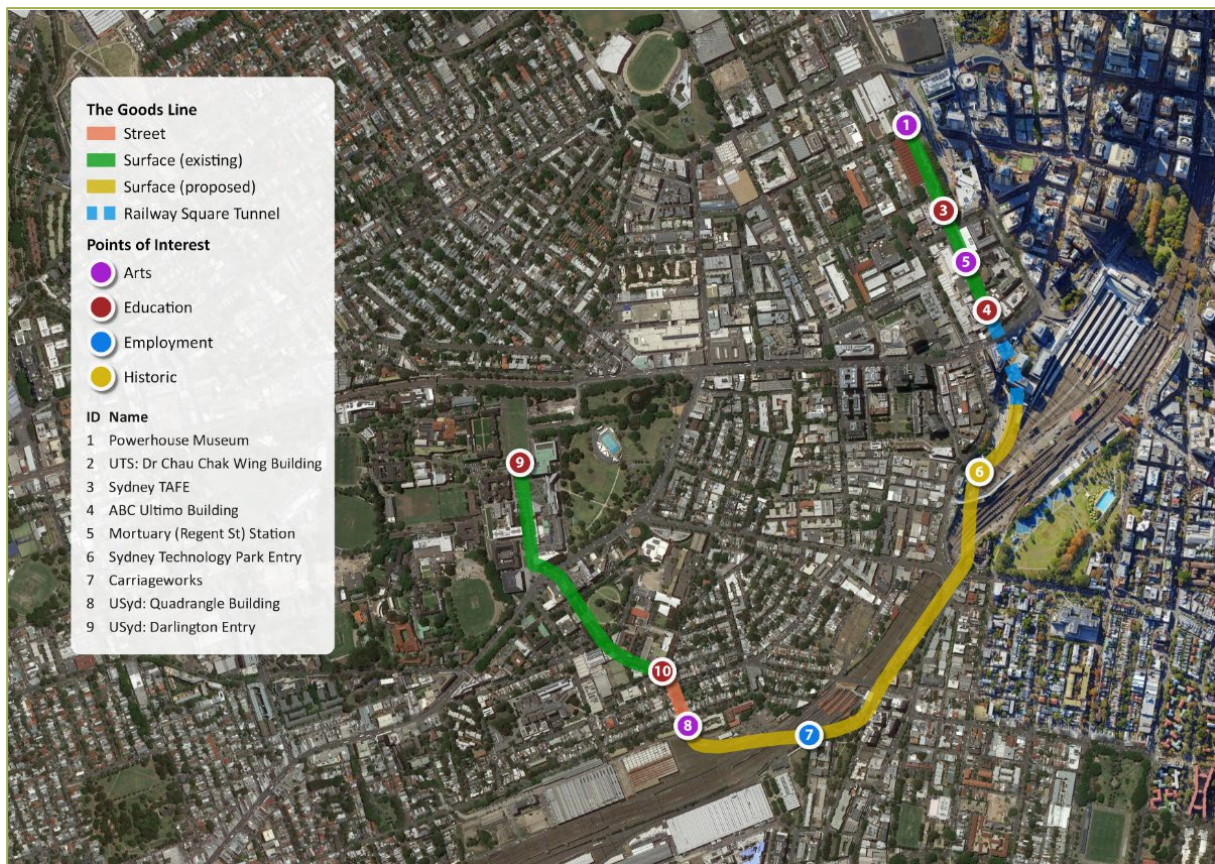
Source: HillPDA

Our discussions with DOT Placemaking Team for Central along with Mirvac, the South Eveleigh Place Manager, Sydney University and UTS all showed strong support for extending the line all the way to the Camperdown Campus providing a connection to North and South Eveleigh and back to Darling Harbour.

Figure 10 Existing End of Goods Line shows the potential tunnel to Central (Source HillPDA)

The line could be like the existing Goods Line with a combination of tunnels and under/cover rail pathways and bridges. The pathway would link all the innovation cluster and provide an opportunity to:

- Display innovation (as for example the Robotics at UTS and a TV Studio at ABC)

- Provide creative space uses like art, sculptures along with live-performances and links to cafes and small bars and parks

- The focus would be on pedestrians and cycling but there could be an opportunity to test some low emission personal transport options too (e.g. electric car charging stations, low speed/shared zones, etc.).

Figure 11: Ultimo Goods Line near UTS School of Business

Source: Designboom.com CHROFI Architects

3.2 Activating parks for both day and night use

In a consultation a view was expressed that we should leverage public parks as more active community spaces not only for the daytime but for the night-time as well.

Sydney University is investigating in partnership with the CoS to open up the public connection between the University's Law Building and Victoria Park by removing the campus fencing and creating the opportunity for shared use, public events like night cinema, formal and informal learning outdoors, delivering learning on display, and attract a diverse group of practitioners and visitors to the park and the campus.

The UTS campus also has significant potential for public activation. The connection with the Powerhouse Museum along the Goods Line offers an opportunity to research and teaching on public display. The campus' public spaces could also host more public and industry events in collaboration with University activities. There is also a significant opportunity for the existing public spaces of streets and laneways adjacent to the campus to become more pedestrian-friendly and support neighbourhood activities for residents, workers and students.

3.3   Pedestrian priority safe zones and healthy city zones

Successful innovation precincts promote opportunities to mix freely and encourage serendipitous meetings or 'bump-in' encounters where people interact and share ideas.

Keeping people safe in these precincts is paramount and there are several measures that can be used to provide this such as:

- Removing through traffic and providing an appropriate separation of pedestrians and cyclists from vehicles in order to prevent collisions

- Traffic calming initiatives, with suitable signage and lighting for vehicles

- Keeping pedestrians alert and not stressed, via appropriate street lighting, low noise levels, good sight lines, clear signage, user-friendly pavements

- Adhering to CPTED (crime prevention through environmental design) principles in order to protect pedestrians from assault, theft, abuse, or unwanted confrontation with "undesirables"

- Hostile vehicle mitigation applications, including 'cover spaces' for potential victims, in the event of terrorism (also applicable in the case of a violent weapon attack, adversary drones, explosives) (ANZCTC 2017).

Figure 12: Sky Garden Seoul at night

Source: Seoul Government Seoullo7017

Similarly, there are initiatives that could be combined to create a new 'Healthy City Zone':

- Create a legible and highly connected network of major pedestrian connections through the precinct, such as Broadway / Surry Hills Tunnel to Goods Line to Darling Harbour. Evaluate axes proposed by GSC as possibilities (Highline, Beltway)

- Address pedestrian and public space issues through the development of an ultra-low emissions zone (see transport notes)

- Significantly increase urban tree canopy in streets and open space, to support pedestrian amenity, climate amelioration and distinctive placemaking

- Invest in major iconic public spaces to act as a central focus for sub-precincts and their community identity.

3.4 Transportation

Through our consultation, the transport experts agreed that light or heavy rail connections would be the most effective way to intensify development around the Camperdown precinct, which has the best potential for a medical research node, and some under-utilised land for expansion/intensification along Parramatta Road.

However, in the absence of significant planned government investment for these modes of transport in the area, there is a need for alternative solutions. For example, arterial streets pose significant barriers to movement across the district and feed traffic onto minor streets. Leveraging investment in major transport infrastructure to remove through traffic and reallocate roadspace to people in places can help encourage more efficient modes (public transport, walking, bicycle riding).

A highly contentious but very interesting alternative is creating an ultra-low emissions zone through parts of the district. One such case study is the city of Madrid. 'Madrid's first … car-restricted zone, … is a 1.8-square-mile (472 hectares) ultra-low emissions zone will transform the city's transit network (The Guardian, 2018). The new zone will ban through-traffic—currently estimated at over 58,000 vehicles a day—and severely restrict drivers' access even for people whose ultimate destination lies within the zone's borders.

From Friday, all gas-fuelled cars built before 2000 and all diesel vehicles from before 2006 will be banned from this area of inner Madrid. In 2020, this ban will be further tightened to restrict all gas cars from before 2006 and all diesel from before 2014.

People with limited mobility will be exempted, as will residents within the zone, who will also be allowed to register up to 20 visitors a month. These strict limitations should do much to clean the city's notoriously dirty air. It's estimated that after the zone's introduction NO_2 levels in the area will drop by as much as 40 per cent.'

A hybrid approach would maintain the main arterial links (Broadway/Parramatta Road, Harris, Wattle) but severely restrict local street access within the district. Parking structures made obsolete by this strategy could be re-used to increase innovation start-up space. There is also good evidence for the positive health impacts of such a strategy (particularly in terms of encouraging activity and improving air quality) (Khreis 2017).

A less ambitious strategy would instead focus on increasing pedestrian crossings on arterials; with effective traffic management, this would have only minor disruptive effects on car travel.

'Mobility as a service' (MAAS) offers an alternative to car use, and the Ultimo-Camperdown Innovation District is well suited to serve as a local 'living lab' for this concept. In 2016 Helsinki[4] pioneered the development of a single app 'to plan and pay for all modes of public and private transportation within the city to make it so convenient for users to get around that they opt to give up their personal vehicles for city commuting, not because they're forced to, but because the alternative is so appealing' (Goodall et al 2017, p. 114). Combined with a pedestrian-centred traffic management system, connectivity improvements to Central Station, and further streetscape enhancements, MAAS could compensate in part for deferred necessary investments in light/heavy rail serving Camperdown, and the transit gaps within the district. Surveys of Australians show a strong preference for public transport to form the key component of mobility services (ITS Australia 2018).

Working on the Living Lab concept test some ideas for supporting smaller area, precinct-based innovation that potentially might be applied to other emerging precincts in Sydney such as:

1. Wonerf, or shared path concepts (e.g. a living street, as originally implemented in the Netherlands), for smaller and more residential streets

2. Creation of an active transport zone with complete connectivity for micro-mobility (bikes, scooters, skateboards). This could be adopted for the extended Goods Line concept with electric bikes available for hire

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[4] Paris, Eindhoven, Gothenburg, Montpellier, Vienna, Hanover, Las Vegas, Los Angeles, Denver, Singapore and Barcelona have all piloted local versions that span the spectrum from modest peer-to-peer (P2P) offerings to integrated public transportation to combined mobility services that include private-sector players (Goodall et al 2017, p. 115)

3. Trial of on-demand shuttles connecting precincts main institutions and commercial centres (see transport notes on MAAS). Address major issues with pedestrian connectivity such as Haymarket to Darling Harbour, around Central Station and so on.

3.5 New north-south rail route

Workshop consultation with transport experts and Sydney University proposed revisiting the north-south rail line link that would follow a proposed path from Macquarie Park Metro Station to a station at White Bay and Glebe/Camperdown. Stakeholders also supported a route that would connect the new line at Waterloo and proceed to new station at Green Square and onto Randwick (UNSW).

The rationale for this path is to connect the innovation districts at Macquarie to Sydney University and on to UNSW and POW at Randwick. While the light rail will connect UTS to the UNSW, both Macquarie Innovation Hub and Sydney University remain disconnected.

3.6 Special innovation business zone

It is suggested that the Collaboration Precinct could form part of a new special innovation business zone that would provide certified innovative / creative businesses and workers located in this zone with the following benefits and support services:

- Access to Visas for key workers and their families for 5 years
- Accelerated Accreditation for Health Workers relating to medical research (certain restrictions to apply)
- Support and flexibility to claim R&D Tax Concession
- Business start-up package (like the City of London) with tax breaks and legal support to register a business and all the associated start-up red tape streamlined
- Free legal advice on business formation and IP partnership structures
- IP Bank that lends money to start-up for a share in their IP with the option to buy back later
- Business collaboration matching service for research projects. AusIndustry (Department of Industry) has a service called Cooperative Research Centres (CRC) where you assist industry groups, university, and industry players with some Government funding) to cooperate on research projects.
- Set aside some future floor space for subsidized commercial space for small innovative and creative companies who may become displaced due to rising innovation precinct rents (e.g. as the precinct becomes a major attraction, large companies may begin to bid up rents).
  - This model could be like what is done in the social housing space where space is set aside and managed by an entity to ensure that they have access to good quality / low cost commercial floor space.

3.7 Other financial support programs

Direct financial support opportunities in Australia would appear limited in comparison to the North America and Asia. In Toronto, MaRS offers a range of solutions to help businesses obtain the funding they need (MaRS, 2019).

- Ontario Scale-Up Vouchers Program: helping firms scale globally by increasing sales, securing and nurturing talent, developing intellectual property and accessing capital
- Embark Funding Program: place a young professional (aged 22-29) with an Ontario-based technology venture
- Embedded Executive Funding Program: place a C-level or another senior-level executive with an Ontario-based technology venture
- ArcTern Ventures: Start-ups solving climate change and sustainability
- Investment Accelerator Fund: "seed stage" investor in Ontario, investing in IT, health and cleantech companies

- MaRS Catalyst Fund: an impact investment fund that supports Canadian companies solving social and environmental challenges — domestically or abroad.

The government might seek to establish such a fund to deliver a package of services like those above. The CoS might consider seed funding for topics like solving climate change and sustainability or non-property-based innovative community health solutions.

PROJECT BRIEF

4.0   PROJECT BRIEF

HillPDA has been engaged by the City of Sydney (**CoS**) to undertake in-depth research and stakeholder consultation into the spatial drivers of innovation and associated industry clusters within the Camperdown-Ultimo Collaboration Precinct (Collaboration Precinct).

This research paper will identify opportunities to support growth in innovation, creativity and knowledge-intensive jobs and help inform future strategies that aim to nurture and generate employment and economic activity. The paper will present an evidence base of research that collates ideas from stakeholder consultation, study area analysis, literature and case studies to determine opportunities that can feed into the SS2050 and other CoS strategies

4.1   Study background

The Collaboration Precinct was firstly defined in the Eastern City District Plan with the area identified as a Collaboration Area (highlighted in yellow in Figure).

Figure 13: Camperdown Ultimo Collaboration Area Source GSC Place Strategy
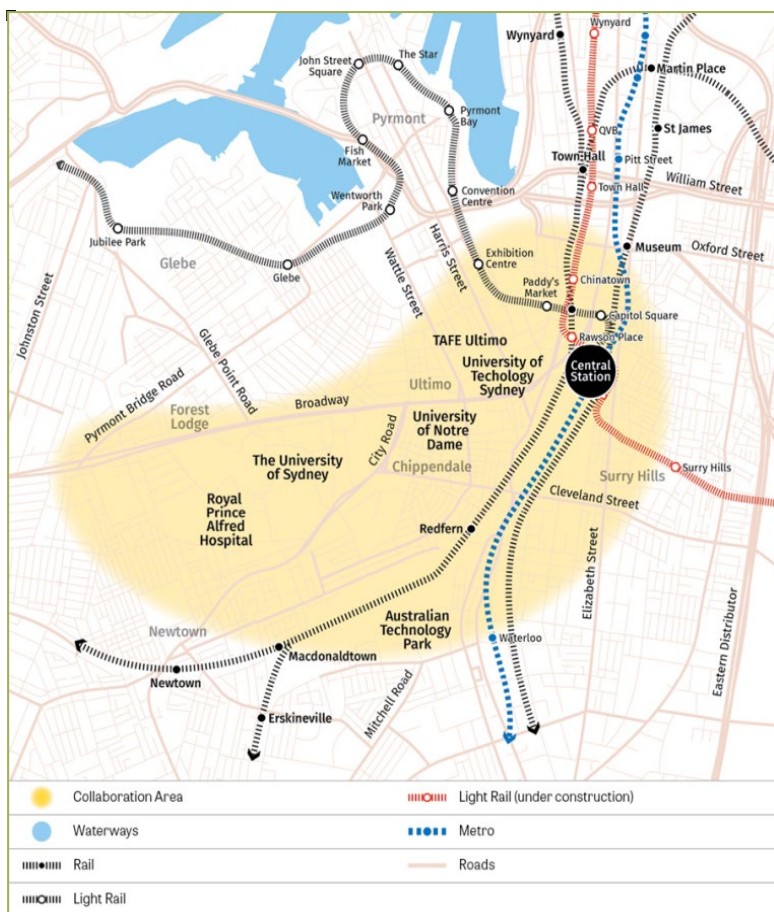
The vision, identified in the Place Strategy suggests

In 2036, Camperdown-Ultimo Collaboration Area is Australia's innovation and technology capital. Industry, business, education and skills institutions work together, and talent, creativity, research and partnerships thrive. Low carbon living, green spaces and places for people and easy connections support resilience, amenity, vitality and growth (MaRS, 2019).

The Place Strategy identifies the Collaboration Area structure as consisting of three activity nodes: Haymarket, Camperdown and Eveleigh with three connecting axis being Ultimo axis (UTS to Sydney University along Parramatta Road) Darlington axis (South Eveleigh to Sydney University via Redfern) and Surry Hills axis (Redfern to Central)

As background to this research paper several other relevant studies for this precinct include:

- "The Sydney Innovation and Technology Precinct Panel Report December 2018 " by NSW Government
- NSW Innovation Precincts (Sept 2018) by NSW innovation and Productivity Council, NSW Government
- Technology & Innovation Precinct: Industry Survey Report October 2018 by TechSydney
- Statement of Principles for Australian Innovation Precincts (October 2018) by Dept of Industry Innovation & Sciences; Australian Government

- The Innovation Economy – Implications and Imperatives for States & Regions (Aug 2018) by NSW Government
- NSW Innovation Strategy – Bringing big ideas to Life; NSW Government

All these reports and more are detailed in the earlier baseline data report prepared by HillPDA for this project.

4.2 Study area

The study boundary broadly spans the Collaboration Area defined in the Eastern Sydney District Plan. In our report we define this as the Collaboration Precinct The jagged shape of the boundary is dictated by the travel zones boundaries by TPA. Consistent with the GSC Place Strategy, we too have defined three activity nodes which we are referring to as Camperdown; South Eveleigh and Ultimo to Central and have add Surry Hills as a fourth core innovation node.

Figure 14: Precinct cluster nodes
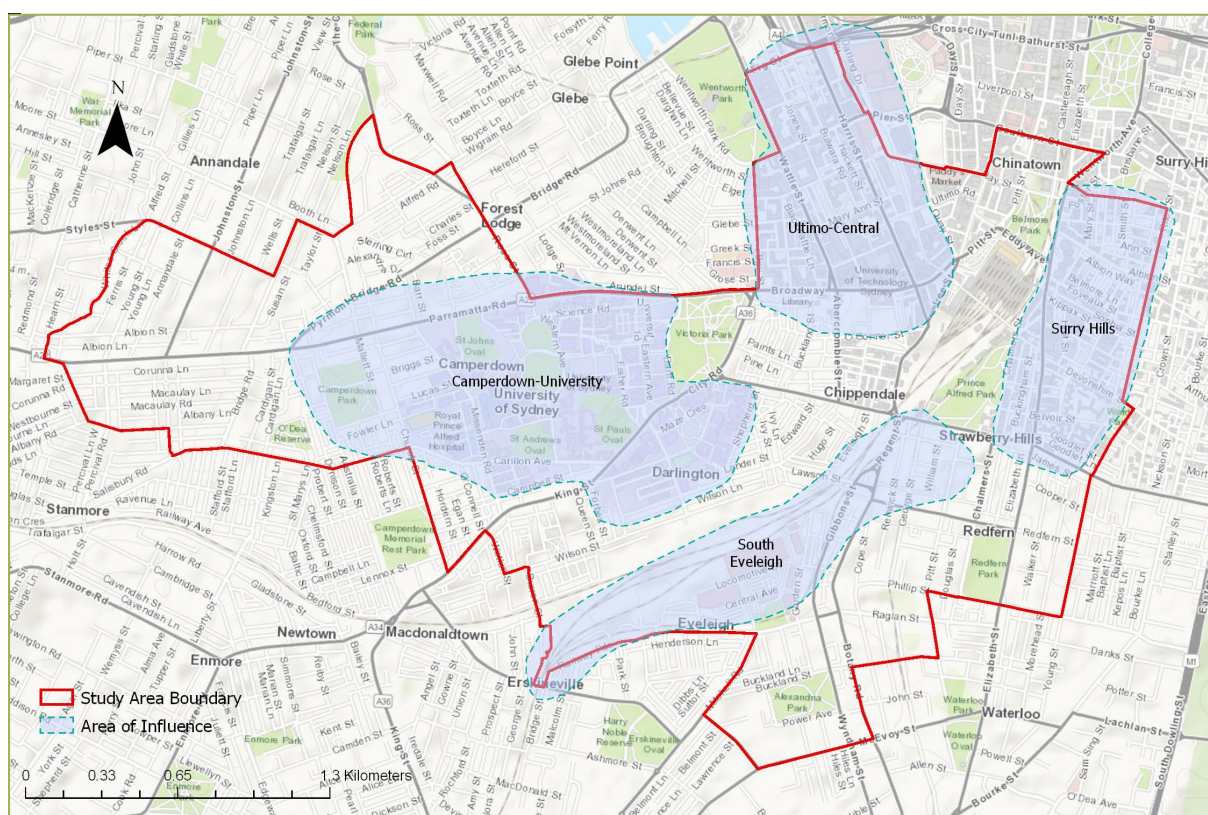
Source: HillPDA

The distribution of these nodes is consistent with CoS Floor Space Survey which demonstrates a similar cluster pattern.

4.3 Methodology

To undertake this study, we have employed a mixed qualitative and quantitative analysis method.

As a primary source of information, we have used CoS Floorspace and Employment Survey (FES). The FES accounts for buildings, establishments within buildings, and how space is used by the various establishments. This survey is conducted every five years to align with the ABS Census of Population and Housing.

The FES provides important insights into not only the amount of space within the Sydney LGA but also how that space is used. The FES provides a more granular view into the workforce and land use within the LGA and is complementary to the insights provided by the ABS Census of Population and Housing.

However, in some cases where we need additional information, we used SA2 census data of Darlinghurst, Glebe-Forest Lodge, Newtown-Camperdown-Darlington, Pyrmont-Ultimo and Redfern-Chippendale to provide a clear and quantitate data analysis into the socio-economic profile and demographic of the study area. While the boundaries do not match perfectly, both data sets are comparable and provide a sense of the underlying economics.

In cases where we did not have quantitative data, we relied on stakeholder input and cases studies as evidence. This enabled us to have a better sense of what is currently "happening on the ground" than from other data sources. For demographic, employment and floorspace analysis with have adopted the following TPA zones for each precinct as follows:

Camperdown – University TPZ ID

ID	Name	Size (ha)
236	Sydney Uni Campus	67.8
238	Royal Prince Alfred Hospital	24.3
239	Darlington Uni Campus	16.4
242	RPA & Syd Uni	18.3
243	Darlington Uni Campus	12.2
252	Included in City Floor space Survey (now included in 238)	

Ultimo to Central TPZ ID

ID	Name	Size (ha)
136	UTS Ultimo East	3.7
144	Sydney TAFE	2.6
159	UTS Ultimo West	18.6
160	ABC Ultimo Centre	2.5

South Eveleigh (former ATP) TPZ ID

ID	Name	Size (ha)
222	Australian Technology Park	20.23
224	Including in City Floor space Survey (now include in 222)	

Surry Hills TPZ ID

ID	Name	Size (ha)
192	Campbell St and Mary St	2.8
193	Campbell St and Riley St	8.8
194	Centennial Plaza	1.9
195	Albion St and Riley St	6.2
197	United Dental Hospital Of Sydney	4.8
198	News Ltd	10.7
201	Strawberry Hills Elizabeth St and Belvoir St	19.1

The zoned are outlined below.

Figure 15:Collaboration Area Precinct Cluster Nodes
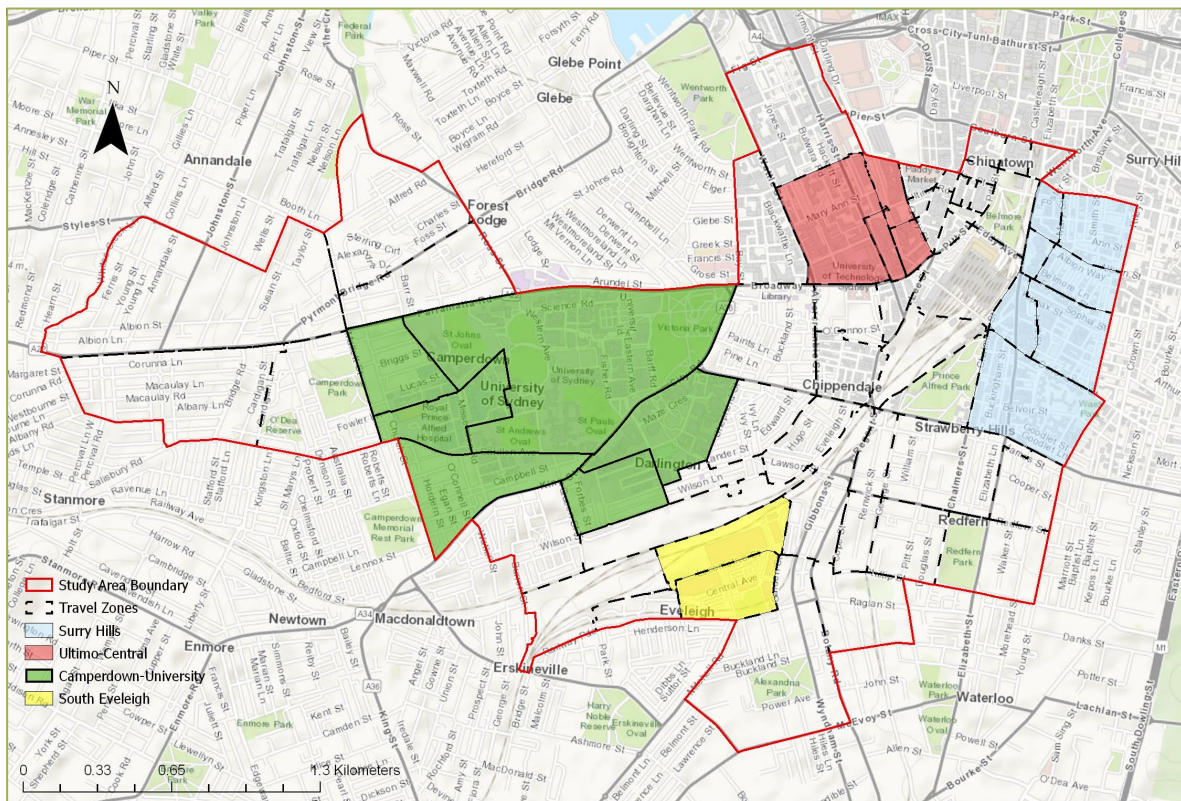
Source: NSW TPA and HillPDA Analysis

LITERATURE REVIEW SUMMARY

5.0 LITERATURE REVIEW

This section should be read in conjunction with the earlier baseline data report that provide our earlier more comprehensive literature review and international case study review. The review below is summary focusing on the innovative ecosystem and elements that form it. The intention is only to give a cursory overview for those not familiar with the extensive work done on this subject.

5.1 What is innovation?

Miriam-Webster defines innovation as the introduction of something new. For businesses, entrepreneurs or institutions, this could be something as simple as improving existing services or more complicated like creating new and dynamic product (Miriam Webster, 2019). But how do businesses innovate or become innovative?

Seldomly does innovation happen by accident. Based on research from the Brookings Institute and other leading thinkers, the myth of the "lone wolf" innovator is just that – a myth. Most innovation occurs as the result of an incremental process of collaboration, convergence and talent – it is not a product in and of itself.

Innovation has long been a process of entrepreneurs and companies coming together to solve problems in groups where they can mingle with other problem solvers. In these creative spaces, they have efficient access to everything from new ideas, financing, business advice, legal advice, sophisticated lab equipment, etc.

"Successful innovation districts are not started from scratch but instead are built on a pre economic and physical base. Policymakers or other leaders can help transform a barren landscape into fertile ground, but a seed must be available that can grow to fruition." (Ingenium Research, 2019)

5.2 Density and productivity

If we can bring companies, people and institutions together, what are the benefits for the economy?

One of the key benefits is that it lowers the costs associated with exchanging ideas. Abel, Dey and Gabe (2010) note that increasing interpersonal contact has been shown to enhance productivity when information is imperfect, rapidly changing, or not easily codified (Abel, Dey and Gabe, 2010).

Indeed, researchers like Porter have stressed the importance of local clusters in easing the management of modern value chains in which more firms contract out not just traditional parts of production but also support services for manufacturing, such as IT systems and management, training, design, and research and development (Porter, 1998).

Among the earliest studies, Ciccone and Hall (1996) undertook a study that explored the spatial dimension of productivity and density. Their study found that a doubling of employment density increases productivity by 4.5 to 6 percent. Similarly, Abel, Dey and Gabe (2010) developed a model of urban productivity to estimate how employment density is enhanced by the increase in the stock of human capital. This study found that a doubling of density increases productivity by 2 to 4 percent. While lower than Ciccone and Hall, this estimate was consistent with their result.

More recently within the Sydney context, SGS Economic and Planning found a relationship between density and productivity depending on the industries around the Sydney LGA. The analysis found that some industries are more productivity as employment density is greater. For example, it found that for a one unit increase in density, productivity in the Education, Health Care and Professional Services industries increases approximately 7.5%, 12.0% and 16.0% respectively (SGS Economics & Planning, 2015). Figure 16 provides a summary of productivity and density for each industry.

Figure 16: Sydney industry density productivity elasticity
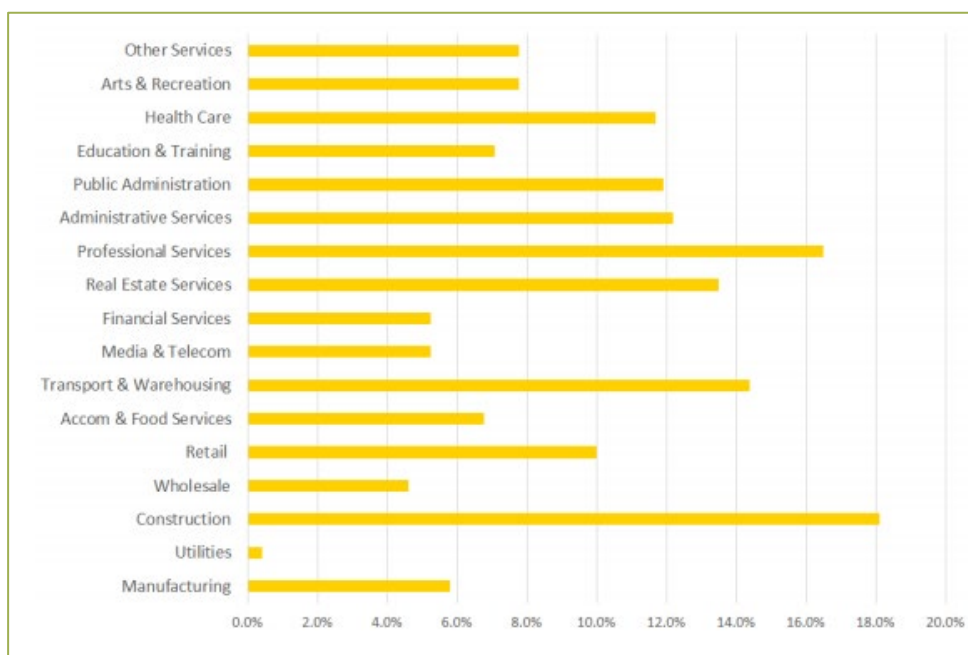
Source: SGS Economics and Planning 2015

5.3   Ingredients for place-based innovation

But, why do some places become innovation hot spots while others continue to languish?

As Rissola et al. (2017) highlight that innovation precincts require the consideration of a range of factors:

- Institutions committed to develop the territory and attract the necessary resources, and to nurture its human capital
- Harmonious business sector where established companies and new start-ups specialise and cooperate in clusters that serve both local markets and are connected to global networks
- A risk-taking entrepreneurial culture, which accepts facing major challenges and is open to change and evolution.

The authors further outline that additional enabling factors include:

- Continuous movement of ideas and people
- Fluid interaction and 'cross-fertilisation' between business and academia, academia and government, government and business, organisations and individuals
- Services that support knowledge transfer and commercialisation of products and developing innovation networks are equally needed (Rissola et al, 2017).

The Brookings Institute has worked to develop simplified tools to assist with identifying the strengths and weaknesses of a potential innovation cluster or precinct. In all cases, the intention is to help identify features that are common to all innovation districts. For example, the Brookings Institute innovation district audit guide outlines a five-part framework for assessing an innovation ecosystem. The five parts of their framework are:

1. **Critical mass**
    a.   Where are a region's concentrations of innovation assets?
2.   **Innovation capacity**
    a.   What are the distinctive advantages/disadvantages to grow and strengthen innovation capacity?
    b.   Are these being leveraged and maximised?

3. **Diversity and inclusion**

    a. Does the district have an inclusive, diverse, and opportunity-rich environment?

4. **Quality of place**

    a. Does the district have physical and social assets that attract a diversity of firms and people?

    b. Are these being leveraged to increase interactions, and accelerate innovation outcomes?

5. **Leadership**

    a. Does the district have the leadership necessary to succeed? (Brookings Institute, 2018)

Similarly, a recent NSW Government study noted that there are seven key factors for a successful innovation precinct:

1. **Market drivers:** macro-economic fundamentals, supportive legal frameworks, strong industry base and access to capital

2. **Competitive advantage:** a clear market advantage, clusters of skills and talent, brand recognition and positioning

3. **Collaboration**: networking, commercial linkages and partnerships

4. **Infrastructure:** digital supports, transportation infrastructure, flexible facilities and amenities, affordable commercial rents

5. **Amenity:** liveability, social interactions, housing choices, vibrant mix of uses

6. **Enterprise culture:** risk-taking, mentorship, anchor institutions

7. **Leadership:** governance structures, vision, political commitment (NSW Innovation and Productivity Council, 2018).

Lastly, Clark and Moonen (2017) highlight that innovation precincts located near a major transport centres and in proximity major educational institutes should also consider:

- Zoning guidelines or incentives may be needed to encourage private developers to bring forward flexible innovation-friendly development

- Any underused land and property being used in a non-innovation function (e.g. parking) should be optimised

- Better leverage of university assets – a common criticism of campus-style innovation areas is that there are exclusive districts detached from their surrounding communities

- Innovation campuses rely on transport systems and choices, and a clear transportation plan to highlight opportunities for new entrants

- Developing a "total place" strategy that includes an affordable housing component to promote vibrancy, reduce through traffic, and encourages economic integration

- Some campuses have successfully institutionalised community involvement into the governance of the innovation precinct– for example, community task forces that agree on housing, public spaces and job opportunities, and establish planning principles that are incorporated into long-term goals

- Innovation campuses need to make it as easy as possible for businesses to relocate and to find the space, networking, and services they need (Clark and Moonen, 2017).

5.4   Key innovation principles

With an understanding of both the key innovation ingredients, what are some key principles that will allow us to assess the Precinct and recommend strategies to facilitate the growth of the innovation ecosystem?

Based on our review of the literature, we have summarised a range of elements common to the literature we reviewed.

Quality of Place

- Innovation ecosystems should have a clear and relevant integrating character

- The innovation ecosystem should have a variety of way for connecting people within (and around) innovation clusters, including transit, sidewalks, bike paths, roads

- There should be a range of green spaces, recreational options, and health and education services to support active and healthy lifestyles

- There should be high-quality internet access that is available to both workers and residents

- The innovation ecosystem should integrate the wider community of stakeholders, participants and residents

- The innovation ecosystem encouraged creativity and fosters cultural identity

- The innovation ecosystem should provide a range of core services to workers and residents day and night.

Economic Fundamentals

- The innovation ecosystem should have good access to skilled workers and institutions develop and commercialise new technologies

- There should be a distinct clustering of businesses and employees

- Innovation clusters should integrate with key strategic assets such as universities, hospitals, and large anchor businesses

- There should be enough commercial and residential space (with competitive rents) to support the innovation ecosystem and attract a range of potential tenants

- The innovation ecosystem should support a mix of uses including institutional, residential, commercial, collaboration spaces, advanced manufacturing, cultural, retail, dining, etc

- Underutilised facilities should to explored for redevelopment potential using inexpensive land or old buildings with potential for novel reuse.

Governance and Support Services

- There is should be clear governance structure and top leadership should be inclusive and representative of the wider community as well

- There should be active collaboration networks the connect people within and between innovation nodes and clusters

- There should be clear branding of the innovation ecosystem and marketing strategy to promote and attract top talent and businesses

- There should be a clear set of values to guide planning and operation of the ecosystem

- There should be flexible land use zoning guidelines that can be tailored to encourage development.

Based on our assessment of the literature and our professional assessment, we have synthesized these insights into a single framework that we can used to assess each node within the Precinct. The following table summarises six key assessment principles used to assess the suitability of a node to form an innovation district.

Table 9: Innovation assessment principles

Theme	Principles
Quality of Place	**Quality of transport and connectivity:** residents and workers have access to quality transport options and a good walking experience within and between nodes; there are few barriers that inhibit or segregate innovation clusters.
	Quality of amenity: workers and residents have a range of amenities than enhance the way they live, work and play. This includes quality internet access and availability of the latest digital innovations.
	Distinct urban character: nodes have a unique history and character. Creative industries and cultural organisations are supported and encouraged; this enhances the liveability and sense of community.
Economic Fundamentals	**Distinct industry / employment clustering:** there are distinct clusterings of innovation workers – a critical mass; these group according to industry and occupation that complement one another.
	Residential / commercial development potential: there is enough commercial and residential space to accommodate future demand; land zoning is flexible and supports a changing economy.
Governance and Support Services	**Anchor institutions or firms:** there are large scale institutions or firms that lead and drive collaboration within and between nodes; a governance body (bodies) exist to coordinate and facilitate innovation programs, activities and services across the precinct.

STAKEHOLDER CONSULTATION

6.0   STAKEHOLDER CONSULTATION

6.1   Engagement approach

To further supplement our own assessment and analysis, we drew on the expertise of a range of stakeholders relevant to the precinct to inform recommendations for boosting collaboration and innovation as part of a broader study.

To limit the potential for duplication and overlap, we first carried out an analysis of key studies and strategies previously developed to assess where there may be gaps or opportunities for further consultation.

Next, we undertook initial rounds of consultation in late March to early April with the objective of gathering high level thoughts and ideas on how to drive collaboration and innovation in the precinct. Consultation activities included workshops, focus groups, roundtables and interviews with key stakeholders.

We sent a proposed invitation list to each organisation targeted for consultation and worked with them to determine the most appropriate and relevant representatives. We kept the groups small so that discussion could be targeted specifically at innovation and collaboration and to ensure all voices were heard equally. The workshops focus groups and roundtables involved lively participation, with robust discussions regarding the current situation in the precinct with many new and creative ideas suggested to drive collaboration and innovation forward.

We also received several proactive requests from people keen to participate in the Study, based on conversations they had had with colleagues about the Study and the positive feedback from the consultation activities.

Lastly, we created an online survey to businesses both within the precinct and relevant businesses outside of it who might be attracted to move there. Responses ranged from multiple choice, ranking and free form. A total of 38 responses were received and the results of this survey are provided throughout this report.

6.2   Current Nature of Collaboration and Innovation

6.2.1   Collaboration is happening ad hoc and in silos

Throughout the consultation, stakeholders were able to cite examples of collaboration activity throughout the precinct that was producing innovative outcomes for example:

- '*UTS Animal Logic Academy*' - a custom built visual effects studio at UTS built and operated in collaboration with industry experts offering immersive education and practice-based research opportunities
- '*University of Sydney Collaboration Agreement with the Sydney Local Health District*' – a comprehensive agreement which provides a framework to increase the efficient translation of research to health outcomes
- '*TechSydney Startup Community*' – which involves a community of entrepreneurs working with industry, government, media and the community to make Sydney a desirable place for tech start-ups

Whilst some of these partnerships are long-standing, they have arisen in isolation, as opposed to being part of a guiding framework or cohesive plan for the precinct. What this means is that opportunities to collaborate are somewhat restricted, for smaller, new or emerging players who may lack the networks or relationships required to form these activities. This means collaboration is somewhat fractured and lacking in cohesion, which may be limiting innovation.

Silos both within and between industries are also problematic. For example, stakeholders from the creative arts industry said there is a tendency for people to seek opportunities 'within their own tribe' and not beyond. This was viewed as being detrimental to innovation as its likely there would be mutual benefit to creatives from partnering with business and other industries.

It was noted that many artists lack business skills and know-how and would therefore benefit greatly from collaborating with the entrepreneurial community in order to commercialise their talents. Likewise, entrepreneurs can use creative skills, for example for logo and product design. However, without the appropriate networks in place, visibility of these opportunities is low and therefore unlikely to be realised.

Respondents to the online survey on average ranked the current status of collaboration and innovation relatively low at 45/100 and 55/100 respectively.

Figure 17: Stakeholder survey responses

How would you rate the current level of collaboration and innovation in the precinct?
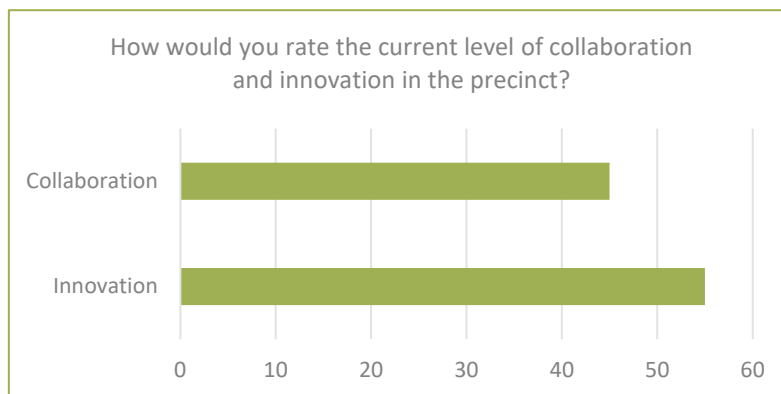
6.2.2 Universities play a key role but competitive tensions can limit collaboration

The need for the universities to support each other and collaborate was also raised extensively, however it was noted that competitive pressures – such as competition for students and protection of ideas and IP - can somewhat limit opportunities. Encouragingly, there is a strong desire for these barriers to be overcome and the relationships strengthened to drive greater innovation within the precinct. It was broadly agreed that each university should recognise its key strengths and understand how it can complement other organisations and their ability to innovate.

Stakeholders also believed that these barriers could be reduced or overcome with the appropriate governance structure in place and/or formal agreements for the protection of intellectual property.

"The universities should be supporting each other and recognising their differences. We need to look at who is shining in what area and be open to collaboration and a willingness to share ideas. Governance is critical and will provide a framework for this to work." – University of NSW

6.2.3 Industry participation is desired but sometimes lacking

Across the precinct and throughout its nodes there is a strong desire to see industry participate in and provide funding for collaboration and innovation activities. However there appears to be a lack of awareness, understanding and/or acceptance from industry that investing in these types of partnerships will bring mutual benefits.

For example, it was agreed that issues with the translation of research into commercial outcomes could be improved by increasing collaboration with industry through, for example, a partnerships program.

The need to integrate industry into university campuses was also a key theme discussed.

"There has been growth in translation of health and medical research but the missing link is industry partnerships. To attract industry you need to understand what's important to the big industry players. We need to look at more ways we can integrate industry into our campuses." – Sydney University

"Universities don't talk to people working in the creative arts industry much about how and what they are teaching their students. Partnering with industry would no doubt improve their courses so people can have both artistic and commercial success" – Art Pharmacy

6.3 Opportunities to Boost Collaboration and Innovation

6.3.1 Harnessing the power of new and emerging technologies

The importance of using technology to drive innovation precincts was repeatedly raised by stakeholders as a key factor in determining their success. For example, UTS is currently exploring ways to use big data to drive innovation at its Tech Lab which allows people to immerse themselves in datasets, finding new patterns and linkages leading to research breakthroughs.

The introduction of 5G technology, which will enable more people in the same place to use the mobile data network at much higher speeds, was also seen as a great opportunity to activate the precinct. For example, it could be used to deliver wayfinding applications that enable people to take virtually guided tours of the precinct or signal meetups and other events via apps and push notifications. The technology innovation precinct at South Eveleigh was cited as a potential 'living lab' for this technology and that government should be encouraging or providing incentives for investment in building the infrastructure required to deliver it.

This was seen as particularly important given that many stakeholders have found that technological capability across all precinct nodes can be poor, with slow internet speeds and poor phone reception with many blackspots. Fixing this was seen as a key priority, given that it creates the exact opposite atmosphere and experience that you would expect from an innovation district.

Providing free WIFI hotspots across the precinct was also seen as playing an important role in making people feel welcome and connected – two key features that foster collaboration and drive innovation.

"The advent of 5G is very exciting but even providing free WIFI is a start. In emerging countries like Vietnam, it is prevalent and is helping their economy to flourish" – Sydney Business Chamber

6.3.2 Creating a vibrant atmosphere with better public amenity and a 24/7 offering

The need to create a vibrant atmosphere for the precinct, with an exciting day and night-time offering is seen as a key opportunity to drive collaboration. For example, the provision of services such as retail shops, gyms and childcare, alongside cafes, restaurants and a thriving night life were all seen as factors that would help attract people to the precinct and encourage them to stay. Improving this 'stickability' offers people the opportunity to meet socially and share ideas which can then lead to innovation.

Stakeholders agreed there is a great opportunity to draw on the history and culture of the area to attract more people to it. For example, using the skills and talents of the creative businesses and individual artists in the area to host events such as performance art, galleries, fashion shows and theatres. It was noted that these events need to be low-cost or even free-of-charge in order to ensure maximum attendance.

"Precincts are successful when people know that there will be something going on at any time, day or night.

There needs to be events on all the time, or at least something happening so people know that when they get there, they are more than likely to find like-minded people."

South Sydney Business Chamber

6.3.3 Providing activated spaces and events that foster collaboration and innovation

Stakeholders believe that a combination of activated spaces that encourage 'bump in' encounters and formal events are required in order to foster collaboration and innovation in the precinct. Both these spatial drivers allow people to connect whilst also providing amenity and recreation to those in the precinct.

This was supported by responses to the online survey, which ranked *(1) Networking and social events* and *(2) Open spaces for people to meet informally* as the most effective ways to drive collaboration and innovation.

It was suggested that the universities could play a leading role in providing this activated space, by opening their campuses for a range of uses that encourage networking and collaboration. Other suggestions include improving the amenity of some of the pedestrian connections, such as the Goods Line, which would improve connectivity whilst also providing space for 'bump in' encounters.

Several different types of events were suggested ranging from large cultural festivals, markets and hackathons to smaller talkfests, live music and busking. One example cited was the Creative Hub at 107 Redfern Street which regularly hosts pop-up activities such as exhibitions, public talks, performances and workshops.

These forums help bring people together, sharing ideas and catalysing creative thinking which helps spur innovation. There may be a role for the City in making it easier for people to host such events, for example by reducing the cost of event permits and/or the complexity of permissions required to hold them.

Integrating the precinct into existing events, such as extending the Vivid Festival into Chinatown in the Haymarket node or throughout the university campuses were also suggestions supported by stakeholders.

"It's not easy to get events up and running due to the cost and number of approvals. The City could definitely make this process easier to encourage more events." – South Sydney Business Chamber

"What happens in between the buildings that is most important." – Atlassian

6.3.4 Curating, attracting and retaining the best mix of tenants

The benefits of being co-located with like-minded organisations and/or industries that can drive innovative thinking is broadly recognised - in the online survey, 34 per cent of participants stated the opportunity to be side-by-side with like-minded businesses as the most important factor attracting them to innovation precincts. However, the curation of these tenants must be carefully managed to ensure the mix is complementary and diverse in order to create the right atmosphere for collaboration and innovation to flourish.

Each node therefore needs to be made up of businesses that support each other to collaborate and include a mix of retail, hospitality and other services that create a place where people want to work and play in order to attract tenants. Location is also key with stakeholders citing the broad connectivity of Central Station to other parts of the CBD as well as greater Sydney as being a key drawcard for attracting tenants. Investments in public transport, including new and innovative technology such as driverless vehicles, were suggested as potential ways to attract tenants to each of the precinct nodes.

Spaces that provide additional onsite benefits such training are also highly desirable features to encourage social cohesion and help build a sense of community. For example, start-up coworking space Fishburners provides access to intellectual property lawyers and training sessions on IP protection to its members as an add-on benefit of its tenancy. This helps them develop the skills required for business success, whilst also providing opportunities for networking and collaborating with peers.

"It's like building a shopping centre – you want the mix of tenants to complement each other so they can bring out the best in each other.

This means putting like-minded people together, but also ensuring you have diversity to bring the right vibe to the precinct." – Fishburners

6.3.5 Opportunity to highlight Indigenous history and culture to invigorate the precinct

Redfern is seen as the birthplace of the Indigenous rights movement and is a critical part of indigenous history and culture. Stakeholders believe there is a great opportunity to draw on this history to invigorate the precinct, noting that there are strong synergies between the movement and the way it innovated Australian society and the current tech start-up tenants who are also driving innovation.

One suggestion which received broad support was to create an 'Avenue of Hope' which brings to life Indigenous history and culture via plaques annotating historical landmarks, artwork and messages that tell the story of the Aboriginal experience.

"The more we see ourselves and our cultural representation in the community the more comfortable our people will be and the more opportunities there will be for the broader community to collaborate and learn about Indigenous culture." – National Centre for Indigenous Excellence

6.3.6 Bringing together technology and creative industries

Stakeholders agree that there are strong synergies that can be created between the creative arts community and tech start-ups to drive collaboration and innovation. One idea raised was the potential for creative arts to collaborate with the tech industry and build an interactive 'meeting tree' within the precinct. The meeting tree would allow people to share their ideas on a topic, for example by sending a text message, which would then be displayed on the digital 'tree' for others to view and discuss. This would no doubt foster collaboration within and between industries and drive innovation in the precinct.

Another example given was the opportunity for performance arts to collaborate with tech to create interactive experiences for theatre and media. For example, Stalker is currently collaborating with highly skilled coders to develop 3D installations that provide a range of experiences. Its dome-like structure enables participants to interact with a projected environment, offering cultural and creative immersion. The future use of this collaborative project is endless. For example, it could be used to project Sydney in the early 20th Century and take visitors on a virtual reality tour of how the streets and landscape has changed over the past 100 years.

Whilst there is no doubt this innovative synergy of creative arts and technology would add immensely to the precinct; it needs to be adequately funded in order for it to be a success. There may be a role for CoS and industry to provide some funding for this initiative given the reciprocal value it will bring to the City and its tenants.

"We could hold some of the most innovative events in the precinct. The opportunities are endless – we just need the right type of space and for the City and State Government to come on board and provide some funding. The return they would get would far exceed the value of their investment." – Stalker Theatre

6.4 Key Barriers to Collaboration and Innovation

6.4.1 Availability and affordability of floor space

Lack of available floor space was cited as a key threat to future collaboration and innovation. For example, Sydney University noted it has several buildings that have self-imposed height limits due to restraints around heritage listings. There is a risk that it will run out of usable floor space in the foreseeable future unless there are changes made to allow for an increase in building heights.

The affordability of floorspace, particularly in an environment where demand is increasing faster than supply, is also a key issue. Researchers and start-ups – two key groups that drive innovation – rely on subsidised rent to carry out their activities, particularly in the early stages of a project. This is currently provided by various groups including the Universities, who offer subsidised space to researchers, and by start-up incubators and co-working spaces who receive rent subsidies and/or discounts from government which they then pass on to their tenants.

The recent announcement from the NSW Government of 250,000 sqm of subsidised floorspace dedicated to innovation was welcomed by stakeholders, however there was wide agreement that this would be met or exceeded by existing demand. More solutions are therefore required to accommodate innovation now and into the future.

There is a strong desire to see industry play a much greater role in providing rental subsidies, for example in exchange for future profits and/or in recognition of the wider benefits it receives from having researchers and/or

start-ups co-located. However, at present there is little appetite from industry stakeholders for such arrangements, who instead believe it's primarily the role of government to provide these benefits.

Lack of affordable, available and appropriate space is also a key issue for the creative arts industry, who are increasingly finding themselves priced out of precinct. Given that the creative arts community could add immense value by bringing culture and events to the precinct and activating public space, stakeholders believe the City should play a pivotal role in delivering the built form required to make this happen.

For example, it could modify some of its publicly available space to make the built form more suitable for art installation, theatre and other performances. It was noted this could be done on both an events basis for specific opportunities and could also be built in the general landscape of the city.

> *"Research, particularly in its early stages, doesn't tend to generate income, however it is essential for driving innovation.*
>
> *"Industry should come to the table more and provide funding for this to thrive" – UTS*

6.4.2   Competition for funding and lack of prioritisation for innovation

Adequate and accessible funding was repeatedly cited as a key barrier to innovation, with competition for limited funding and grants hindering the ability of many organisations to collaborate. For example, universities, health and medical research institutes often feel they are competing for government funding which can hinder the appetite for collaboration.

Prioritisation of government funding was also cited as a challenge, with many stakeholders believing that there is not a strong enough focus on research and innovation. For example, RPA has plans to build a new research facility which will see clinicians and researchers work side by side, collaborating to develop and deliver innovative patient outcomes. However, the project has been stalled as it has been unable to secure funding.

It was suggested that this gap could be filled by encouraging industry to invest more funding into research in return for an eventual share of the revenue made for its future commercialisation.

> *"There is a huge opportunity to drive more clinician-driven research, which will provide major economic benefits to Sydney.*
>
> *"The challenge is securing funding and ensuring research is prioritised in the mix." – RPA Hospital*

6.4.3   Poor pedestrian connectivity and accessibility to public transport

With traffic congestion a major issue for the area, improving pedestrian connectivity is seen as key to unlocking innovation and collaboration. There was support expressed for creating an 'innovation spine' – a walkway that connects various parts of the precinct – for example from Sydney University to ATP – which could also be activated to showcase innovative projects and/or host events.

Pedestrian thoroughfare is also an issue that is somewhat exacerbated by the Universities who have major holdings of land that are not always open for public thoroughfare or use There was a strong desire to investigate how campuses could be opened up to provide better connectivity, which could also result in the space being used for events designed to foster collaboration in the precinct.

Congestion on public transport and lack of a heavy rail connection to the Camperdown node is seen as an issue that will only grow as Sydney University and RPA expand their campuses and attract more students and workers to the precinct. There is overwhelming support from stakeholders for a train station to be considered as part of the NSW Government's plans for Metro West.

6.4.4 Lack of a coherent shared identity and known brand

Stakeholder feedback has confirmed that a lack of shared identity or 'branding' for the precinct is hindering its ability to attract and retain talent and funding, in contrast to other places such as the Melbourne Innovation District (MID) which is internationally recognised as a premier innovation district.

It was suggested that the creative arts industry could play a pivotal role in building this identity and creating a vibrant atmosphere for the precinct. For example, the City in partnership with industry could provide funding for artists for public murals and exhibitions, street performances and events that activate the space, attracting more people to venture and stay there, boosting opportunities for bump in encounters that facilitate collaboration.

6.4.5 Lack of governance and differing views on the best model to drive innovation and collaboration

Developing and implementing an effective governance model for the precinct was also seen as key to achieving innovation outcomes and was seen a precursor to obtaining the necessary funding to drive its growth. At present, there are small and fragmented structures and strategies governing innovation activity which creates inefficiencies and crossovers and limits opportunities for collaboration.

It is widely agreed that an appropriate framework for the governance of the precinct is critical to its success, however there are a mix of views as to what this model should be, who should be involved and whether it should govern at a precinct-wide level or be tailored to each node.

"The entire Sydney ecosystem feels fragmented as initiatives have started from the ground up. There is little governance that ties everyone together to work meaningfully. Most collaborations are one-offs and for specific events rather than long-term partnerships and initiatives that bring people to work together and create real value."

INCUBATE

6.4.6 Challenges with attracting and retaining international talent

Stakeholders acknowledged that there is great competition on a global scale to attract and retain the talent required to drive innovation and there are various factors that make the Precinct (and Sydney in general) less attractive. For example, the cost of housing and education is cited as a major barrier for many people, particularly those who have families or wish to live close to the precinct/Sydney CBD. One way it was suggested this could be overcome was via the provision of subsidised housing for researchers.

Issues around securing visas to enable talented researchers to work in Australia is also an ongoing issue. There are only around 200 visas available each year for distinguished talent and competition is fierce. Suggestions were made that priority should be given to visa applicants who can demonstrate a history of innovation as well as a desire to pursue this further in Australia.

PRECINCT & SUB PRECINCT OVERVIEW

7.0   PRECINCT & SUB PRECINCT OVERVIEW

7.1   The study area overview

The study area boundary outlined below covers both Sydney and Inner West LGAs and spans 640ha in total.

Figure 18: The study area
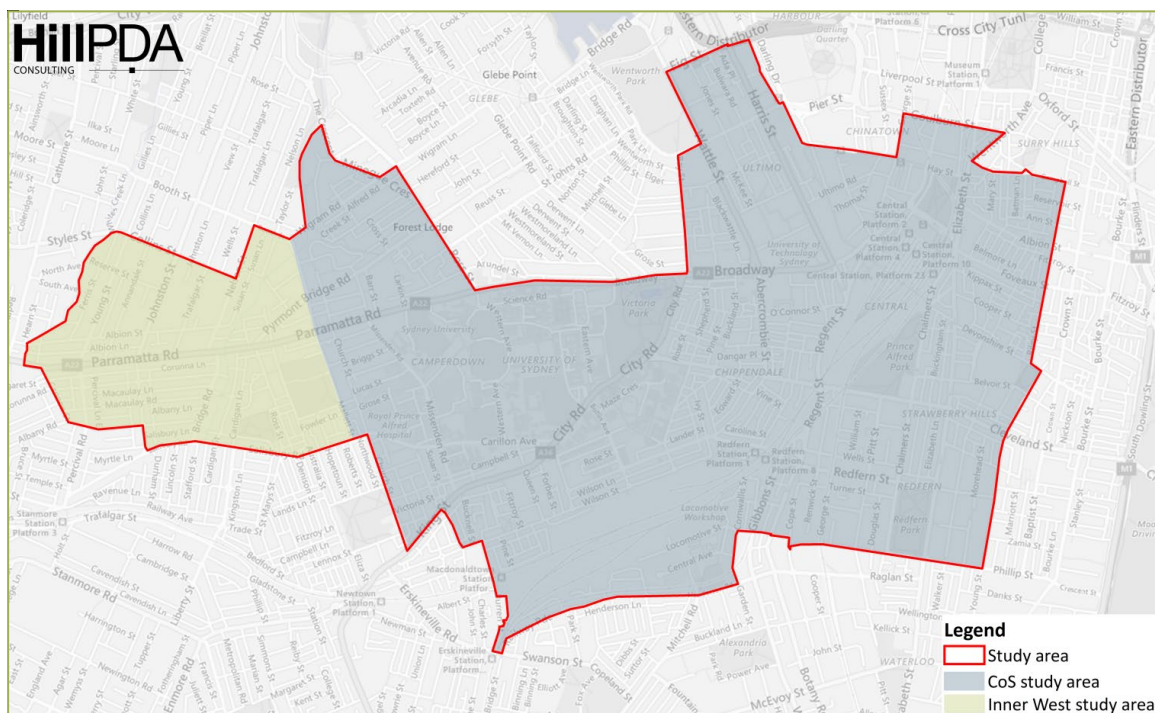
Source: TPA Zones HillPDA Analysis

The Precinct is composed of the following NSW travel zones.

Suburbs	TPA Zones
Ultimo to Central	130 to 146, 200, 205 to 209, 157 to 160
Surry Hills	192 to 195 197 198 201
Camperdown – University	820, 316,230, 231, 236 to 239,242 ,243 246,252
Eveleigh Redfern	211 to 213, 215 to 219, 222 to 225,240,244,258 & 270

7.2   Precinct floorspace profile

The CoS floorspace survey for the Collaborative Precinct identified over 6.39 million square metres of gross floor space excluding parking and other infrastructure.

	Office	Community	Retail	Ent & Rest.	Hotel	Indust & Storage	Vacant	Residential	Common Area	Total
Ultimo-Central	441,057	148,647	54,179	168,584	130,336	215,036	101,967	844,222	622,770	2,726,800
Surry Hills	216,093	20,783	20,039	49,750	21,754	51,882	63,984	345,891	190,981	981,156
Camperdown-University	218,111	199,494	14,697	78,767	4,506	73,907	14,661	646,243	311,642	1,562,028
Eveleigh-Redfern	134,950	12,700	15,757	55,100	4,924	49,567	47,102	644,585	157,876	1,122,561
Sub Precinct	1,010,210	381,624	104,672	352,201	161,520	390,392	227,715	2,480,942	1,283,269	6,392,544

Note community refers to public uses such as hospitals and education facilities like the Universities. Ultimo and Camperdown in those uses. Common area refers to communal area like foyers, lobbies public areas like toilets and stairs lifts and passages way. This is common to all area and is typically around 15% to 20% of total GFA. The survey shows it as 20% of total GFA reflecting like the presence of public and civic building.

If remove common areas the net GFA[5] for the total precinct falls to 5.1m sqm of floorspace and percentage break up of uses is as follows:

	Office	Community	Retail	Ent & Rest.	Hotel	Indust & Storage	Vacant	Residential
Ultimo-Central	21%	7%	3%	8%	6%	10%	5%	40%
Surry Hills	27%	3%	3%	6%	3%	7%	8%	44%
Camperdown-University	17%	16%	1%	6%	0%	6%	1%	52%
Eveleigh-Redfern	14%	1%	2%	6%	1%	5%	5%	67%
Node Total	20%	7%	2%	7%	3%	8%	4%	49%

Overall residential floorspace dominates the Precinct at 49% of GFA net of common area. Office is next at 20% and Community uses at 7% however in Camperdown it is comparable to office uses at 16%.

The Precinct and sub precincts give an overall view of floor space, but it is not until the analysis is broken down to the node level the importance of the innovation clusters can be interpreted.

The nodes are review in the next section of this report.

7.3   The collaboration precinct economic assets

The suburbs of Redfern, Ultimo, Haymarket, Camperdown, Chippendale, Darlington, Surry Hills and Eveleigh are already recognised as places of heritage, vibrancy, and supported by transport (NSW Government, 2018). The Precinct is home to many leading health, education and research institutions that bring value-add opportunities through collaboration, research and innovation. These include:

Culture, recreation & services: Carriage Works; the Seymore Centre; Victoria Park; Victoria Park Pool, Prince Alfred Park; Prince Alfred Park pool; Ian Thorpe aquatic centre, Camperdown Memorial Park; Sydney University athletic fields; Sydney University Sports & Aquatic Centre; Broadway Shopping Centre; Central Park Mall; tourist accommodation (Mercure, Adina Apartments, Rydges, etc.); Sydney International Convention Centre; Darling Quarter

Health: RPA Hospital; Professor Marie Bashir Mental Health Facility; RPA Institute of Rheumatology & Orthopaedics; RPA Institute of Academic Surgery; and Chris O'Brien Lifehouse.

Education: TAFE NSW Ultimo; University of Notre Dame; University of Sydney; University of Technology Sydney; TAFE Eora College; TAFE Community Education and Arts Development (CEAD) Centre; Sydney School of Entrepreneurship (SSE); RPA Surgical and Robotic Training Institute; and Creative Industries Knowledge Hub UTS.

Research: Baird Institute; Brain and Mind Centre; Heart Research Institute; Sydney Health Partners; Centenary Institute of Cancer – Medicine and Cell Biology; George Institute for Global Health; Woolcock Institute of Medical Research; Sydney Research; Blackfriars Precinct Industry Hub; Australian Centre for Field Robotics; Sydney Nano; Microscopy Australia; Charles Perkins Centre; Statewide Biobank research facility; United States Studies Centre; and CSIRO Data61.

7.4   Precinct economic baseline

Based on 2016 NSW Government Transport Performance and Analytics (TPA) data, there are roughly 96,934 full and part time workers that work in the Precinct. In terms of how the workforce breaks down by industry, as expected, the Precinct contains large numbers of workers in the Education and Training sector. The Precinct also

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[5] Common areas are common to all buildings regardless of the nature of the tenant and does not reflect economically productive floor space. As such it is generally note included when assessing floor space composition.

contains many Professional, Scientific and Technical Services workers and Health Care and Social Assistance, Government and Information, Median and Telecommunication workers.

This is due to the location of key facilities like UTS or University of Sydney, RPA Hospital and Professionals who require office space at the periphery (e.g. accounting, engineering, architecture, etc.) of the CBD and take advantage of lower rents. The following table provides a breakdown of the industry profile.[6]

Table 10: Summary of top 15 industries in Precinct, 2016

Industry	No. Workers
Financial and Insurance Services**	1,143
Education and Training	14,978
Professional, Scientific and Technical Services	13,970
Health Care and Social Assistance	10,889
Public Administration and Safety	9,581
Information Media and Telecommunications	8,871
Transport, Postal and Warehousing	7,385
Accommodation and Food Services	5,747
Retail Trade	4,436
Administrative and Support Services	3,822
Construction	3,470
Other Services	3,442
Arts and Recreation Services	3,251
Wholesale Trade	2,396
Other	3,554
Total	96,934

Source: ABS Table Builder; 2016 Census of Population and Housing

It is important to note that Commonwealth Bank has recently relocated some 18,000 staff to ATP sine the TPA analysis was undertaken. This means that as of 2019 there may be more than to 100,000 workers in the Precinct.

Just as important as the industry, it is good to understand what kind of work in being done in the Study Area. From an innovation perspective, some occupations are inherently more creative than others, yet those workers could potentially work across a wide range of industries.

Table 11 provides a summary of the proportions of occupations within the study area as compared to Greater Sydney. This data is sourced using SA2 boundaries and Census data of the wider statistical area, not FES data used above.

Of note is that there is a considerable clustering of Professionals as compared to Greater Sydney, likely owing to the proximity to the Sydney CBD. As expected, there are considerably fewer labourer, machinery operators, drivers, and technicians and trades workers than Greater Sydney.

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[6] We have noted the change in industry employment between 2016 and 2019, and thus the ordered rankings in the table, using the ** notation.

Table 11: Summary of occupation level 1

Occupation	Study Area Total	Greater Sydney
Managers	16.13%	14.32%
Professionals	40.25%	27.49%
Community and Personal Service Workers	7.48%	9.83%
Technicians and Trades Workers	9.74%	10.93%
Clerical and Administrative Workers	13.42%	15.27%
Sales Workers	6.81%	9.36%
Machinery Operators and Drivers	1.13%	5.62%
Labourers	3.9%	7.18%
Total	100.0%	100.00%

Source: 2016 ABS Census of Population and Housing

Looking at both industry and occupation together can provide a sense of whether an area contains any clustering or hotspots of creative talent. Of note is that the Precinct contains Specialists, Business Professionals, Designers and Computer Professionals.

These are important ingredients not only in that they are part of the creative economy, but they are also important for translating ideas into commercially successful enterprises. This suggests that indeed the Precinct has many of the innovation workers required to stand as an innovation Precinct in its own right.

7.5   Entertainment economy

Innovation does not necessarily happen 'in a laboratory'. Many important innovation activities occur through social interactions and accidental meetings of people with similar interests. Further, many innovative companies can the availability of vibrant social assets to help attract some of the best talent. As a result, it is important to know where many of the social assets are located that support innovation.

The availability and quality of a vibrant "night time economy" is often used as a proxy to judge the quality of an innovation Precinct. In practical terms, the NTE includes dining, pubs, university lectures and tutorials, shopping, art galleries, evening sports, street buskers, takeaway food shops, taxis, nightclubs, live music, street cleaners, service industries, accommodation, policing, security, cultural institutions, night markets, public talks, harbour cruises, party boats, walking tours, live theatre, hospitals, casinos, gyms, pharmacies, supermarkets, outreach services and convenience stores, and more.

The CoS commissioned Ingenium Research to study the Night Time Economy (NTE) to understand the changes in the economy over the period of July 2013 to June 2017 and consider the concentration and mix of business types that support a safe and vibrant NTE (Ingenium Research, 2019). Figure 19 provides an overview of this analysis highlighting local centres, city living, and light night spots arranged by post code.

Figure 19: Entertainment economy assets by postcode
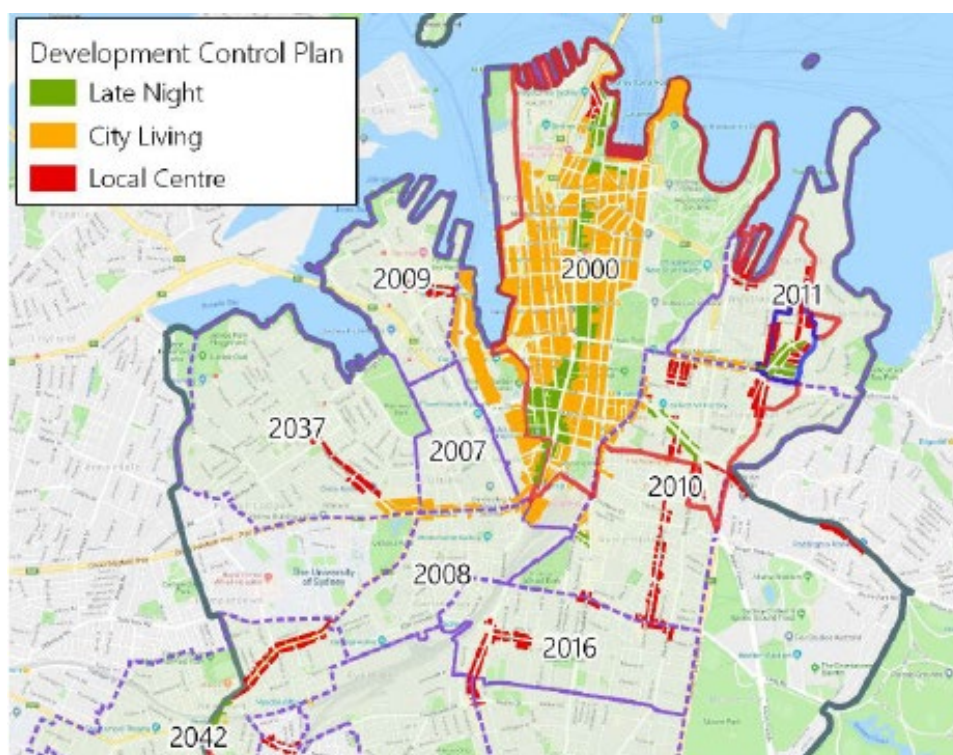
Source: Ingenium Research 2019

In line with CoS land use zones and planning policies, we note clustering of late-night assets towards Chippendale and Ultimo, which is owing to the presence of Chinatown and new developments like Central Park (e.g. postcode 2007 & 2008).

Additionally, Surry Hills and Oxford Street to the east has a long history as a leading entertainment and night life spot. We also not some additional night time assets to the opposite side of the Study Area towards Newtown along King Street (post code 2042). While somewhat outside the specified boundary, Glebe also shows concentration of local centre assets in closer proximity to the University of Sydney, UTS and TAFE NSW.

Between 2013 and 2017, Ingenium Research indicates that overall the number of establishments increased by 2.1% per year while the number of workers increased by 4.1% per year. The large increases were in Alexandria, Zetland, Waterloo, Eastlakes and Roseberry. This is due to the large-scale apartment developments occurring in South Sydney, particularly those located in and around Green Square. Figure 20 provides a summary of key results over the period.

Figure 20: Summary change in core NTE

Postcode	Establishments			Employment			Turnover (A$m)		
	Number	CAGR 13-17	Density per km²	Number	CAGR 13-17	Density per km²	Number	CAGR 13-17	Density per km²
2000: CBD & Harbour	1,675	-0.3%	391	15,145	1.2%	3,533	$1,630	3.6%	$380
2007 & 2009: Broadway, Ultimo & Pyrmont	277	3.9%	186	2,150	4.0%	1,442	$262	6.2%	$176
2008 & 2016: Chippendale, Darlington & Redfern	209	4.1%	104	1,345	7.4%	667	$170	9.6%	$84
2010: Darlinghurst & Surry Hills	627	2.3%	289	4,760	3.4%	2,190	$556	5.6%	$256
2011: Woolloomooloo, Potts Point & Elizabeth Bay	288	3.2%	206	2,160	6.2%	1,542	$234	8.2%	$167
2015: Alexandria, Beaconsfield & Eveleigh	174	7.4%	41	1,580	13.6%	375	$192	15.9%	$46
2017: Zetland & Waterloo	182	14.7%	94	905	17.5%	467	$101	19.7%	$52
2018: Eastlakes & Rosebery	116	13.9%	30	710	13.4%	181	$89	17.4%	$23
2037: Forest Lodge & Glebe	146	-1.3%	68	890	-1.2%	416	$108	1.5%	$51
2042: Enmore & Newtown	270	0.8%	132	1,665	1.4%	814	$186	4.2%	$91
City of Sydney	4,872	2.1%	182	35,580	4.1%	1,333	$4,059	5.5%	$152

Source: Ingenium Research 2019

Importantly, some of the slowest (or negatively) growing suburbs are the areas like Enmore, Newtown and Glebe, which grew at -1.3% per year and -0.8% per year respectively. These areas are established areas and are key entertainment support precincts for areas around University of Sydney, UTS and TAFE NSW.

This is partially offset by growth in Surry Hills-Darlinghurst, Ultimo- Pyrmont, and Chippendale-Darlington-Redfern. We note that Surry Hill was the lowest at only 2.3%, which is in line with general economic and population growth rates. Both Ultimo-Pyrmont, and Chippendale-Darlington-Redfern were faster likely reflecting the increased development in places like Central Park in Ultimo.

7.6   Precinct employment forecasts

Going forward, NSW Government Transport Planning and Analytics (TPA) baseline forecasts suggest that the Precinct is anticipated grow by 26.0% over the next 10 years.

Table 12: Summary baseline projected precinct growth

	2016	2026	10 Yr % Avg	10 Yr %Chg
Precinct Total	96,934	122,149	2.3%	26.0%

Source: TPA employment projections 2016; HillPDA analysis

In terms of industry changes, based on baseline TPA forecasts, Financial and Insurance Services and Professional, Scientific and Technical Services are among the fastest growing industries. This is expected to be followed by Education and Training and Health Care and Social Assistance.

Financial Services is likely being driven by shifts in workforce within Sydney among the major banks and other related financial institutions. Professional Services appears to build off its strong base within the area and continue at a robust pace. This is potentially due to the need for proximity to the CBD and growth in the services sector more generally across the Australian economy.

Education and Training, Health Care and Social Assistance and Public Administration and Safety are likely to continue as a muted pace, which is generally in line with broader economic growth and population growth. This is due to the nature of public funding in Universities, hospitals, and government more generally, which tends to keep in line within demand from the public.

Creative industries like Information Media and Telecommunications are expected however to grow at a much weaker pace over the coming periods. This is likely related to the turbulence in the global media industry from other start-ups as well as digital disruption being felt across the sector. The following table provides a summary of employment forecast by industry for the top 15 industries within the Precinct over the next 10 years.

Table 13:Top 15 industry Precinct employment projections 2016-2026

	2016	2026	10 Yr %Avg	10 Yr Chg
Financial and Insurance Services**	1,143	19,292	32.7%	1587.9%
Professional, Scientific and Technical Services	13,970	16,195	1.5%	15.9%
Education and Training	14,978	16,028	0.7%	7.0%
Health Care and Social Assistance	10,889	11,795	0.8%	8.3%
Public Administration and Safety	9,581	10,186	0.6%	6.3%
Information Media and Telecommunications	8,871	9,058	0.2%	2.1%
Transport, Postal and Warehousing	7,385	7,521	0.2%	1.8%
Accommodation and Food Services	5,747	6,164	0.7%	7.3%
Retail Trade	4,436	4,722	0.6%	6.5%
Administrative and Support Services	3,822	4,100	0.7%	7.3%
Construction	3,470	3,699	0.6%	6.6%
Other Services	3,442	3,569	0.4%	3.7%
Arts and Recreation Services	3,251	3,370	0.4%	3.6%
Wholesale Trade	2,396	2,434	0.2%	1.6%
Other	3,554	4,017	1.2%	13.0%
Total	**96,934**	**122,149**	**2.3%**	**26.0%**

Source: TPA employment projections 2016

Theoretically, most of these zones are at 'capacity' given the SP2 and SEPP zonings; however, there may be additional pent up demand with limited ability to provide for additional capacity. For example, in an "high case" scenario, South Eveleigh is currently at capacity with around 18,000 workers, but there might be additional capacity through redevelopment of Eveleigh North and the Metro corridor, which would add capacity for an additional 4,000 workers.

Further, the NSW government is planning for an additional 25,000 workers through the Ultimo-Central corridor, which will be accomplished through redevelopment of existing stock. The University of Sydney estimates that it is at 85% capacity, which is an implied 17,000 workers if developed to full capacity. UTS has no additional plans for expansion.

All together this represents an additional 46,000 potential workers in the precinct under an optimistic 'high' scenario where the existing capacity and planning is developed to its fullest extent.
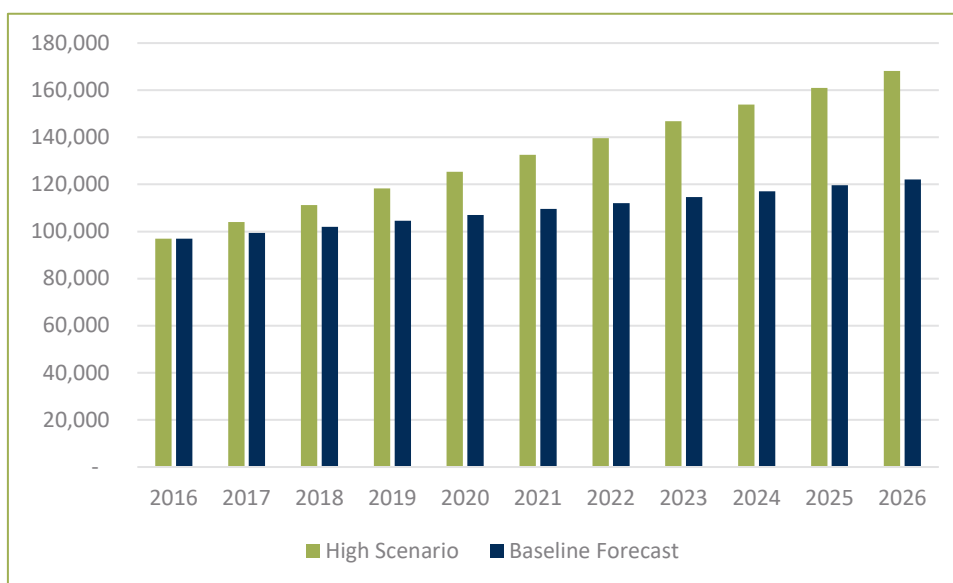
Source: HillPDA analysis; *TPA employment projections 2016*

7.7 Occupational forecast

While this analysis is helpful to estimate the quantum and speed of workforce growth, it is limited in one key respect – it does not account for disruption to specific jobs and industries over the long term.

While these figures suggest solid forward-looking growth, technology and innovation do possess risks to specific occupations across a range of industries. Further, while industry projections are important, they do not capture specific disruptions to jobs themselves.

Based on 2014-2015 studies from Oxford University (Frey and Osbourne, 2013) and PwC (PwC, 2015), the combined analysis suggested that 44 per cent (5.1 million) of current Australian jobs are at risk of being disrupted by computerisation and technology over the next 20 years.

The Oxford study found that the jobs most likely to be disrupted are those where machine learning or robotics can learn routine tasks faster and more accurately than humans. These typically include low-skilled activities in offices, factories and shops such as data entry, retail checkout, bookkeeping, and operating machinery (PwC, 2015). Those occupations that fared better are those that require creativity and human interaction.

Table 14 provides a detailed summary of the top occupations in the Precinct (ABS level 4) and a mapping to equivalent occupational categories drawn from the Oxford study. However, some occupations within the Precinct stand to be disrupted, particularly those in marketing, sales roles or general clerks.

Table 14: Summary of key occupations disrupted

Sub-Occupation (Level 4, ASCO Code)	2016 No. Workers	Comparable Oxford Category (SOC Code)	Probability of Disruption	Proportional No. Workers Disrupted
University Lecturers and Tutors (24-2111)	3,902	Postsecondary Teachers (25-1000)	0.032	125
Advertising and Marketing Professionals 22-5111	3,197	Market Research Analysts and Marketing Specialists (13-1161)	0.61	1,950
Sales Assistants (General) 61-1111	2,875	Retail Salespersons (41-2031)	0.92	2,645
Advertising Manager (ASCO 13-1113)	2,844	Marketing Managers (11-2021)	0.014	40
Software and Applications Programmers 26-1313	2,572	Computer Programmers (15-1131)	0.48	1,235
General Clerks (53-1111)	2,380	Office Clerks, General (43-9061)	0.96	2,285
Graphic and Web Designers, and Illustrators (23-2414)	2,085	Multimedia Artists and Animators (27-1014)	0.015	31
ICT Project Manager (13-5112)	1,438	Computer and Information Systems Managers (11-3021)	0.035	50
Chief Executives and Managing Directors (11-1111)	1,136	General and Operations Managers (11-1011)	0.015	17
Retail Managers (14-2111)	1,061	General and Operations Managers (11-1021)	0.16	170

Source: Carl Frey and Michael Osborne (2013) & HillPDA Analysis

Even among computer programming, advances in artificial intelligence are automating portions of the software development process, meaning that even computer related occupations are at risk of being disrupted.

While the Precinct appears to contain a good range of 'future proofed' jobs, it is important to encourage innovation to ensure that those old jobs that are disrupted by technology are replaced by more innovative work.

NODE LEVEL ANALYSIS

8.0 NODE LEVEL ANALYSIS

The GSC Place Strategy identified the Collaboration Area structure as consisting of three activity nodes: Haymarket, Camperdown and Eveleigh with three connecting axes, being the Ultimo axis (UTS to Sydney University along Parramatta Road) Darlington axis (South Eveleigh to Sydney University via Redfern) and Surry Hills axis (Redfern to Central) as follows:

Figure 22: GSC activity nodes

Source: GSC Place Strategy Camperdown Ultimo 2018

Following our consultation and analysis of the CoS Floor Space Survey we suggest the innovation clusters be identified as follow:

Camperdown – extending east of Pyrmont Bridge Road along Parramatta Road to Victoria Park incorporating the University of Sydney Campus and Royal Prince Alfred Hospital extending south of City Road to North Eveleigh and Darlington.

Ultimo to Central - including UTS Campus down to the Powerhouse Museum and across to Chinatown, the ABC and Goods Line, TAFE Ultimo, Central Park, Spice Alley and the environs of Central Station.

South Eveleigh - which is the former Australian Technology Park, CSIRO Data61, Cicada Innovations and Carriageworks and surrounding Redfern Station and Redfern town centre.

Surry Hills - home to many diverse creative businesses extending along Elizabeth and Crown Street from Oxford Street to North Cleveland Street to the South.

Further consultation with Sydney University would suggest that the Camperdown Node be in fact identified as 2 clusters; one being the Camperdown Biomedical Cluster with Royal Prince Alfred Hospital and a second campus south of City Road in Darlington. This is Deep Tech & Digital Cluster including Engineering, Architecture and School of Business. Sydney University also identified a third innovation cluster namely FinTech, but this cluster is in the CoS on Castlereagh Street.

These clusters can be identified by analysis the CoS floor space survey data. Figure 23 illustrates a heat map of employment densities based on FES data. The heat map shows the location of key employment establishments, weighted by full time employment to highlight density.

Figure 23: Heat map key employment density by industry
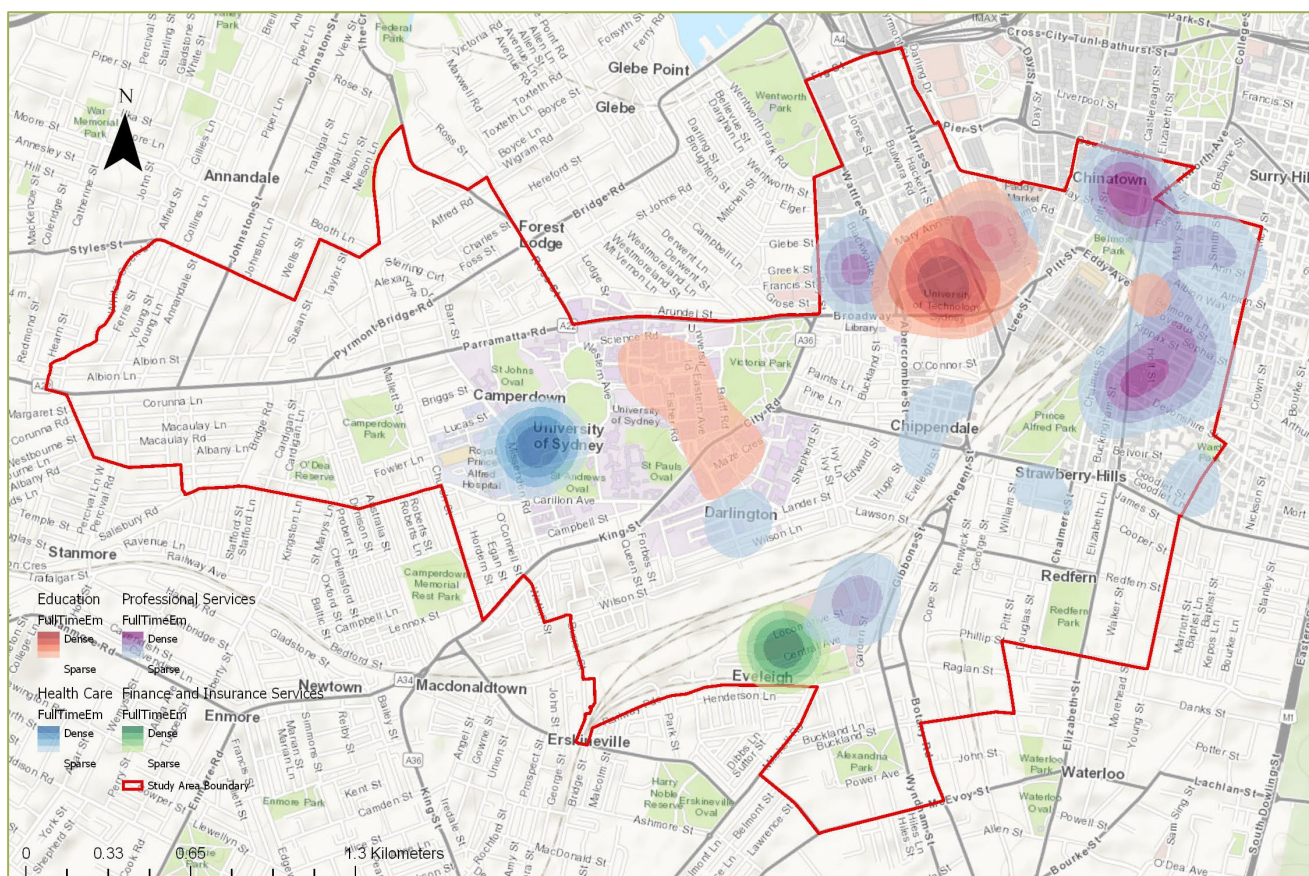
Source: CoS FES data; HillPDA analysis

These cluster have been defined into clusters as follows:

Sub Precinct	TPA Zones
Ultimo to Central	136 144 159 160
Surry Hills	192 to 195 197 198 201
Camperdown – University	236 238 239,242 ,243 252
South Eveleigh Redfern	222 & 224

Figure 24: Precinct cluster nodes
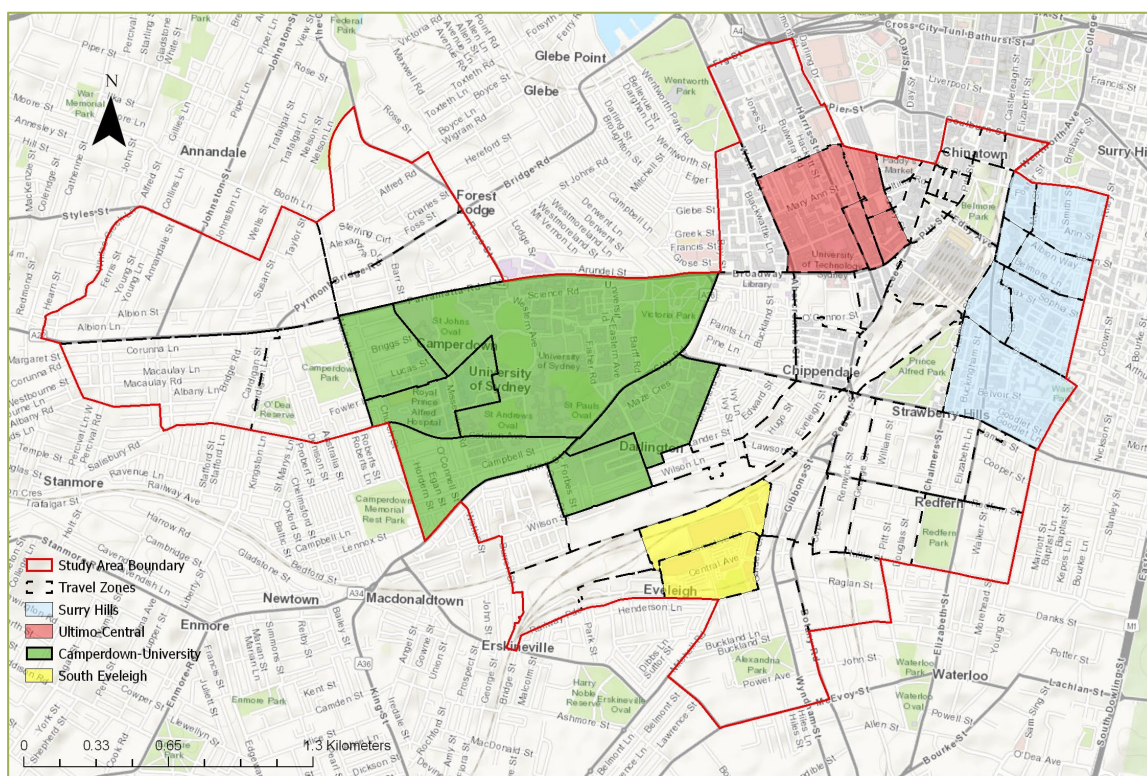
Source: NSW TPA and HillPDA analysis

Looking at only the **nodes**, there are some 48,785 workers, which account for almost half of the workers in the entire Precinct. The fastest growing node is anticipated to the South Eveleigh node, which is driven by the CBA relocation to ATP.

Table 15: Summary employment growth by node

	2016	2026	10 Yr % Avg	10 Yr %Chg
Surry Hills	21,026	22,183	0.5%	5.5%
South Eveleigh	2,262	20,360	24.6%	800.1%
Camperdown-University	16,306	17,460	0.7%	7.1%
Ultimo-Central	9,191	9,678	0.5%	5.3%
Total	**48,785**	**69,681**	**3.6%**	**42.8%**

Source: TPA employment projections 2016

8.1 Floor space and distribution at the nodes

The CoS floorspace survey for the four nodes identified close to 3 million square metres of gross floor space excluding parking and other infrastructure.

	Office	Community	Retail	Ent & Rest.	Hotel	Indust & Storage	Vacant	Residential	Common Area	Total
Ultimo-Central	134,950	104,603	3,448	40,691	19,870	53,484	10,570	116,049	180,204	663,868
Surry Hills	216,093	20,783	20,039	49,750	21,754	51,882	63,984	345,891	190,981	981,156
Camperdown-University	209,906	211,203	9,254	76,767	7,486	63,853	8,374	283,640	293,809	1,164,292
Eveleigh-Redfern	53,746	4,139	145	15,570	-	12,097	7,098	-	35,430	128,226
Node Total	614,695	340,727	32,886	182,778	49,110	181,317	90,025	745,581	700,423	2,937,542

Residential remains the dominate use at 25% followed by Common Areas at 24% followed by office space at 21%. Community Space being education and hospital constitutes 12% of the overall GFA in the survey

If remove common areas the net GFA[7] for the total precinct falls to 2.2m sqm of floorspace and percentage break up of uses is as follows:

	Office	Community	Retail	Ent & Rest.	Hotel	Indust & Storage	Vacant	Residential
Ultimo-Central	20%	16%	1%	6%	3%	8%	2%	17%
Surry Hills	22%	2%	2%	5%	2%	5%	7%	35%
Camperdown-University	18%	18%	1%	7%	1%	5%	1%	24%
Eveleigh-Redfern	42%	3%	0%	12%	0%	9%	6%	0%
Node Total	21%	12%	1%	6%	2%	6%	3%	25%

Overall residential and office floorspace are comparable in percentage terms with community uses third. Looking at the individual nodes you start to see the character of the area. For example, South Eveleigh, office space is the dominate use. With the addition of CBA that space has now double and with the conversion of the Locomotion shed to predominately office space (23,000sqm of 30,000sqm) and balance being retail you will find office space will be over 80% of total GFA. It is a business park.

Camperdown and Ultimo have an even mix of office, community uses and residential demonstrating a mixed-use community. Surry Hills has residential as a more dominating use but when office, retail and entertainment is combined they residential and non-residential mix is even. The benefit of breaking the analysis down to this hyperlocal area of the node you can profile the characters and needs of the node more specifically.

8.2 Camperdown-University node

8.2.1 Camperdown-University employment (economic fundamentals)

The Camperdown-University node is home several major institutions that act as anchors for wide use for economic and innovative activities.

Overall, the node is home to some 16,306 workers. As expected, the core industries within Camperdown-University node are Health Care and Social Assistance and Education and Training with 6,731 and 6,527 workers respectively.

The next largest industry is the Accommodation and Food Services industry, which is present to support short term accommodation needs of patients and families accessing the RPA Hospital.

Table 16: Summary industry projection Camperdown-University node 2016-2026

	2016	2026	10 Yr % Avg	10 Yr %Chg
Health Care and Social Assistance	6,731	7,253	0.7%	7.8%
Education and Training	6,527	7,019	0.7%	7.5%
Accommodation and Food Services	822	842	0.2%	2.5%
Professional, Scientific and Technical Services	644	719	1.1%	11.6%
Other Services	303	312	0.3%	3.1%
Retail Trade	221	225	0.2%	1.6%
Administrative and Support Services	215	221	0.3%	2.7%
Construction	171	181	0.6%	5.7%
Information Media and Telecommunications	164	165	0.1%	0.9%
Other	507	522	0.3%	3.0%
Total	16,306	17,460	0.7%	7.1%

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[7] Common areas are common to all buildings regardless of the nature of the tenancy, and they do not reflect productive floor space. As a result, this space is typically excluded in this sort of floor space composition analysis.

The node is expected to grow to 17,460 over the next 10 years, which is 7.1% or roughly an average of 0.7% per annum. While much smaller overall, Professional Services is expected to grow by 11.6% over 10 years or on average 1.1% per annum. This contrast is likely due to faster growth in the private sector as opposed to the public sector. While the RPA Hospital and the University of Sydney are no doubt world-class institutions, this are limited in terms of growth as being publicly funded.

8.2.1 Camperdown-University floor space (economic fundamentals)

Based on CoS FES survey data, there is around 182,021 sqm of lettable commercial office space within the Camperdown-University node. Further there are 180,904 sqm of lettable community space used for University instruction and other services.

Table 17: Summary node floor space

	Office	Community	Shop / Showroom	Entertainment	Restaurant
Camperdown-University	182,021	180,904	6,170	32,936	31,529

Source: CoS Floorspace and Employment Survey

The Camperdown commercial office market is categorised by health and educational facilities centred around Sydney University and Royal Prince Alfred Hospital. The University and Hospital account for a significant portion of the suburbs total area leaving limited available space.

Discussions with leasing agents who specialise in Sydney fringe commercial property market outlined that the market is tightly held with limited opportunity to rent space within this inner-city location given the significant SP2 zonings.

Leasing agents have highlighted that the remaining available commercial/retail offerings within the suburb was the B4 zonings towards the western part of Camperdown. These areas were mainly inhabited by a mix of residential, hotels, a consulate (Consulate General of the People's Republic of China), additional university uses (Nursing Library) and medical uses (Brain & Mind Research Institute and Sydney Neurology) intertwined with local bar's and eateries.

The agglomeration of the health and educational facilities makes Camperdown a less desired location for emerging commercial tenants given the lack of similar types of businesses within the locality. Typically, technology, marketing, design and creative companies and media professionals have been targeting space in Surry Hills and Redfern over Camperdown.

Lastly, agents have been forecasting the rents to remain stable within Camperdown over the short term. It is difficult to determine the average market rents within the sub-market given the large proportion of commercial space leased to State Government and Educational facilities, which may skew the data. An investigation into the existing commercial premises showed an average market rent of circa $450-$550/net would be appropriate for Camperdown.

8.2.2 Camperdown-University amenity (quality of place)

A key advantage of the Camperdown-University node is the presence of the University of Sydney. The University is a unique educational institution asset that provides to a rich and diverse array of innovation and research outputs. As a result, it has several spill-over impacts for local amenity:

● **Green spaces:** The University of Sydney brings significant green spaces and recreational amenities. To the north east there is Victoria Park and the Victoria Park pool and recreational facility. The University also hosts recreation and athletics facilities, including the University Oval, University Sports and Aquatic Centre, and an assortment of playing fields and green spaces like Cadigal Green. Newtown is home to O'Dea Reserve, Hollis Park, Camperdown Park and Camperdown Memorial Rest Park.

- **Broadway:** while not in the node itself, Broadway Shopping centre is a major retail shopping mall. It is home to a 500-seat Food Court, 12-screen cinema complex along with major retailers and over 100 specialty shops.

However, the University campus itself lacks shops, cafes, bars and restaurants. Further, the local amenity is negatively impacted by considerable through traffic (e.g. adding to congestion, safety concerns, noise and pollution).

As a result, much of the high-quality local amenity is provided by other nearby areas:

- **Glebe Point Road:** Located to the north of the university, Glebe Point Road is a retail centre with many shops, restaurants, bars, cafes and pubs. The neighbourhood is a mixture of university student housing and up-scale single detached dwellings.

- **King Street**: Located to the south east of the University, King Street is home of one of Sydney's most rich and active cultural centrals. As a key residential area for University students, it is home to many shops, bars, restaurants and cafes.

- **Forest Lodge:** Located to the north west, it is a smaller and quiet suburb. Booth Street is the retail centre and is home to a small assortment of shops and services. The neighbourhood is predominantly single detached dwellings and is relatively affluent. It is also home to Jubilee Park and Jubilee Oval, which is connected to the Sydney transport network via light rail.

However, many of the key innovation assets are located on Missenden Road and Paramatta Road, which means there is limited accessibility to areas like Glebe Point Road and Forest Lodge. This has the effect of encouraging amenity and night life south towards King Street outside of the node into Newtown.

8.2.3 Camperdown-University connectivity and transport (quality of place)

The Camperdown-University node suffers from limited transport connectivity both internally and between other nodes.

Within the node, the sheer scale and size of the University of Sydney and the RPA Hospital makes transport connections within the node difficult.

- **University Campus:** There is no internal bus or rail linkages within the University Campus. Transport it limited to shared pedestrian and bicycle. Parking in very limited on campus and the roadways are quite narrow.

- **RPA Medical Centre:** There is currently no rail access to RPA medical centre. Bus service is limited along Missenden Road. Access to bus stops along City Road, King Street or Paramatta Road require a 5-7-minute walk.

- **University-Darlington:** Access between the University and Darlington is somewhat better as it has access across City Road via a pedestrian bridge. However, pedestrian commuting habits often limit use.

Connecting to other nodes can also be problematic. The arterial streets at Parramatta Road and City create physical barriers to movement between nodes. They also have the secondary impact of feeding traffic onto minor side streets.

Key arterial choke points include:

- **University-Central Station:** Transferring from bus to train can be time-consuming given the overall size of Central Station and the location of adjoining transfer points along both Parramatta Road and City Road. General through traffic slows down people catching public transport, walking and riding bikes. Potentially the Central Station upgrade project will alleviate this problem.

- **University-Redfern:** Access to Redfern is limited to narrow residential streets. Bicycles are required to share the surface roads and have limited benefit of dedicated bicycle paths. The distance is significant owing to the lack of bridge access over Redfern station to the rest of the suburb.

8.2.4 Input from the Sydney University (governance and support services)

In consultation with Sydney University they have suggested the follow actions and improvements. Making the Campus more open to the public on an informal basis such as:

- Community use of University grounds – passive recreation, dog walking and through site links etc

- Community access to University recreation centre/spaces – swimming, tennis etc

- Vacation care programs for children

- Events – several events are open to community participation

- Retail facilities and cafes

- The University use the Carriageworks spaces for exams and public lectures

- Presence of some industry partners on campus – e.g. Microsoft

Some additional opportunities include:

- Potential industry/mixed use spaces on campus; which capitalises on the capacity for built form uplift opportunities, particularly on the Darlington campus, and notably alongside the "green heart" which the campus provides for the precinct

- Precinct wide pedestrian priority (a true 30-minute city) and super connected public transport to CBD and beyond (i.e. Metro connectivity)

- Recent discussions have highlighted differentiating the precinct as a digital precinct - a significant high-speed internet precinct, building on the AARNET system of the Universities and research institutions to enable "all" in the precinct to access it. We are advised that this would be a major drawcard for companies, researchers and entrepreneurs in the knowledge economy

- "Living lab" opportunities – from autonomous vehicles to health-related research programs

- Local connections such as - build on the gateway, recently installed, to Victoria Park from the University's Law Building, to start removal of the fence and create the opportunity for shred use - events, formal and informal learning outdoors, deliver learning on display, and attract a diverse group of practitioners and visitors

- University has approached TfNSW to lease vacant buildings including the Chief Mechanical Engineers Building, on Wilson St to be fitted out for childcare or as a prototype lab.

8.2.5   Camperdown-University node assessment

Based on the preceding analysis, the following table contains a summary of our assessment rating of the node.

Table 18: Camperdown-University Assessment Summary

Theme	Principles	Assessment
Quality of Place	Quality of transport and connectivity	Train: Poor. Redfern & Central are closest stations
		Bus: Good. Access mainly via King St or Parramatta Rd
		Car: Poor. Limited parking and subject to congestion vis King St and Parramatta Rd.
		Pedestrian Experience: Good
	Quality of amenity	Good: Access to large green spaces and public recreation options
	Distinct urban character	Strong. Distinct historical campus with unique architectural heritage
Economic Fundamentals	Distinct industry / employment clustering	Strong. Distinct clustering of major education and health care institutions
	Residential / commercial development potential	Limited. Limited development given zoning and self-imposed development strategy; historical restrictions
Governance and Support Services	Anchor institutions or firms	Strong. Presence of major education and research institutions; Limited inter node governance or interactions

Potential node vision: The Camperdown-University node is home to major education, health care and research institutions. It has the character, amenity, economic fundamentals and governance potential to form its own self-sustaining biomedical innovation centre of excellence. It is limited in its connectivity to other nodes due to size, location and isolation of the current campus structure.

8.3   Ultimo-Central node

8.3.1   Ultimo-Central employment (economic fundamentals)

The Haymarket Activity node is a key area for emerging information technology. UTS plays a significant role in supporting start-ups through providing free co-working space, connection to industry events and funding programs and knowledge sharing workshops to encourage collaboration between private enterprise and the university.

Additionally, north of the Haymarket Activity node includes an emerging media and communications cluster in Pyrmont, with a combination of major media outlet and smaller, supportive media and communications specialists. Key assets include:

- Education clusters due to UTS and TAFE NSW

- Media clusters due to the ABC and additional media hub in Pyrmont (e.g. Domain.com, Ten, Fairfax)

- Financial cluster in Darling Quarter (Commonwealth Bank Headquarters) and emerging entertainment cluster (the Sydney International Conference Centre and Darling Harbour redevelopment)

- Major presence for professional services and government employment.

As of 2016, the node is contained 9,191 workers. By far the largest industry in the node is the Education and Training industry with 4,677 workers as the node is home to UTS and TAFE NSW. The next largest industry is Information, Media and Telecommunications with 2,593 workers, which is likely due to the presence of the ABC and other supporting media firms.

Education and Training is expected to grow by 7.5% over 10 years to 5,030 workers, which is consistent with Education and Training growth rates at the University of Sydney / Camperdown node. Information, Media and

Telecommunications is the next largest industry but is only expected to grow by 0.9%. This is likely because the ABC is a public entity and due to the broader market constraints of the media sector generally (e.g. competition with social median and other digital platforms).

Table 19: Summary industry projection Ultimo-Central node 2016-2026

	2016	2026	10 Yr % Avg	10 Yr %Chg
Education and Training	4,677	5,030	0.7%	7.5%
Information Media and Telecommunications	2,593	2,616	0.1%	0.9%
Accommodation and Food Services	451	462	0.2%	2.5%
Professional, Scientific and Technical Services	396	442	1.1%	11.6%
Retail Trade	197	200	0.2%	1.6%
Administrative and Support Services	185	190	0.3%	2.7%
Health Care and Social Assistance	170	183	0.7%	7.8%
Other Services	167	173	0.3%	3.1%
Construction	111	118	0.6%	5.7%
Other	242	264	0.9%	9.0%
Total	9,191	9,678	0.5%	5.3%

Source: TPA employment projections 2016

8.3.2 Ultimo-Central floor space (economic fundamentals)

Based on CoS FES data, there is a total supply of over 134,950 sqm of lettable commercial office space. There is an additional 104,603 sqm of lettable community space owing to the presence of both UTS and TAFE NSW.

Table 20: Summary node floor space

	Office	Community	Shop / Showroom	Entertainment	Restaurant
Ultimo-Central	134,950	104,603	3,448	19,633	21,058

Source: CoS Floorspace and Employment Survey

The Ultimo/Haymarket commercial office market is categorised by a mix of educational, design and government tenants who prioritise cheaper rents over a CBD location.

Discussions with leasing agents and professionals who communicate with tenants within these markets state the low vacancy experienced within the Sydney CBD over the past two years has impacted upon the affordability of these fringe markets.

Tenants who prioritise a 'secondary market' as a preference, who forgo location for cost, now must look past Ultimo/Haymarket given the tightening of vacancy and increasing rents experienced within these markets.

A current vacancy rate of 2-4% and gross rents of circa $750/sqm has caused smaller tenants to be priced out of the market. A recent deal completed by UTS for 9,850sqm of office space within 100 Broadway in Chippendale (directly opposite UTS engineering building) was transacted at $675/sqm gross.

While this deal was completed at below market rents it was for a significant amount of space and on a 15-year term. Another example of the type of existing market rents being achieved is Healthdirect also signed a lease in 2018 for 2,594sqm of office space within 477 Pitt Street, Haymarket at $850/sqm gross for four years.

8.3.3 Ultimo-Central amenity (quality of place)

A key advantage of the Ultimo-Central node is its proximity to significant cultural assets. Particularly, Haymarket is a unique cultural asset that provides to a rich and diverse array of amenities unlike the other innovation nodes.

- **Multiculturalism**: Haymarket is an important cultural centre for Sydney's Asian communities. It is home to Chinese, Korean and Indonesian communities and a large international student population.

- **Apartment living options**: The former warehouses and wool stores along Harris Street have converted to apartments and office buildings, populated by wealthy young professionals, particularly couples and young families, and a large Chinese community. Parks on the harbour foreshore provide open space for residents.

- **Green spaces:** Open space is provided in local parks and around Darling Harbour and the Darling Quarter development.

8.3.4 Ultimo-Central connectivity and transport (quality of place)

Ultimo-Central has potentially the most competitive public transport offering of any of the innovation nodes. With proximity to Central Station, the node has access to the T1, T2, T3, T4 and T8 lines as well as light rail service and connections to the new Sydney Metro from 2024 onwards. The node is also served by road assets include Parramatta Road, City Road, Broadway, Harris Street through to Botany Road, Cleveland Street and Foveaux Street. While the proximity to Central Station is a key advantage of the Precinct, access to mass transport deteriorates as pedestrians move west from Central Station along Parramatta Road.

However, at the node level Ultimo-Central still suffers from several key issues:

- **Parramatta Road-Broadway:** Pedestrians do have good access to bus service via Railway Square. Physical distance from Central Station to UTS and TAFE NSW means that pedestrians can access transport within approximately 10 minutes. While cyclists can use the bus lanes and anecdotally these can be quite dangerous during peak hours.

- **UTS Campus:** Given the compact nature of the campus, pedestrians have good access to the entire UTS and TAFE NSW area. The roadways are non-atrial roads, allowing for good cycling and foot access around the campus.

- **Railway Square to East Platform:** Local train services are located on eastern end of Central Station, but the bus services are located to the west. This is accessed via a connecting tunnel and can be a 400m+ walk (roughly a 5-7-minute). This is problematic at peak times when tunnel is congested.

8.3.5 Input from the UTS (governance and support services)

One of the themes of the UTS 2027 Strategy is about this precinct and how the campus can be a central focus for the connections between the university and the innovative technology and creative industries.

- **Convening public conversations:** The UTS campus will provide spaces, both, formal and informal, to invite people from the various communities in; for events, lectures, courses, cafes, entertainment, libraries, galleries, public art, festivals, student activities and various shopfront venues.

- **The Goods Line:** The Goods Line, and its surrounding lanes, from UTS to the Powerhouse and connecting into Darling Harbour, should be activated by small cafes, bars and technology-focused activities such as small labs and storefronts.

  – The UTS would participate through its own properties, but the Goods Line ownership is very complex involving several State agencies. UTS could convene the conversation and develop scenarios.

- **Industry co-location:** UTS currently has several smaller facilities scattered around the campus which are primarily for shorter term or project-based collaborations. The university's strategy is to move to the development of larger and longer-term facilities, and this could potentially happen as part of the Central Station redevelopment. The opportunity at Central, while there might be some need for UTS space to accommodate campus growth, is for a focus on populating the development with UTS industry partners in R&D, engagement with student interns and industry-based PhD's and master's students, as well as the convening of events by UTS.

- **Campus activation:** Related to all these ideas is a general approach to the activation of the entire campus as a key part of its connection to the surrounding city and precinct. This requires excellent street level experiences, high quality public spaces and throughways, excellent wayfinding and lighting, all public frontages to be active and visible, a broad range of services and amenities on the street-front, open legible campus entry points, excellent at-grade connections beyond the campus proper.

8.3.6   Ultimo-Central node assessment

Based on the preceding analysis, the following table contains a summary of our assessment rating of the node.

Table 21: Ultimo-Central Assessment Summary

Theme	Principles	Assessment
Quality of Place	Quality of transport and connectivity	Train: Excellent. Proximity to Central Station.
		Bus: Very Good. Proximity to Railway Square interchange.
		Car: Poor. Limited parking options and congestion vis Broadway / Paramatta Rd.
		Pedestrian Experience: Poor
	Quality of amenity	Good. Access to numerous entertainment and night life options.
	Distinct urban character	Moderate. Standard modern office / urban area
Economic Fundamentals	Distinct industry / employment clustering	Strong. Education, media and government
	Residential / commercial development potential	Good. More flexible R/ B zoning to facilitate development; fragmented ownership
Governance and Support Services	Anchor institutions or firms	Strong. UTS, TAFE NSW, Notre Dame University

Potential node vision: The node is home to several large public education institutions, media outlets and government offices. The node has the transport interconnectivity, amenity, economic fundamentals and governance potential to be a centre of technology and innovation excellence. The node is near the main centre of Australian commerce and rich with entertainment and night life options. The node needs to enhance is walkability and green space amenity to provide a balance for living, working and play.

8.4   South Eveleigh node

8.4.1   South Eveleigh employment (economic fundamentals)

The South Eveleigh node is home to the Australian Technology Park (ATP). ATP was an initiative from Sydney's leading universities to regenerate and re-use vacant land south of Redfern Stations as a technology and innovation hub.

The heritage workshop sites have been converted into offices and conference facilities, with a focus on technology and creativity with buildings like:

- Biomedical Building
- Data 61 (formerly known as the National ICT Australia (NICTA) Building) and Cicada Innovations
- Media City and the 7 Network.

As of 2016, the South Eveleigh node was home to 2,262 workers. From 2019 onward there will be additional workers in the Financial and Insurance Services with the completion of the Commonwealth Bank building and the relocation of workers from Homebush to ATP.

This will bring the node to its capacity. As a result, by far, the largest industry in the node is Financial and Insurance Services. This is followed by Information, Median and Telecommunications, which is due to the

presence of 7 West. Additionally, there are some government workers due to the presents of both Commonwealth Government (CSIRO and Data 61) and NSW state transport agency.

Table 22: Summary industry projection South Eveleigh node 2016-2026

	2016	2026	10 Yr % Avg	10 Yr %Chg
Financial and Insurance Services	---	18,000	N/A	N/A
Information Media and Telecommunications	910	918	0.1%	0.9%
Public Administration and Safety	432	450	0.4%	4.4%
Professional, Scientific and Technical Services	348	389	1.1%	11.6%
Health Care and Social Assistance	173	186	0.7%	7.8%
Education and Training	160	172	0.7%	7.5%
Wholesale Trade	77	78	0.1%	1.2%
Transport, Postal and Warehousing	57	57	0.2%	1.5%
Accommodation and Food Services	22	23	0.2%	2.5%
Other	84	87	0.3%	3.3%
Total	**2,262**	**20,360**	**24.6%**	**800.1%**

Source: TPA employment projections 2016

8.4.2 South Eveleigh floor space (economic fundamentals)

Based on CoS FES data, there is a total supply of over 146,976 sqm of lettable commercial office space. This includes an additional 93,000 sqm of lettable space for the Commonwealth Bank's new development at ATP. There is an additional 4,139 sqm of lettable community space.

Table 23: Summary node floor space

	Office	Community	Shop / Showroom	Entertainment	Restaurant
Eveleigh-Redfern	146,746	4,139	145	11,993	3,577

Source: CoS Floorspace and Employment Survey

The Redfern/Eveleigh commercial office market is categorised by a mix of creative and design companies intertwined within rich cultural, food and beverage offerings. The commercial market is anchored by the office space at 219-241 Cleveland Street, Redfern that houses; Australia Post, TheFork AU and StarTrack.

While the market consists of various advertising, galleries and boutique style office spaces the establishment of the Australian Technology Park (ATP) changed the make-up and interest of tenants.

Existing tenants within ATP who have helped transform the space into a digital and design focused activity node are 7 West (media), NEP Group (media) and AC3 (IT). Additional office/retail space will be available in the coming years with Mirvac transforming the locomotive workshops into habitable office space.

The Commonwealth Bank (CBA) complex at ATP provide 93,000 sqm of office space and represents a significant development for the South Eveleigh node. Mirvac will produce three buildings for CBA. Buildings 1 and 2, which will be characterised by the large office floor plates ranging from 5,500 to 8,600 square metres. Building 3 will become CBA's "pavilion building" hosting community and childcare spaces.

While the ATP will eventually cater to 16,000 to 18,000 additional workers. The price of the office space has been around $850-$1,000sqm gross. As a result, it may be challenging for smaller research and design tenants to relocate within this area as CBA has set market rental rate precedents for the node.

The previous tenants of the locomotive workshop who have now been asked to vacate the premises given the demolition clauses were paying circa $200/sqm gross on short-term leases. While, this is not reflective of a

market rent for space within this submarket any existing tenant operative within the locomotive workshops would have to look elsewhere when seeking commercial office space.

8.4.3   South Eveleigh amenity (quality of place)

The South Eveleigh node can be characterised as a mixture of residential and commercial land uses. The eastern section of the University of Sydney campus extends into the node and provides a mixture of cafes and restaurants within a residential/university setting. Redfern Station is the primary means of transport within the node with Lawson Street being the major pedestrian thoroughfare.

However, the location of the railyards and Redfern station essentially cuts the node in half, separating residential land uses from commercial land uses. This is made worse by the location of the arterial roads of Gibbons and Regent Street east of Redfern Station. Potentially this could be improved by leveraging WestConnex and the Sydney Metro.

As a result, the main commercial streets of Botany Road / Regent Street lack the cohesive character of main high street. Abercrombie Street and Redfern Street are the key active local residential retail centres for the area, but this is located 1.0km or a 15-minute walk to the north east of Australian Technology Park. The new Redfern concourse could improve connections to Abercrombie Street.

Similarly, the suburb of Erskineville is located 1.0km to the south west of ATP. Swanson Street / Erskineville Road is the main residential retail centre for the area. It is home to several shops, bars, and restaurants. It is also home to several parks and nature reserves including Erskineville oval, Solander Park and Harry Noble Reserve.

As a result, much of the amenity is disconnected from the main innovation node at ATP. However, with the Commonwealth Bank redevelopment, it may help to improve the local amenity at ATP providing for shops, cafes, restaurants and outdoor green spaces.

8.4.4   South Eveleigh connectivity and transport (quality of place)

The precinct is well serviced by public transport through Redfern Station, Macdonaltown Station and some bus routes. There will be additional public transport accessibility as a result of the Sydney Metro station being built at Waterloo.

However, while Redfern is one of Sydney's busiest rail stations, the primary entrance to Redfern Station is poorly aligned and does not provide for easy access to other parts of the precinct such as the University via Lawson Street, ATP to the south or Camperdown further to the west.

While the Australian Technology Park (ATP) occupies a significant land holding along the rail lines, it lacks integration with the centre of Redfern or Macdonaldtown Station. As a result, workers within the node are required to walk some 5-7 minutes to access major rail and bus connections at Redfern Station.

8.4.5   South Eveleigh node assessment

Based on the preceding analysis, the following table contains a summary of our assessment rating of the node.

Table 24: South Eveleigh Assessment Summary

Theme	Principles	Assessment
Quality of Place	Quality of transport and connectivity	Train: Good. Connections via Redfern Station
		Bus: Poor. Minimal access into ATP; better access via Redfern
		Car: Good. New parking options; congestion around Henderson Rd /Botany Rd/ Wyndham Rd
		Pedestrian experience: Poor
	Quality of amenity	Limited. Some dining options; limited green space
	Distinct urban character	Weak. Modern business park; proximity to rail yard / warehousing
Economic Fundamentals	Distinct industry / employment clustering	Strong. Financial services; major anchor tenant
	Residential / commercial development potential	Limited. ATP currently near capacity.
Governance and Support Services	Anchor institutions or firms	Moderate. CBA does not undertake incubator or R&D as this location

Potential node vision assessment: With a large anchor tenant and traditional business park format, the area has potential to form a prime inner-city business destination. Innovation potential is limited by connectivity options and public amenity. It would also require major tenants whose core business is in the area of research and development, and a range of innovation support programs reach innovation potential.

8.5 Surry Hills node

8.5.1 Surry Hills employment (economic fundamentals)

Surry Hills continues to be a highly desirable location, especially for younger workers. Surry Hills is home to several new start-ups, arts and media firms, consultancies and professional services, and incubation hubs.

Key assets include:

- Professional services (small professional services and marketing companies)

- Information, Media and telecom cluster (e.g. News Corp)

- Government employment cluster (Bureau of Meteorology, Cth Department of Health, Cth Department of Veterans Affairs etc.).

Overall, there are 21,026 workers in the node. By far the largest group of workers are in professional services with 5,059 workers, followed by information, median and telecommunication with some 2,615 workers, and government with 1,980 workers.

Table 25: Summary industry projection Surry Hills node 2016-2026

	2016	2026	10 Yr % Avg	10 Yr %Chg
Professional, Scientific and Technical Services	5,059	5,646	1.1%	11.6%
Information Media and Telecommunications	2,615	2,642	0.1%	1.0%
Public Administration and Safety	1,980	2,067	0.4%	4.4%
Health Care and Social Assistance	1,836	1,979	0.7%	7.8%
Administrative and Support Services	1,436	1,474	0.3%	2.7%
Retail Trade	1,238	1,258	0.2%	1.6%
Accommodation and Food Services	1,202	1,231	0.2%	2.5%
Other Services	1,039	1,071	0.3%	3.1%
Education and Training	894	961	0.7%	7.5%
Other	3,727	3,854	0.3%	3.4%
Total	**21,026**	**22,183**	**0.5%**	**5.5%**

Source: TPA employment projections 2016

Professional Services is expected to grow by 11.6% over the next 10 years. The next fastest growing sectors in the node are Health Care and Social Assistance and Education and Training, which are expected to grow by 7.8% and 7.5% respectively. Unlike other nodes, this is more likely due to the presence of health professionals and private colleges than large public universities.

Information, media and telecommunications is only expected to grow by 1.0% over 10 years, which likely accounts for the disruption to traditional media and business modelling being experience industry wide (e.g. social media). Similarly, government is expected to only grow by 4.4% over the next 10 years which likely reflects slower changes in government spending typically in line within population growth.

8.5.2   Surry Hills floor space (economic fundamentals)

Based on CoS FES survey data, there is around 216,093 sqm of lettable commercial office space within the Camperdown-University node. Further there are 20,783 sqm of lettable community space used for community purposes.

Table 26: Summary node floor space

	Office	Community	Shop / Showroom	Entertainment	Restaurant
Surry Hills	216,093	20,783	20,039	21,755	27,994

Source: CoS Floorspace and Employment Survey

The Surry Hills market is categorised by A and B-grade larger style commercial stock along Elizabeth Street that quickly changes into lower three-to-four level creative spaces scattered throughout the suburb. The stock located along Elizabeth Street has larger style floorplates and is home to more professional and technological services.

JLL agents say Surry Hills is the creative and innovative hub of Sydney and the unique building offerings draw tenants attracted to the boutique nature of the space and the surrounding restaurant and bar strips.

Ongoing demand for creative and unique office space is driving rents upwards and incentives down. The Surry Hills market has its lowest vacancy rates ever recorded at just 1.3%, on JLL figures, and more tenants in the technology, media and professional services areas are looking for space. The availability of this new space will determine whether these record low vacancy rates continue to remain at low levels or track back to historical levels.

Cushman & Wakefield reported that fringe rent is approximately 30% less than rent in the CBD, with A-grade net rent in Darlinghurst and Surry Hills currently averaging at $675/sqm. The proximity to transport and the availability of a mix of diverse retail offerings makes Surry Hills a highlight sought after location with these rents forecast to continue to push higher in the short-term.

8.5.3 Surry Hills amenity (quality of place)

Surry Hills is a diverse community, home to be residential and commercial assets. With proximity to Central station, a hub for night life and cultural diversity, and proximity to the CBD.

- **Character:** The node is characterised by the early 20th century warehouse stock and unique terrace housing. Particularly the warehouse building provides for large floor plates that are flexible in terms of usage. These tend to attract creative and media firms who seek out this sort of unique and trendy area outside the CBD.

- **Green space:** Surry Hills is home to several key green spaces including Frog Hollow Reserve, Harmony Park, Shannon Reserve, Belmore Park, Ward Park and Prince Alfred Park.

- **Night life:** Crown Street is the retail centre of Surry Hills and home to cafes, restaurants, bars and pubs. The length of Crown Street runs from Oxford Street in the north to Cleveland Street in the south and provide numerous entertainment options throughout.

8.5.4 Surry Hills Activity connectivity and transport (quality of place)

Surry Hills will soon be served by light rail as a result of the new extension through Surry Hills via Randwick.

- **Crown Street :** A major arterial north-south roadway running through the centre of the node, Crown Street is an exemplar for leveraging investment to reallocate road space to places and more efficient modes i.e. pedestrians.

- **Cleveland Street**: Running the length of Surry hills to the south, Cleveland street is a major arterial road that disconnects Surry Hills to Redfern and Eveleigh. The traffic volumes are significant and discourage pedestrians and bicycle traffic.

- **Elizabeth Street:** With the current redevelopment of Central Station, pedestrian access between Ultimo and Central is limited. Also, Elizabeth is a major north-south arterial road, which discourages bicycle traffic. The topography along Elizbeth street is also quite steep, impacting foot traffic over long distances.

- **Parking**: Despite a sizable stock of commercial office space, parking is limited in the node discouraging car traffic.

8.5.5 Surry Hills node assessment

Based on the preceding analysis, the following table contains a summary of our assessment rating of the node.

Table 27: Surry Hills Assessment Summary

Theme	Principles	Assessment
Quality of Place	Quality of transport and connectivity	Train: Good. Eastern area good connection to Central Stn and future light rail
		Bus: Good. Proximity to Bus at Railway Square and Elizabeth St interchange
		Car: Poor. Residential character; limited parking and congestion issues
		Pedestrian experience: Good
	Quality of amenity	Good. Access to café, restaurant, night life and some green spaces
	Distinct urban character	Good. Distinct urban / historical character.
Economic Fundamentals	Distinct industry / employment clustering	Moderate. Some professional / creative industry clustering
	Residential / commercial development potential	Minimal. Residential character with historical protections; lower grade commercial space
Governance and Support Services	Anchor institutions or firms	Weak. Few major creative / professional firms.

Potential node vision: With a unique urban character and good connectivity and public amenity, Surry Hills has potential offerings to draw together creative /professional industries attracted to the boutique nature and form Sydney's creative epicentre. Given limited development potential, there is a need to protect existing spaces to ensure creatives are not priced out of the market; there is a need for strong governance and curation of tenants.

DIGITAL CONNECTIVITY

9.0   DIGITAL CONNECTIVITY

The digital infrastructure is critical to any innovation district, and not just for digital technology start-ups but as method to connect industry academia and the community internally and externally to other innovation clusters and industry partners. There are two important factors to consider: the speed/quality of the digital connectivity; and the ease of access/flexibility. There is significant evidence to support the notion that the digital infrastructure provided as an overlay to the innovation district should be open and free.

In broad overview, the speed/quality of the digital connectivity within the Camperdown-Ultimo innovation district is generally quite variable, from those able to access the AARNet (the Australian Academic and Research Network) to those in the broader community who rely on WiFi networks that suffer distinct pockets of poor reception in and around the inner city suburbs. Every innovation study makes some reference to the need for high speed/quality of digital connectivity across the board.

Evidence to support the significance of the ease of access and flexibility of digital connectivity is only now emerging (O'Loan, 2017). A growing number of case studies highlight the fact that the active participation of local stakeholders and residents in the development of a smart place is a key success factor (Myeong et al, 2018). That is to say that the top-down, technocratic approach is required to promote major public and large organisation investment, but an innovation district is most successful when the bigger interests are complemented with a bottom-up, organic approach where the individual and local community participate directly (Almirall et al, 2017).

An analysis of the city of Barcelona suggests that the top-down and bottom-up perspectives are complementary, and their combination can reinforce the collaboration between different city stakeholders (Capdevila and Zarlenga, 2015). The sustainable innovation district is seen to require more of a democratic approach, where the glass borders to digital access and digital enterprise are removed. Much of the glass border appears to be financially driven, as providing open, free access to high speed/quality digital connectivity to the entire community of an innovation district is proving to be significant. The extent to which networks are free and accessible to workers, residents and visitors in key public spaces is a key measure of the quality of a place (Vey et al., 2018). Given access, the next barrier arises from the protective practices of proprietary systems and standards. A commitment to adopt open standards and the use of free software wherever possible removes many of the obstacles to open access (Mayor of London, 2018).

The rate of change in digital technology demands agility and opportunity to experiment with new ways of working with and within the digital realm. Establishing the innovation district as a living laboratory is understood to promote experimentation and enforce greater flexibility.

A culture of creativity and experimentation can be nurtured in various ways. A key part of the digital push is to position the immediate community and environment as an open testbed for potential innovations. There is apparent need for this in a direct sense of the social and business entrepreneurs that constitute the innovation district. But the need to experiment locally goes deeper and is an important potential for community (stakeholders, participants and residents) engagement in innovation. Most particularly, there is growing interest in how the digital infrastructure that is becoming so integral to human existence plays with and against the physical environment of our urban infrastructure (Hill, 2019).

Creating a living laboratory of digital infrastructure goes hand in hand with urban innovation and will lead to place making with a real and important difference. The difference is important as urban innovation is an inevitable consequence of digital innovation, and the findings of the innovation district living laboratory will necessarily transfer to and influence urban development more widely. To be effective, an urban living laboratory needs to be technologically agnostic, offer an open data portal, and directly support digital experimentation through training and thin-layer bureaucracy. Cumbersome permitting processes can slow or stop the development of a cluster (Baily and Montalbano, 2018). In Barcelona, living labs are of importance as they have been found to inspire companies to test and develop innovative products and services (Probst et al., 2017).

However, the emerging challenge for Barcelona is how to migrate a predominantly technocratic approach to data ownership to more of a data commons, grassroots management of data rights (Calzada, 2018).

In concert with establishing the innovation district as a living laboratory, improving the digital skills of the community and making more local services open to innovation directly enhances the potential for digital leadership.

Public authorities are the ideal champion for the adoption of common digital standards and design principles. Public services are a prime candidate for digital enhancement. The Barcelona City Council Digital Plan provides for open digitisation through a program of free software and agile development of public administration services (Barcelona Ciutat Digital, 2017). The lack of even basic digital skills is known to hold some citizens back from finding work, accessing public services and financial support, engaging in and with innovation, and thereby contributing to the vitality and creativity of the innovation happening within the innovation district. Strengthening digital leadership in public services and enhancing the digital skills and understanding of citizens is a key mission of the recently launched Smarter London Together initiative (Mayor of London, 2018). That is not to say that the entire community needs to be capable of digital innovation, but without universal basic digital skills and the digitisation of essential services, a potentially significant cohort of the community will be unable to participate in or enjoy the benefits of innovation opportunities. Case study evidence supports the promotion of basic digital skills and open data platforms as local shortages have been found to hinder the capacity of the precinct to innovate and scale (NSW Innovation and Productivity Council, 2018).

Every innovation district benefit from having a clear and relevant integrating character and/or purpose. Every place can be seen to have its own, unique cultural evolution, and developing that story/perspective as an integrating force for the innovation district is important to its success.

In developing an integrating character/purpose for the innovation district, attention is often given to the incumbent industries, specific technologies or established innovation precincts. Collaboration within the district calls for convergence, divergence and new mixtures. The purpose of the digital infrastructure needs to be opening new opportunities to reconceive the character of a district and promoting bigger, more inclusive perspectives (Storring and Walker, 2016). Key to this has been found to be moving from a technology or industry district characterisation to focus more on the changing nature of human needs and the potential to make a positive impact in the world. A review of certain Australian innovation districts reinforced the fact that sustainability and long-term success depends entirely on how the needs of the precinct users are met (Optus & Business Models Inc, 2017). Raising the bar, where the purpose is to address significant social challenges, helps broaden the appeal and increase the community engagement in the innovation district.

Integrating the community of stakeholders, participants and residents adds to the social dynamics that are so critical to the growth and sustainability of an innovation district. Another key driver of that integration has been found to be the emergence of a sharing economy. Community building is a critical function of the digital infrastructure of an innovation district.

Many start-ups and small businesses were created in the Barcelona area, creating a surge of co-working spaces. This collaborative spirit helped the city to form a stronger community. Peer-to-peer platforms (e.g. trip4real, EatWith, Airbnb) have created a very simple opportunity for people to become micro-entrepreneurs and generate some additional income. Creative citizens are using online collaborative platforms to actively co-design their public spaces (Mirvac & WORKTECH Academy, 2018). With distributed innovation such as this there is more integrity and resilience to the innovation district. Indeed, a recent study of smart city initiatives in the UK concludes that the reliance on dominant political structures and economic actors has come to promote incremental change only, and has effected only marginal reconfigurations of the material spaces of the city at best (Cowley et al, 2018). An analysis of the changing strategies adopted by Barcelona to grow innovation noted that no matter how advanced a city is technologically, what drives innovation is the capacity to develop a district character that is co-conceptualised and co-implemented with ordinary citizens and other stakeholders (Gascó-Hernandez, 2018).

APPENDICES

Appendix A: REFERENCES

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Appendix B: RESEARCH QUESTIONS

The following table summarises the research questions outlined in our statement of work an maps back to specific sections of this and accompanying reports.

Research Question	HillPDA Report Mapping
1.0 Describe the current nature of collaboration and innovation among stakeholders within the Precinct and outline the identified barriers and opportunities for increasing collaboration and innovation	See Stakeholder Engagement Report Section 4 and Section 3.0 "Big Ideas for Innovation & Collaboration" in this report
2.0 Conduct analysis on the growth and nature of the top ten industry clusters within the Precinct. Include a short profile explaining the nature of their current innovative activities / processes.	See Section 7.0 "Precinct & Sub Precinct Overview" and Section 8.0 "Node Level Analysis" in this report.
3.0 Provide an assessment of the inherent competitive strengths of the Precinct from an innovation perspective and identify any particularly unique attributes (e.g. possibly the mix of industries, history and evolution, cultural practices, built form etc.).	See Section 7.0 "Precinct & Sub Precinct Overview" and Section 8.0 "Node Level Analysis" in this report.
4.0 What role and important linkages does this Precinct have with other precincts and clusters in the Greater Sydney region?	See Section 7.0 "Precinct & Sub Precinct Overview" and Section 8.0 "Node Level Analysis" in this report.
5.0 Consider the role specifically of creative industries within the Precinct in terms of supporting innovation perhaps in terms of spill-overs to other industries. And further, are they a drawcard for other industries to locate there?	Refer to Stakeholder Engagement Report 4.2.3 & 4.2.6
6.0 Review the offering of the night time economy within the Precinct in terms of supporting innovation and by providing an inspiring / desirable attractive work environment	Refer to Section 7.5 "Entertainment economy" in this report
7.0 Consider the pedestrian experience of both the amenity of the public domain, and the commuter experience travelling to, and within, the Precinct (only insofar it relates to impacts on innovation)	See Section 7.0 "Precinct & Sub Precinct Overview" and Section 8.0 "Node Level Analysis" in this report.
8.0 Attempt to quantify the 'productivity premiums' of businesses locating within the Precinct (i.e. attempt to quantify the degree to which businesses grow faster as a result of being located inside the Precinct as compared to somewhere else)	See Section 5.2 "Density and productivity" in this report
9.0 Provide a forecast of how these clusters may change over the next 10 years? Include things such as space, location needs, workforce requirements etc. Identify any big emerging trends that we need to be cognisant of which might shape this area beyond this time frame	See Section 7.0 "Precinct & Sub Precinct Overview" and Section 8.0 "Node Level Analysis" in this report.
10.0 Explain the types of jobs and industry sectors that may be likely to decline and move out of the Precinct over the next 10 years (if present trends continue)	See Section 7.6 "Precinct employment forecasts" in this report
11.0 Outline some 'big project ideas' for consideration in SS2050 (possibly adopted from GSC's Place Strategy, Tech Central Taskforce advisory panel, consultation with stakeholder and / or international case studies)	See Section 3.0 "Big Ideas for Innovation & Collaboration" in this report

12.0 Provide a summary table of low, medium and high employment growth scenarios for industry clusters, and what high-level actions required by the CoS (in partnership with stakeholders) are required for each scenario to be realised.	See Section 7.6 "Precinct employment forecasts" in this report
13.0 Refer to at least two relevant international case studies of innovation clusters with support strategies from other global cities.	Please refer to Preliminary Baseline Report Section 3 Case Study Exploration. Also see Section 2.1 and Section 2.11 of this report.
14.0 Provide some general principles for supporting smaller area, precinct-based innovation that potentially might be applied to other emerging precincts in Sydney. And suggest some general indicators of success.	See Section 5.4 "Key innovation principles" in this report

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SYDNEY

Level 3, 234 George Street

Sydney NSW 2000

GPO Box 2748 Sydney NSW 2001

t: +61 2 9252 8777

f: +61 2 9252 6077

e: sydney@hillpda.com

MELBOURNE

Suite 114, 838 Collins Street

Docklands VIC 3008

t: +61 3 9629 1842

f: +61 3 9629 6315

e: melbourne@hillpda.com

WWW.HILLPDA.COM