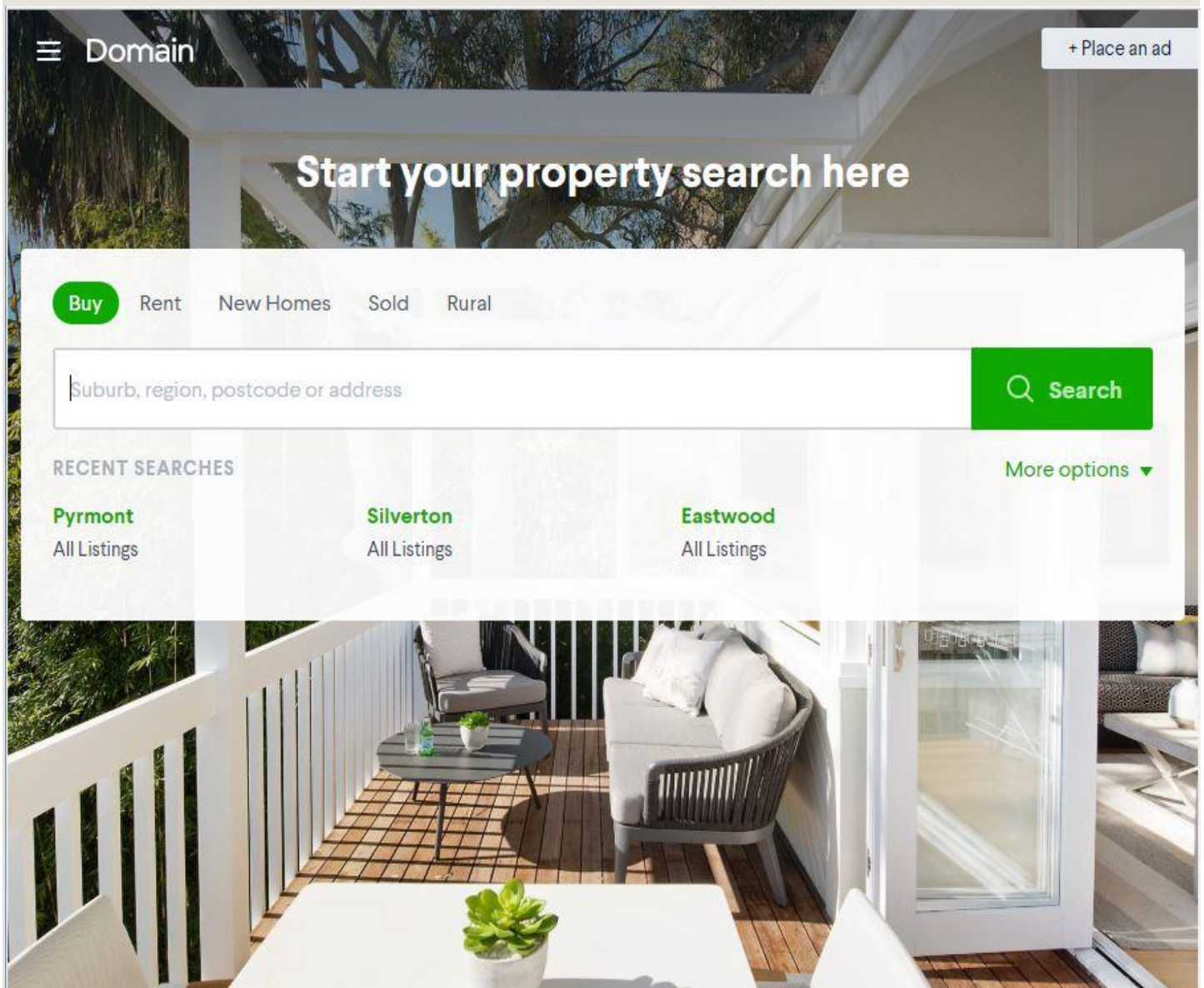




# ITEC897 Industry Based Internship Final Report

## DATA ANALYST AT DOMAIN GROUP

The Danh Phan – 44116543 – Master of IT in Management



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I am also very grateful to Edson Carvalho, Rogerio Roldan, Min Li, Bayan Hammami, Thierry Wendling, and especially my Macquarie University's alumni colleagues: Suyash Masurkar and Abhilash Nair, for their highly beneficial suggestions and consultations while performing my tasks. Many ideas are developed through exciting discussions with them. I feel fortunate to work with and learn from all members of the Data department.

Although most parts in this report use public references, several graphs about the outcomes of the internship tasks are gathered from the firm's private sources. With the acceptance from the Chief Data Officer, this report will only show the necessary information, and deliberately remove or modify any sensitive information about the business. This ensures the protection of the firm's intellectual properties, while allows markers to have enough data to assess this final internship report.

## **Executive summary**

Domain Group is one of the leaders in Australia's real estate advertising business. The company provides a comprehensive ecosystem for real estate agents, home renters, buyers, and investors. Building its competitive advantages from the best digital platforms on different channels like web, tablet, and smartphone, the firm continuously enhances their products and services through big data analytics and machine learning. This allows Domain to make agile and data-driven decisions which are indispensable in the fiercely competitive digital property advertising market.

This report consists of two parts. The first part, from section 1 to section 4, underscores the role of data science in the digital transformation of Domain Group. First, section 1 and section 2 will introduce the firm and a highly competitive industrial market in which it is operating. The organisational restructure and digital transformation process are then described in section 3, which explains challenges and opportunities the company faces and indicates the approaches used to transform its operations to gain competitive advantages. Section 4 will emphasise the integral role that data department play in the transformation of Domain Group.

The second part presents the data analyst internship experience of the reporter in the data department. The internship details are described in section 5 with relevant information such as role description, required skills and knowledge, and the tasks that the reporter is assigned to the team. Section 6 then demonstrates the internship experience and several main parts of its results, following by section 7, which expresses the evaluation of internship expectations, its outcomes, and future career selections. Finally, the conclusion of the report will be derived in section 8.

## 1. Introduction

### 1.1. About Domain group

Domain group, founded in 1999 by Fairfax Media, provides leading digital platforms for the real-estate industry.<sup>1,2</sup> Domain's ecosystem allows real-estate agents to upload, manage, and marketing their properties through best-known portals like Domain, All Homes and Commercial Real Estate.<sup>1</sup> These platforms also offer informative information on Australian properties for buyers, investors, and renters both in Australia and internationally.

Domain has around 850 employees, including above 400 people working at the organisation's head office, which is located at 55 Pyrmont Street, Sydney.<sup>3</sup> The company has branches across Australia, and substantial market shares in states such as New South Wale, Vitoria, ACT, and Queensland.

One of the most popular products of the company is domain.com.au which has 90% market penetration.<sup>2</sup> It is the second largest property advertising platform in Australia, competing for the neck to neck with REA Group's portal named realestate.com.au.<sup>2</sup>

Domain Group was listed on the Australian Stock Exchange on November 2017 with a market value of \$2.2 billion.<sup>4</sup> Figure.1 indicates its business performance in recent years after going public.



Figure.1 Domain's share price<sup>5</sup>

In the financial year 2018, the group's revenue is around \$357 million, with an increase of 11.5% comparing to last year.<sup>6</sup> The firm's net profit has risen nearly 8% to above 52 million this year.<sup>6</sup> The digital revenue growth goes up 20% in 2018 financial year, higher than 19% increase of the 2016-2017 period.<sup>6,12,13</sup> The growth of digital revenue is anticipated at around 20% in the coming years.<sup>13</sup>

## 1.2. The business strategy

Starting with Domain portal which focuses only on providing residential real estate services, Fairfax has acquired different companies in recent years to grow its market shares.<sup>7,8</sup> These acquisitions act as strategic shifts to extend its business into the commercial property market and to provide broader services to agents and clients.<sup>8</sup>

The separation of Domain from Fairfax and becoming a public company in November 2017 demonstrate its strategy to focus on digital property business.<sup>4,9</sup> This strategic movement allows Domain management to have more autonomy in making agile decisions, which are needed to compete with other contenders in the harsh competitive environment of the real-estate advertising market.

The recruitment of Jason Pellegrino, ex-CEO of Google Australia and New Zealand, in July 2018 re-ensures Domain's commitment to becoming the best digital property ecosystem in Australia.<sup>10</sup> Jason's previous experience with the technological search firm can help Domain to gain more competitive advantages in comparison with its competitors.<sup>11</sup>

According to its presentation of 2018 full year results to investors, the mission of Domain Group is "to inform, inspire and connect people throughout the property lifecycle".<sup>6</sup> Its strategies include:

- Expanding the number of agents and listings
- Offering mobile-centric platform as the core of property ecosystem
- Growing active users and quality enquiries
- Delivering high valued products and services for agents
- Growing new transactional revenues

The following graph shows the organisational achievements in 2018 regarding its five strategies.

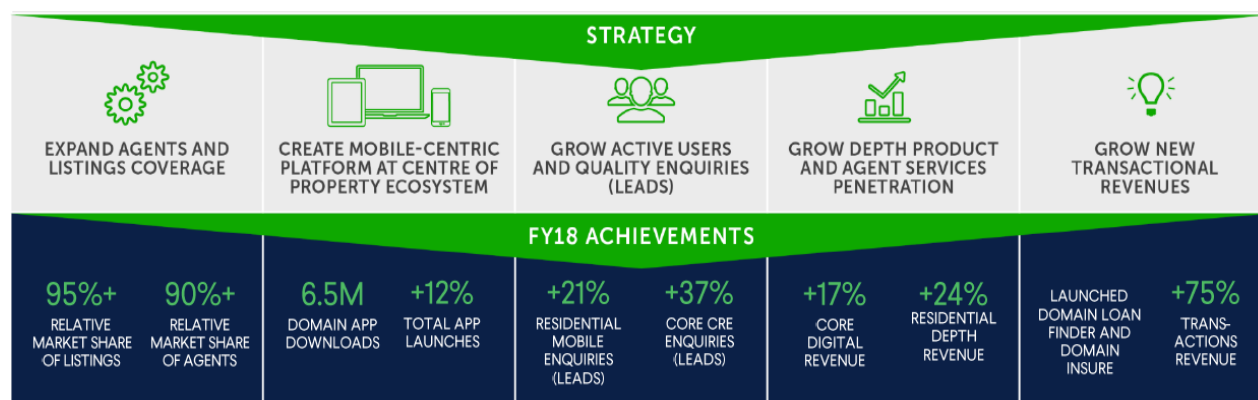


Figure.2 Domain's 2018 full year performance on delivering strategy<sup>6</sup>

### 1.3. Domain's ecosystem

Figure.3 illustrates the ecosystem of Domain Group.

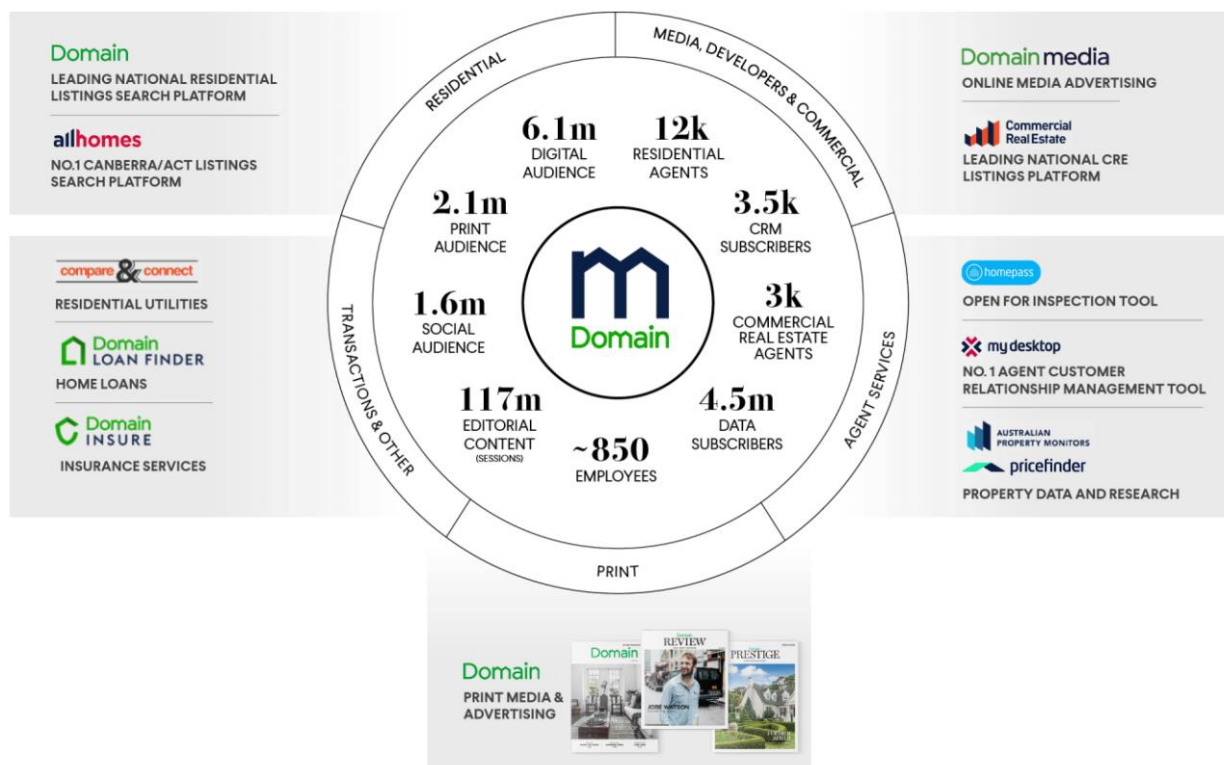


Figure.3 Domain's ecosystem<sup>6</sup>

Domain's business could be grouped into five different categories, including residential, commercial, print, transactions and agent services.<sup>6</sup> In particular, residential products (domain.com.au, allhomes.com.au) contribute to the most significant percentage of total revenue at 48%. The second largest revenue is 21% from print business, followed by commercial with the Commercial Real Estate portal, which accounts for above 15% of revenue. Revenues from transactional products (comprising of residential utilities, home loans, and insurance services) and agent services (including Home Pass, My Desktop, and Price Finder) have recently grown to 8% and 7% respectively.<sup>6</sup> While the print revenue has declined due to printing and distribution channel costs, all other groups of digital products have experienced significant growth.<sup>6</sup> This trend explains the organisational ongoing structural move to digital transformation.

Currently, Domain Group provides products and services to more than 12 thousand residential agents and over 3 thousand commercial real estate agents.<sup>6</sup> The firm has around 6 million digital users and 2 million print audiences.<sup>6</sup> These audiences are the critical assets of Domain ecosystem, which establishes strong connections with both residential and commercial agencies.<sup>6</sup>



The following table gives more details on primary products and services provided by Domain<sup>14</sup>:

Product/Service	Description
 <p>Domain</p>	<p>Domain.com.au allows home buyers and renters to find their best suitable residential properties. It allows real estate agencies to upload and manage its property advertisements. Domain has a strong market in NSW, Victoria, and Queensland.<sup>15</sup></p>
 <p>Allhomes</p>	<p>Allhomes.com.au delivers similar services as Domain.com.au for home buyers and agents. Its market is Canberra, ACT.<sup>16</sup></p>
 <p>Commercial Real Estate</p>	<p>Commercialrealestate.com.au provides commercial real estate advertising services for agents. Companies can find their best offices or shops for their businesses.<sup>17</sup></p>
 <p>MyDesktop</p>	<p>My Desktop is a software as a service which allows real estate agencies to upload and manage their advertisements or listings in different digital property platforms, including domain.com.au and realestate.com.au.<sup>18</sup></p>
 <p>Pricefinder</p>	<p>Price Finder is a data service that supports real estate agents to research the real estate market. It provides insights into the price of houses in different locations and market segments.<sup>19</sup></p>
 <p>Star Weekly</p>	<p>Star Weekly is a real estate magazine and online news which helps Domain Group to reach potential customers through the print and online media.<sup>20</sup></p>

Table.1 Domain Group Portfolio

## 2. Australia's real estate advertising market

### 2.1. Property advertisement providers

The digital real estate advertising market in Australia is highly competitive. [21] demonstrates top five Australian real estate portals, which compose of realestate.com.au, domain.com.au, homesales.com.au, property.com.au, and raywhite.com. Among these portals, Real-estate and Domain account for most of the property advertising market.<sup>21</sup> Figure.4 shares the number of visitors to property portals in Australia from April 2015 to March 2016. It indicates that Real-estate is top one property advertising provider in term of user volumes, following by Domain.

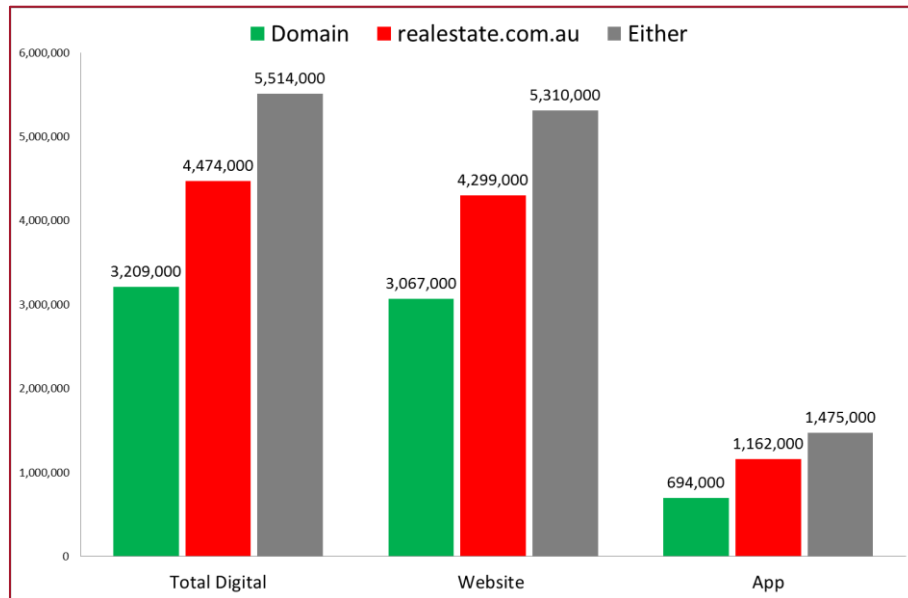


Figure.4 Numbers of visitors from April 2015 to March 2016<sup>21</sup>

However, Figure.5 indicates that in recent years, Domain has continued to close the gap with its main contender regarding the number of listings.<sup>22</sup> This means Domain has caught up its most formidable contender regarding the number of agents who use real estate advertising services.

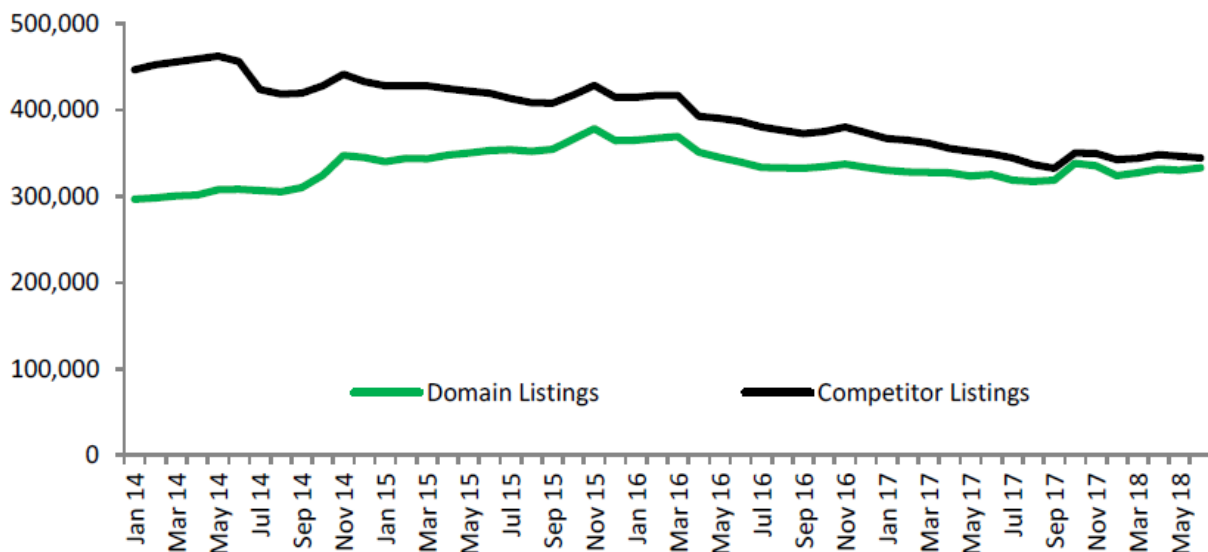


Figure.5 The number of listings from Domain and its competitor<sup>22</sup>

## 2.2. Recent market trend

Regarding economic trends, the real estate market in Australia in 2018 has been slow down with its first annual decline of 0.4% in the last six years.<sup>23</sup> As this cooling period seems unlikely to go up in the coming months<sup>24</sup>, the real estate advertising businesses tend to experience a difficult time in the 2018-2019 financial year.

According to the Guardian, in October 2018, the Australian house prices have decreased by 2.7% in the last year.<sup>25</sup> This slump of the national market is mainly dragged down by the falling prices in Sydney and Melbourne.<sup>25</sup> Sydney is encountering the most significant annual drop since 1990 at 8.2%, while property prices in Melbourne have fallen dramatically at 4.7%.<sup>26</sup> Figure.6 shows the annual capital city home prices in the two cities from 1997 to 2018. It indicates that the current price fall is as severe as the drop in the global financial crisis in 2008.

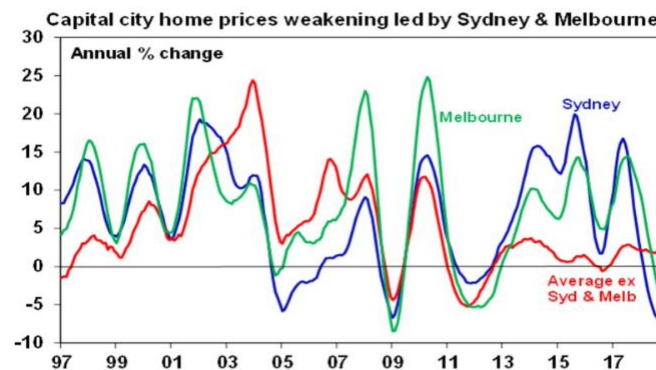


Figure.6 Annual capital city home prices<sup>26</sup>

## 2.3 Industry analysis

Figure.7 analyses the digital property industry in which Domain Group is operating using Porter's Five Forces Framework.<sup>27</sup>

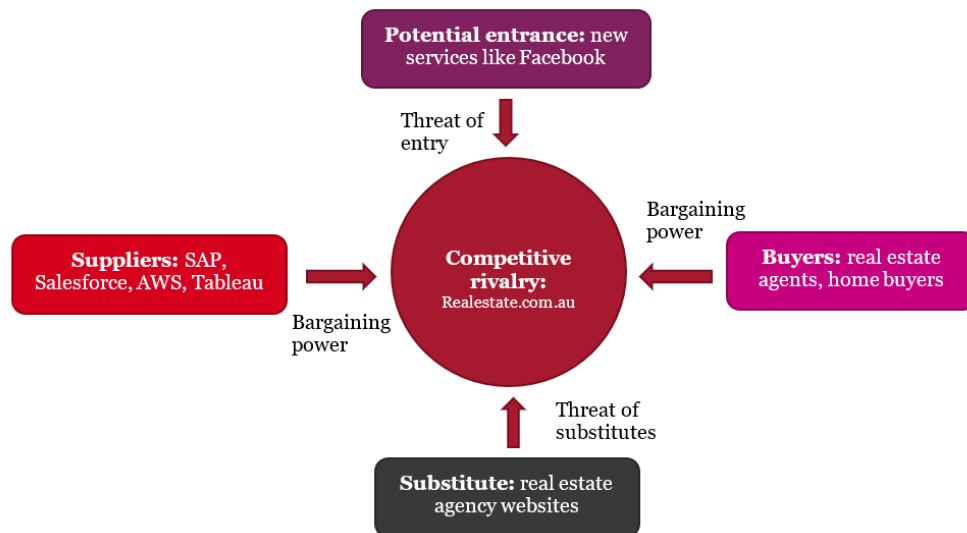


Figure.7 The five forces framework for Domain group

Domain customers are real estate agents and home buyers, and its suppliers include vendors like SAP, Salesforce, Amazon Web Service, Snowflake and Tableau. Its biggest competitor is Realestate.com.au, which has significant market shares in the digital property advertising business. There also the threat of other advertising services like Facebook and Google trying to go into the Australian digital real estate market. Moreover, homebuyers can go to agency websites to easily find their dream properties.

### 3. The organization's digital transformation process

As Australia's housing market is experiencing a prolonged slump, real estate agencies will face great difficulty in selling and leasing properties. This will lead to a considerable decrease in their revenues, resulting in a substantial reduction in expenditures, including its advertisement budgets. This situation puts enormous pressure on property advertising providers like Domain. To maintain its operations, the firm must seek practical solutions to reduce costs and become more agile and efficient

#### 3.1. The organisational restructure

Domain current organisational structure is divided into different departments according to its products, sale operations, and functionalities. Under CEO is the management team including Chief Financial Officer, Chief Product, and Customer Experience Officer, Chief Editorial & Marketing Officer, Chief Operating Officer, Chief Technology Officer, Employee Experience Director, Chief Sales Officer, General Counsel, Group Director, and Chief Data Officer.<sup>28</sup> Each chief officer takes responsibility for their departments. Figure.8 shows the company's main organisational structure.

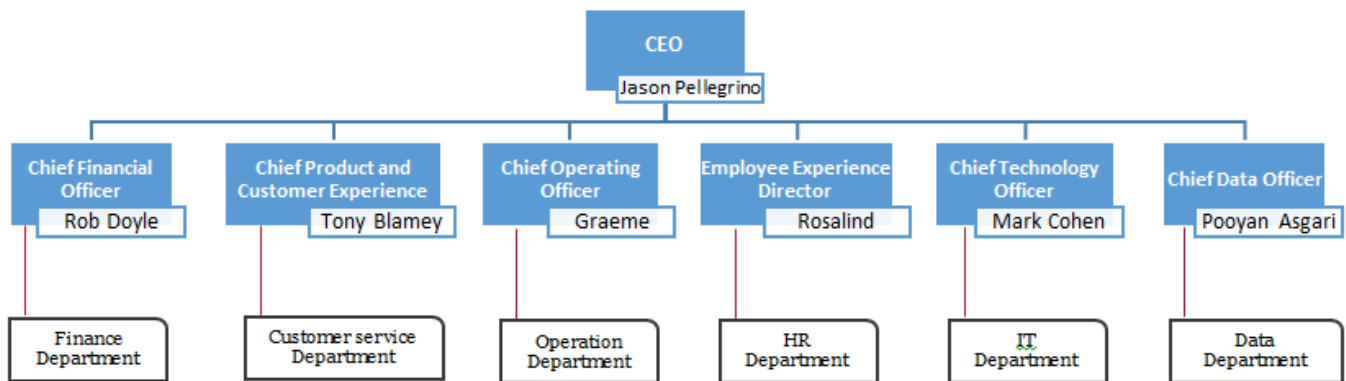


Figure.8 Domain's organisational structure

With the recent resignation of ex-CEO Antony Catalano in January and the revelation of a “boy's club culture” at Domain, Nick Falloon, the firm's executive chairman, has planned for an entirely restructure with full workplace review.<sup>29</sup>

In addition to the recruitment of a new CEO from Google Australia, the firm's sales operations have been changed significantly recently to adopt a fully digital advertising strategy.<sup>30</sup> The chairman contends that this will transform Domain to “the forefront of an evolving digital advertising landscape”.<sup>30</sup> The transformation is implemented by leveraging technology innovation, high-quality data and customer insights to meet customer demands.<sup>30</sup> Furthermore, the company also need to build a cultural spirit that embraces its transformation.

#### 3.2. The organisational culture

All the firm's employees including management at all levels must follow Domain Code of Conduct, which establishes ethical standards requiring people to act with integrity and in an honest manner.<sup>13</sup>

Domain commits to creating a workplace that allows its workers to thrive, personally and professionally.<sup>13</sup> It values all employees' contributions from their unique capabilities, skills, knowledge, and characteristics.<sup>13</sup> The company delivers holistic methodologies to employee health and well-being, including both physical and mental health.<sup>13</sup>

The company promotes diversity in its working environment. This includes encouraging differences in cultural background, ethnicity, and religious belief. Domain’s policies support sexual orientation and gender equality in all aspects such as recruitment, retention, and promotions.<sup>13</sup> Table.2 illustrates workforce gender demographics of Domain Group in March 2018.<sup>13</sup>

Gender/Position	Women	Men
The board of directors	33%	67%
Senior management	35%	65%
In the organization	50%	50%

Table.2 The firm’s workforce gender demographics

The people at Domain firmly believe that it is vital to “promote a sense of inclusiveness, respect and belonging”.<sup>31</sup> The commitment of diversity support creates an open culture and an inclusive working environment for every employee, resulting in the better performance of the business.<sup>31</sup> There are many workshops and events like Diversity Workshop, International Cuisine Day which are operated at Domain to celebrate cultural diversity.

## 4. Data Department

### 4.1. Data department responsibility

The Data department is responsible for Business Intelligence, Data Analytics, and Machine Learning fields.<sup>28</sup> The team plays a crucial role in providing analytics and insights for the organisation to make data-driven decisions.<sup>28</sup> The department has people from fourteen different countries on all six continents in the world. It is the most diversified and collaborative team I have ever worked with. Every member is friendly and cooperative, and I have especially received great help from Macquarie University's alumni who also work in the department.

The department structure is indicated in Figure.9.

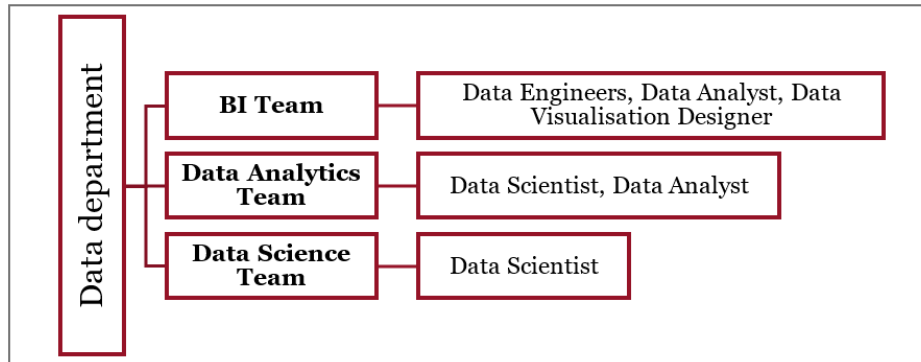


Figure.9 The Data department's functions

The department is grouped into smaller teams including Business Intelligence, Data Analytics, and Data Science teams. The largest team, Business Intelligence, looks after the data warehouse and ETL (Extract – Transform – Load) processes. This ensures that good quality data flow smoothly from several dozen sources into data warehouse every day. Business Intelligence also provides analytical reports in Tableau for product managers, sale managers, and marketers.

The second team, Data Analytic, focuses on answering more profound questions which cannot be derived directly from a data warehouse through Tableau. The team usually develop machine learning models to gain useful insights and answer complicated questions for the business. These model applications consist of, for example, customer churn prediction, customer segmentation, and price prediction.

Besides, the Data Science team pays more attention to advanced techniques like Natural Language Processing and Deep Learning, which can help the company to improve data quality and detect fault information. For instance, there is a system which detects flawed housing advertisements and sends additional bills to real estate agents who upload it.

Since the digital transformation of Domain relies on high-quality data and customer insights, Data department plays a vital role in the company restructure process. The Data department manages and monitors all data of the firm. They integrate and consolidate data from many isolated applications and system, and store data in a central data warehouse. The information in data warehouse allows the firm executives to have a holistic picture of all its operations.

## 4.2. Data management architecture

The data team manages and monitors all data of the firm. Data is stored in a central Data Warehouse by collecting data from a wide range of products and systems. Using ETL processes, operational data like sales, advertising performance, user interactions with different digital platforms are updated daily into the central data warehouse.

Figure.10 illustrates how the Data team apply the Data Warehouse model into the workplace.<sup>32</sup> Data from different operational data sources are loaded into a data warehouse, which then could be used to create different data marts. These data marts allow the data team members to perform different tasks such as analysing, creating reports and performing data mining processes.

The team leverage cutting-edge Data Management Solutions for Analytics such as Amazon Web Services, Redshift, and Snowflake. Leading tools for Analytics and Business Intelligence like Tableau and Mode Analytics are integrated to leverage the data in the data warehouse. Moreover, Natural Language Processing (NLP) and Machine Learning models and Data mining tools are implemented to deliver useful solutions to the business.

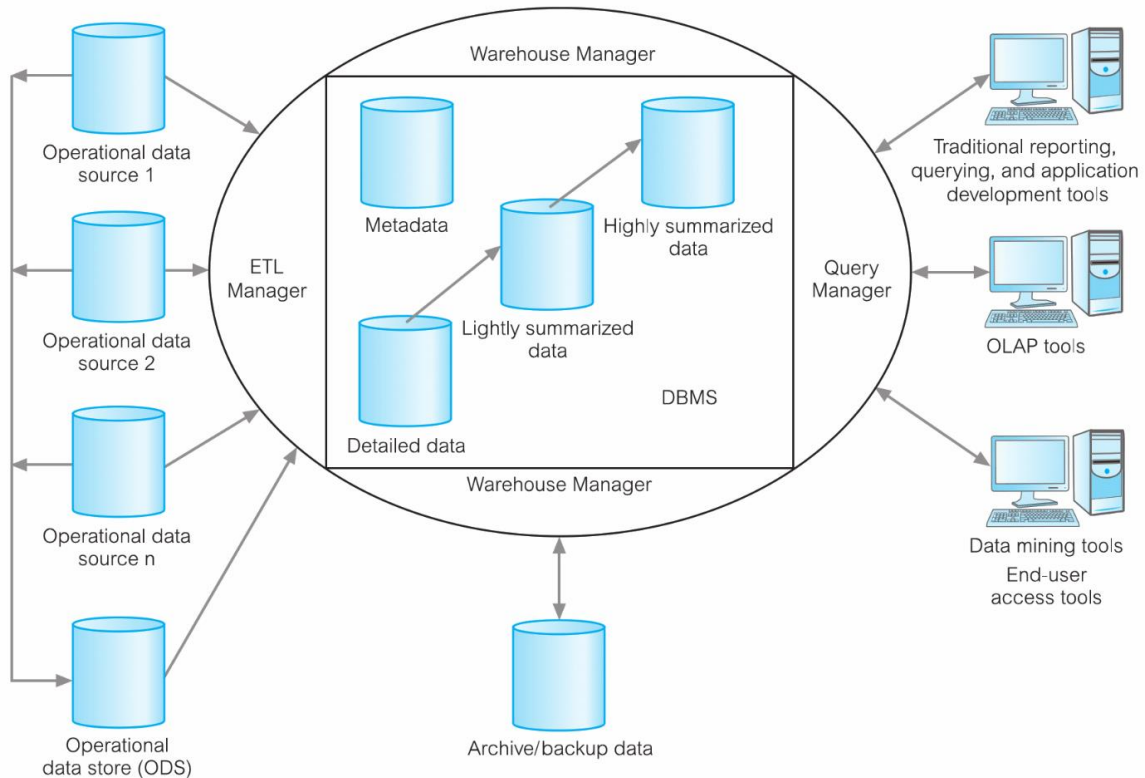


Figure.10 Typical architecture of a data warehouse<sup>32</sup>



## 5. Data analyst intern

### 5.1. Role description

Data Analyst is responsible for:

- Using data to create visualisations by analysing requirements from sales, marketing teams<sup>33, 34</sup>
- Capturing and establishing KPI metrics for different products and services<sup>33</sup>
- Analysing large, complex datasets and delivering actionable knowledge<sup>33, 34</sup>

### 5.2. Required skills and knowledge

Data Analyst is required to have the following skills and knowledge:

- Experience in performing data analysis using SQL and Python or R<sup>33, 34</sup>
- Experience with ETL tools such as Matillion, SSIS, Talend<sup>34</sup>
- Fluency working with data visualisation tools like Tableau, QlikView, Power BI<sup>34</sup>
- Knowledge of Google Analytics and AWS products<sup>33</sup>

These skills and knowledge are compatible with current leading technologies in Business Intelligence (BI), Data Management and Analytics.<sup>35, 36</sup> Figure.11 shows that Tableau, Microsoft and Qlik are the leaders in Gartner Magic Quadrant for Analytics and BI.<sup>35</sup> Besides, top vendors with Data Management Solutions for Analytics are Microsoft, Teradata, Oracle, Cloudera, SAP, AWS, IBM, and Snowflake, which are reviewed in Figure.12.<sup>36</sup>

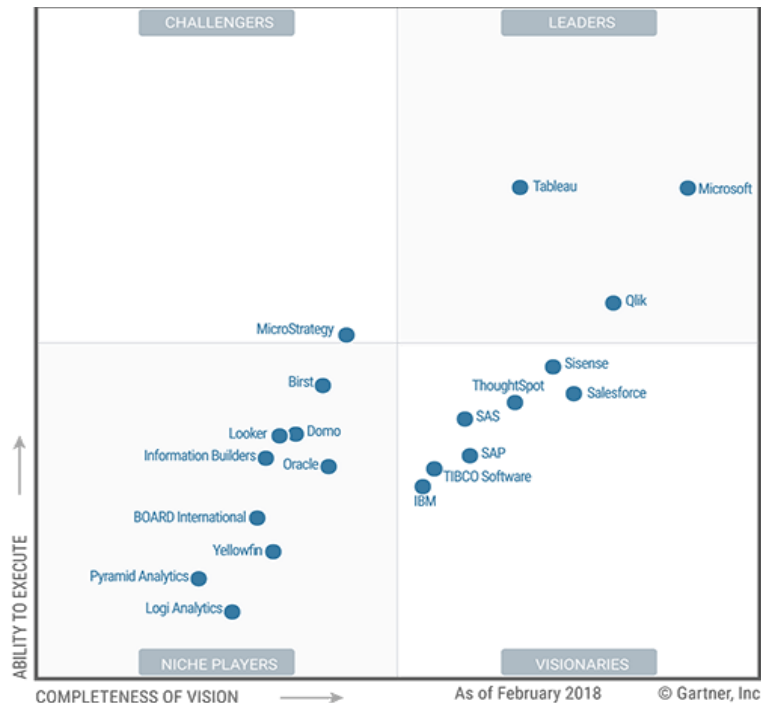


Figure.11 Gartner Magic Quadrant for Analytics and BI<sup>35</sup>



Vendors and Products	Reviews ▾	Overall Rating
		1 — 2 — 3 — 4 — 5
Microsoft	277	<div><div></div><div></div><div></div><div></div><div></div></div> 4.4
Teradata	239	<div><div></div><div></div><div></div><div></div><div></div></div> 4.3
Splunk	213	<div><div></div><div></div><div></div><div></div><div></div></div> 4.5
Oracle	199	<div><div></div><div></div><div></div><div></div><div></div></div> 4.1
Cloudera	125	<div><div></div><div></div><div></div><div></div><div></div></div> 4.3
SAP	112	<div><div></div><div></div><div></div><div></div><div></div></div> 3.9
Amazon Web Services (AWS)	96	<div><div></div><div></div><div></div><div></div><div></div></div> 4.4
Hortonworks	64	<div><div></div><div></div><div></div><div></div><div></div></div> 4.1
IBM	56	<div><div></div><div></div><div></div><div></div><div></div></div> 4.2
Snowflake Computing	45	<div><div></div><div></div><div></div><div></div><div></div></div> 4.7
Pivotal	43	<div><div></div><div></div><div></div><div></div><div></div></div> 4.3

Figure.12 Data Management Solutions for Analytics<sup>36</sup>

### 5.3. The work assignment

Table.3 shows the basic information about the internship placement details at Domain Group.

The internship role	Data Analyst
<b>Company name:</b>	Domain Group
<b>Business unit:</b>	Data department
<b>Location:</b>	55 Pymont Street, Pymont
<b>Placement dates:</b>	6 August 2018 to 2 November 2018
<b>Working times:</b>	9am-5pm, five days per week
<b>Contact position:</b>	Chief Data Officer
<b>Contact details:</b>	pooyan.asgari@domain.com.au
<b>Supervisor:</b>	Edson Carvalho
<b>Supervisor position:</b>	Business Intelligence Team Lead
<b>Supervisor contact details:</b>	edson.carvalho@domain.com.au

Table.3 the internship placement details<sup>37</sup>

#### **5.4. My tasks in the Data department**

From the beginning, each intern, like other staff, is provided with a laptop (you can choose either Mac or Window) and a desk which allows the computer to connect to a big screen and keyboard. This makes it easy for people to work at the office, and staff can also bring the laptop to their home in case they want to work from home.

All staff, including CEO, work in an open space area which promotes active communication and discussion. The colleagues in the Data team are very supportive and help me to set up the working environment on my laptop. I can get strong support from all team members and leaders to learn about the business context, the datasets, and related technologies.

My tasks involve:

- Understanding business requirements
- Analysing large and complex datasets using SQL
- Creating visualisations and reports in Tableau
- Applying data mining to deliver actionable insights using Python, SQL

For the first several weeks, I spend most of the time trying to understand the business context, the industry knowledge, and all the data. I then participate in analysing business requirements and creating Tableau reports in the BI team for the first part of the internship. In the later part of the internship, I also have opportunities to join in several data science projects in Data Analytic and Data Science teams.

## 6. The internship experience

### 6.1. Why this internship

Before starting the master's degree of Information Technology in Macquarie University, I had spent several years working in IT industry. My main roles during that time are web programming and database management. I have enjoyed working with data and solved data-related challenges. Working experience teach me the importance of data in the decision-making process of company leaders.

Recognising the important of data science and wanting to further my career in this field, I have selected subjects such as Data Science and Machine Learning (ITEC873), Data Mining (STAT828), Information Systems Design and Management (ITEC871, about ERP and Business Intelligence), and other subjects related to System Integration, Data Integration and Management.<sup>38</sup> These units provide essential knowledge and background in Data Science.

The reasons of taking a Data Analysts Internship not only stem from the aspiration of applying what I learn about Data analytics from University to address real-world problems but it also from my need to validate what I have learned, what I do not know and what I should continue to learn in the future. Moreover, I want to have work experience in an Australian IT company, which could be highly beneficial for the future career.

Through the internship, I intend to hone practical skills in data analytics and shape my analytical and critical thinking. In addition, I plan to improve communication skills and the ability to work in a multicultural environment. Furthermore, I also want to expand technical knowledge in Data science field.

### 6.2. What I have completed

Working as a Data Analyst during the internship, I have built 12 reports and developed two applications: CRE customer clustering and Domain Messenger Bot. These outcomes will be described in the following text.

#### ❖ *Tableau reports*

Tableau reports are created following these steps:

- Understanding business requirements from stakeholders
- Analysing the requirements
- Checking if these data are available in already built data marts or cubes
- If not, creating SQL query to get necessary data
- Building visualisations in Tableau
- Collaborating, getting feedback and improving reports
- Publishing and maintaining reports on Tableau server<sup>39</sup>

The below graphs show several interesting reports of listings and agencies that I have done during the internship. It includes property advertising reports (Listings and its measurements, Listing price exploration, Listings and booking details) and agency reports (Agency Sale Contract, Agency Contract History).

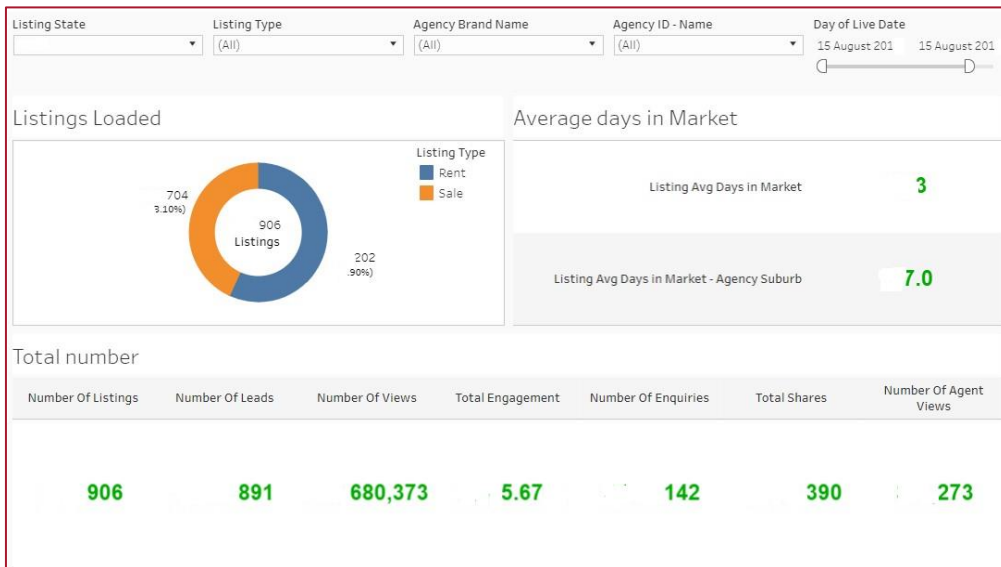


Figure.13 Listings and its measurements<sup>40</sup>

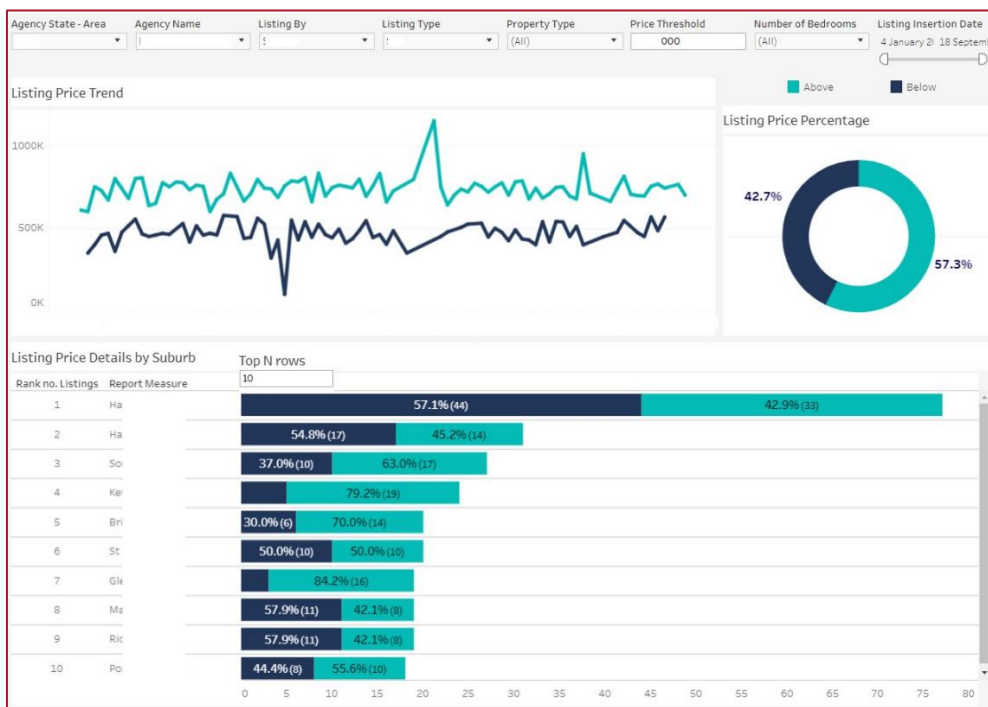


Figure.14 Listing price exploration<sup>41</sup>



Figure.15 Listings and booking details<sup>42</sup>



Figure.16 Agency Sale Contract<sup>43</sup>

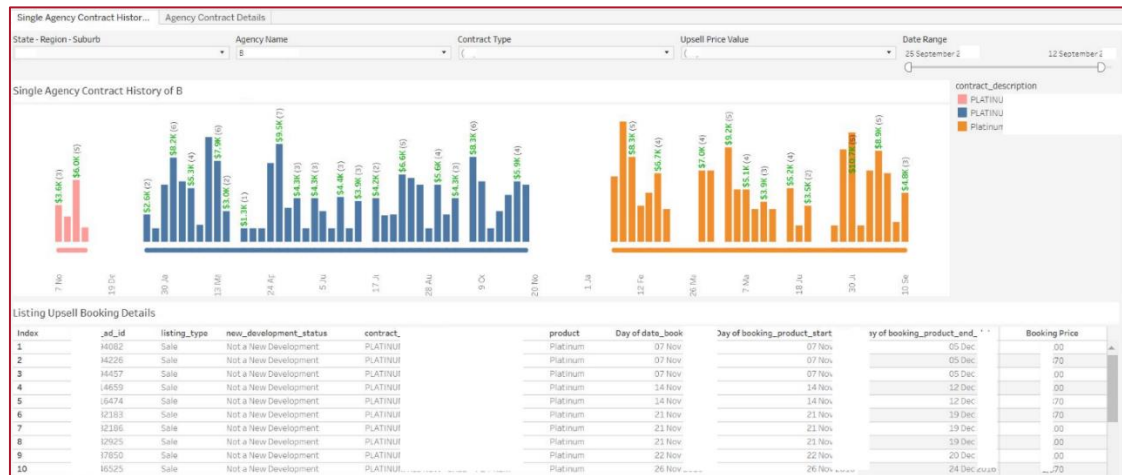


Figure.17 Single Agency Sale Contract<sup>44</sup>

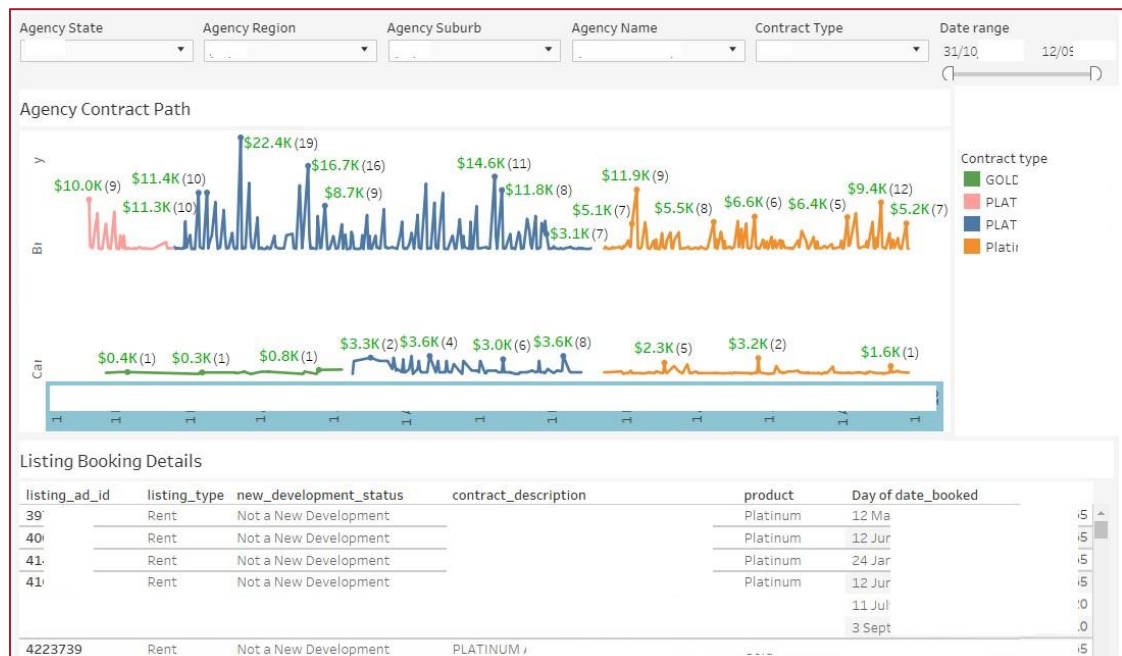


Figure.18 Multiple Agency Contract History<sup>45</sup>

### ❖ CRE customer clustering

The goal of this application is to identify the critical groups of CRE users. It will categorise users into different segmentations and try to map these groups with existing CRE Personas.<sup>46</sup>

The dataset, which is Google Analytics data of CRE website (commercialrealestate.com.au) in the last 12 months, has more than 600 million rows and 174 columns.

In this application, I have applied SQL and Pandas for data preparation, Matplotlib for data exploration, and ScikitLearn for building models.

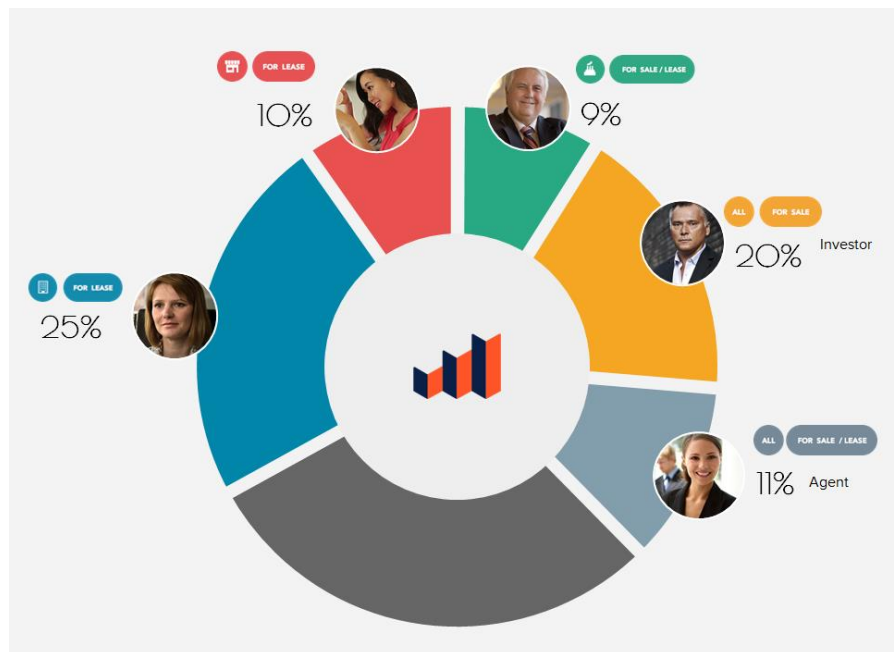


Figure.19 Different CRE personas<sup>46</sup>

Figure.20 indicates the optimal number of clusters using Mini Batch KMeans. It shows that six, seven, or eight clusters could be useful for segmented CRE customers.

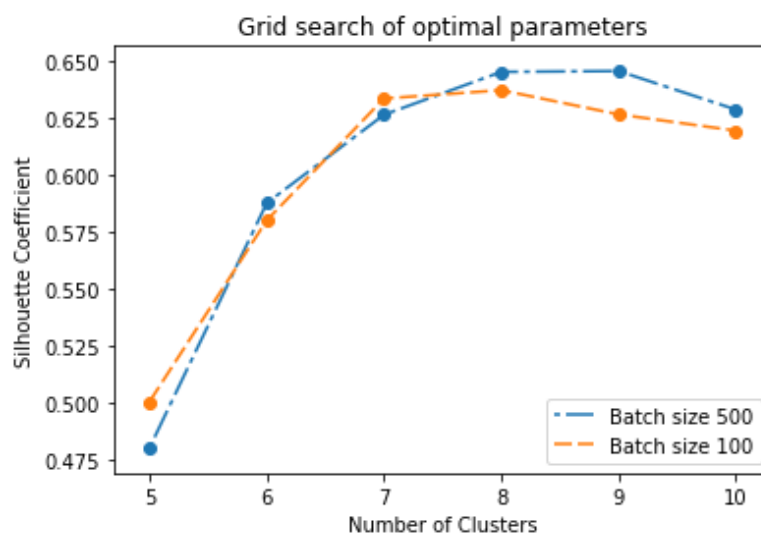


Figure.20 The Grid search of optimal parameters

The results of clustering and its centroids are presented with a radar chart in Figure.21 and a line chart in Figure.22. Each cluster is then labelled with different personas like local businessmen, agents, local investors, or international investors

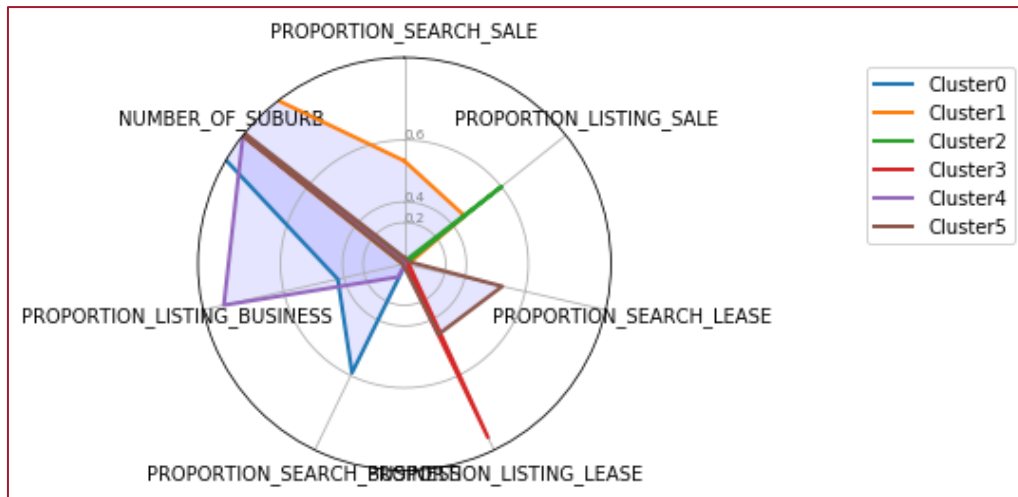


Figure.21 Radar chart of CRE six cluster centroids

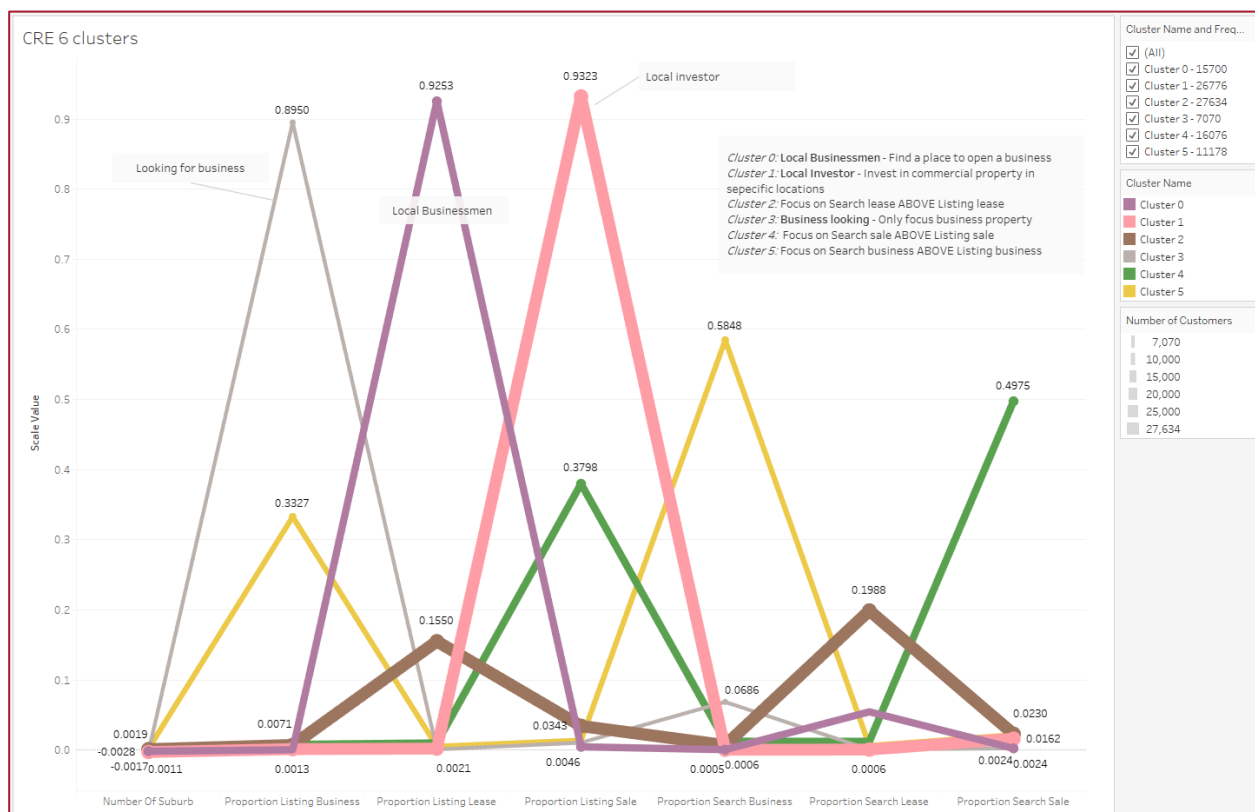


Figure.22 Line chart of CRE six cluster centroids



## ❖ Domain Messenger Bot

I have created Domain Messenger Bot, A Telegram bot in Python, which allows Telegram users search for interesting listings in specific locations. The bot also automatically pushes the top listings into the Domain channel on Telegram daily.<sup>47</sup> Customers can join Domain Scenery Views channel on telegram: <http://t.me/domainviews>

It is noted that these listings are derived from an application which applies NLP to get most interesting properties with special characteristics such as City view, Lake view, Sea view, or Park view.<sup>47</sup> The Domain Messenger Bot is demonstrated in Domain Innovation Day and Data Expo day at Domain on September 2018. Figure.27 in the Appendix shows the poster of the bot.

Using the **/help** command, users can get the list of six supported commands, which are explained in Figure.23.

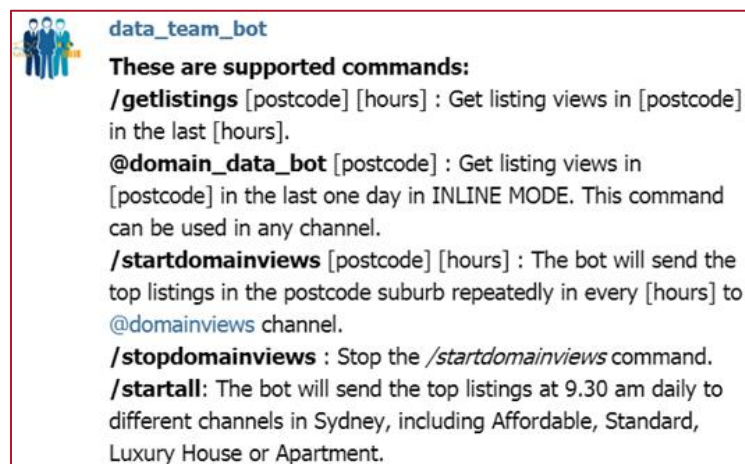


Figure.23 Domain Messenger Bot's commands

Figure.24 shows how to search a list of properties in a postcode.

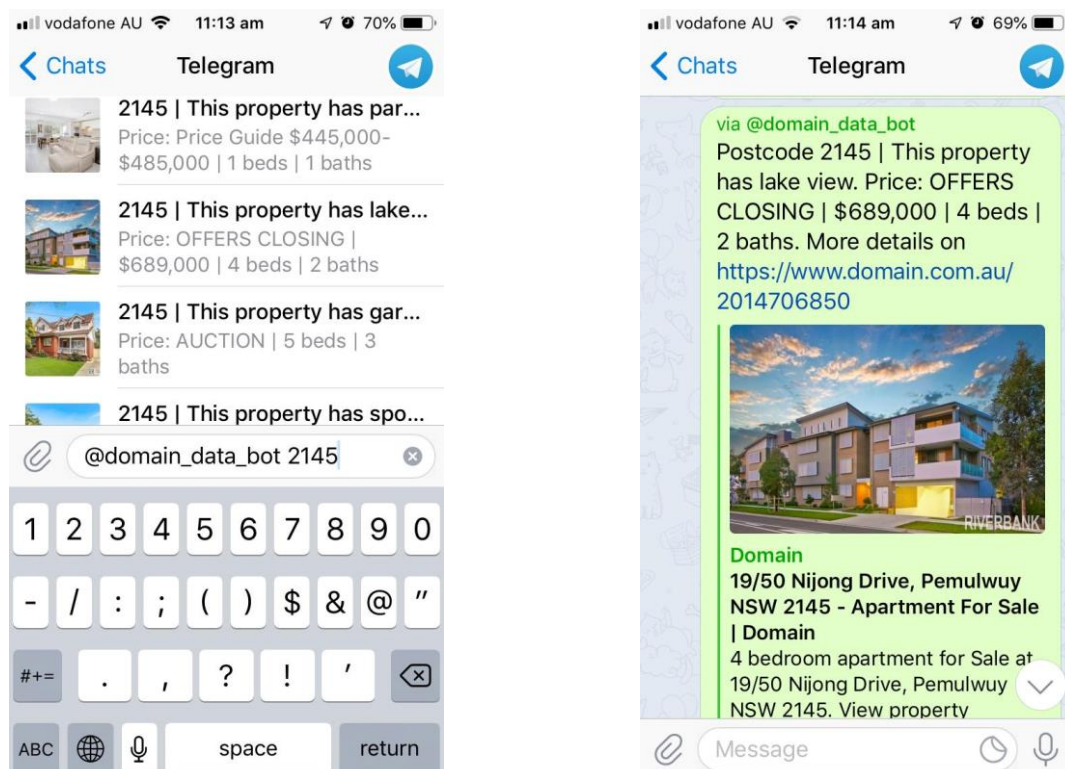


Figure.24 Get listing views with @domain\_data\_bot



Figure.25 demonstrates the way to set parameters for a job which will update daily top houses with great scenery views in Domain Scenery Views Channel. It will help to grow the number of visitors to the Domain portal from the Telegram app.

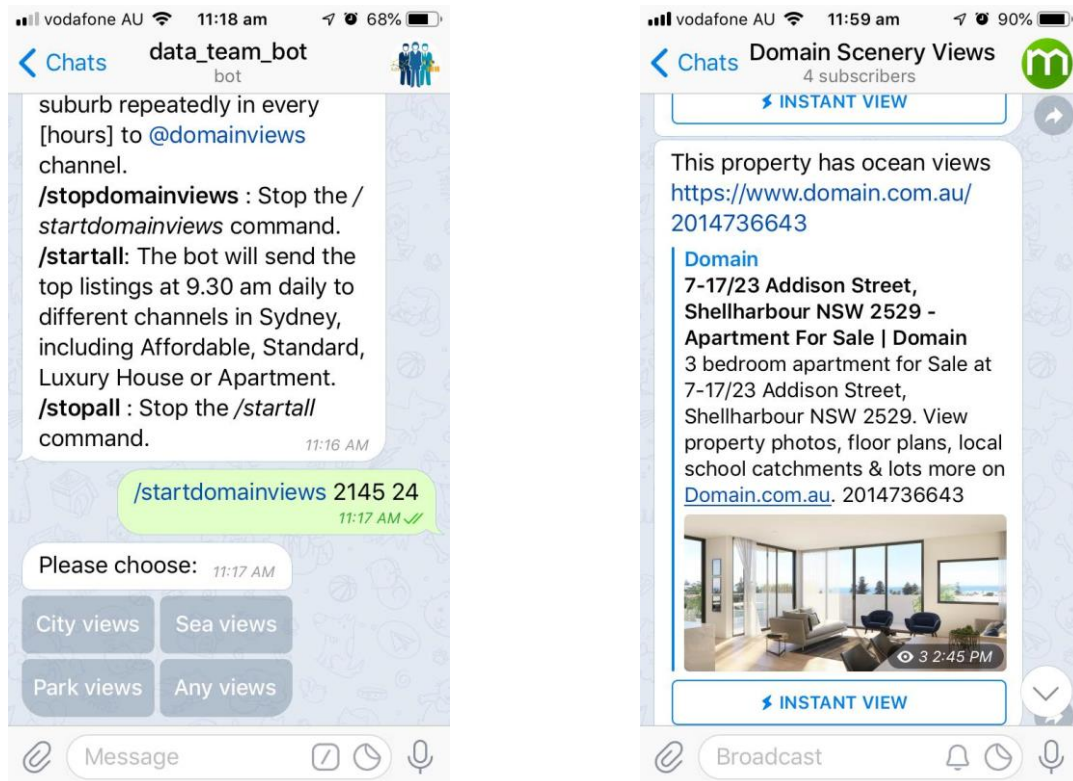


Figure.25 Set parameters to send listings to Domain Scenery channel

All users can view the property promptly inside the messenger app with an Instant View feature.<sup>49</sup> This feature is developed by creating Instant View templates using XPath constructs, rules, and functions<sup>47, 48</sup> Figure.26 shows the template of Domain Scenery Views channel.

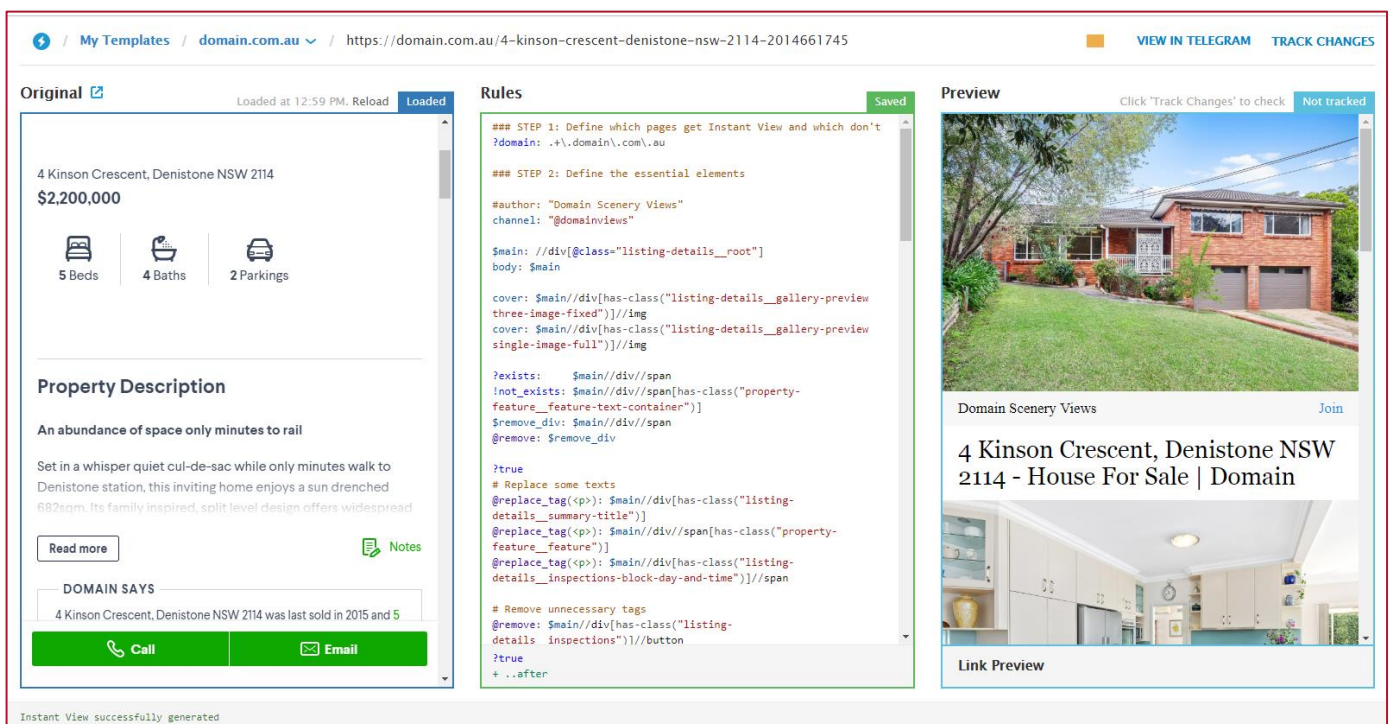


Figure.26 Domain Instant View Template<sup>49</sup>

### 6.3. What I have learned

Working with other colleagues to develop reports and applications helps me to:

- Sharpen SQL skills up to a new level: I have a chance to implement complex SQL functions like complicated Subqueries, Aggregate Functions, and Window functions. I am also able to understand Query Order of Execution and to perform SQL Optimization. These techniques could be highly beneficial when analysing big data.
- Become more adept at using Tableau: I have learned and applied Parameters, Aggregate functions, Table calculations, and different Level-of-Detail calculations.
- Improve programming skills in Python with two projects: Domain Messenger Bot and CRE Customer Clustering. I have developed the capability to integrate different packages and API in Python to manipulate data and build machine learning models.
- Familiar with new technologies such as Mode Analytics, AWS Redshift, and Snow Flake. I also can use various tools and technologies in the workplace (See Table.4 in the Appendix)
- Be able to collaborate effectively in a diverse working environment with people from different backgrounds. This also teaches me how to work in an agile way.

### 7. The internship reflection

While evaluating the internship experience, I contend that its results pass my expectations. The internship has given me an excellent opportunity to apply what I learned from Macquarie University to real-world problems. By working with people from various cultural backgrounds, I not only have a chance to re-evaluate my skills and knowledge but also see things from different perspectives. Furthermore, this helps me to recognise my strengths and weaknesses and biases, and more importantly, I can see which areas needed to be improved.

I firmly believe that the internship has paved the way for the development of future career. I understand that there are specific areas in which I need to improve and master. My short-term learning plan including:

- Improve communication and leadership skills
- Become more adept at SQL and Tableau
- Master Python programming for Data Science: focus on packages such as Pandas, Scikit Learn, NLTK, Keras, and Tensorflow
- Gain more practical skills in building ELT processes with SQL Server Integration Services (SSIS)
- Become familiar with platforms such as AWS, Microsoft Azure and Google Cloud

## **8. Conclusion**

In summary, the report has presented internship experience and reflection. It shows that the internship subject in the master's degree in Information Technology in Computing department at Macquarie University is highly beneficial for students. The programme not only gives students an excellent opportunity to apply what they have studied to address real-world challenges, but also provide them with a head start in their career path. Furthermore, this report also highlights the significant importance of data science in the digital transformation and decision-making process of the firm. Thus, this indicates that applying big data analytics and machine learning is an inevitable process in technology companies in order to exist and thrive in an increasingly competitive market.

END.

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## Appendix

### I. List of tools and technologies used at the workplace during the internship













<b>Task Management and Communication tools:</b> Trello, Slack		
<b>Visualisation Design tools:</b> Tableau, Mode Analytics		
<b>Data warehouse technologies:</b> AWS Redshift, Snowflake		
<b>SQL Editor tools:</b> Aginity Workbench, DBeaver		
<b>Programming IDE (Integrated development environment):</b> JetBrains PyCharm for python, and RStudio for R		
<b>Source code management tools:</b> GitHub, and TortoiseSVN		

Table.4 List of tools and technologies



## II. Domain Messenger Bot Poster in Domain Innovation Day, and The Data Expo



Figure.27 Domain Messenger Bot Poster