CIS 7029 -20249385_Kelum.docx

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Social Media Analytics for Business (CIS 7029)
Assignment

1.1. As of an organization I'd like to select Prime Group real state giant,

issues they are facing are, Because of they are not handling properly, we can see limited number of people engage with their SM channels. *"The value that SM creates for users is limited, and this lack of knowledge could limit the value accessible through SM engagement*."(Cartwright, Davies and Archer-Brown, 2021, p. 130)

Due to SM channels context and trends changing time to time, we can see they are not accepting it, and adopting this behaviour. *"Brand image can be reinforced over time in various SM contexts, targeting B2B purchase decision-makers*."(Tiwary *et al.*, 2021, p. 123)

By not identifying the correct age groups, SM context etc. it causes for incorrect measurements when it is branding through SM. because of they have limited resources and subject expertise. *"corporate branding through SM, firms can face barriers and measurement issues*,"(Tiwary *et al.*, 2021, p. 133) challenger they are facing are, No matter big or small industry, it must build SM correctly *"Despite larger organisations possessing a greater amount of resources, they faced similar challenges to those experienced by smaller organisations when implementing SM*."(Cartwright, Davies and Archer-Brown, 2021, p. 124)

Setting up relevant SM Channel and Content highly challenging its need reach correct audience *"Organisations often face challenges in settling upon an SM channel that is most appropriate for them and in developing the correct content that will reach the desired audience*"(Cartwright, Davies and Archer-Brown, 2021, p. 127) In briefly other important point, we can realize from this. *"No specific channel strategy, Low quality of content that is not engaging, Lack of dialogue amongst existing relationship partners, Difficulty in choosing the correct platform for very specific audiences, difficultly to continuously generate thought leadership content Engaging broad audiences increases risk in negative comments, long period of time to develop beneficial content, Relationships usually very complex that require consistent nurturing*" (Cartwright, Davies and Archer-Brown, 2021, p. 126)

Moreover, when try to implement SM as strategic tool, co-creators facing hesitation of managing it (Cartwright, Davies and Archer-Brown, 2021, p. 129) Ethical consideration wise *"being honest, and disclosing relationships such as who you work for in personal posts when endorsing products and services, and not writing fake reviews."(Joseph W. Barnes, 2015, p. 13)* In order to marketing via SM it's not a good approach to use free giveaways, (Muzumdar, Grant-Kels and Farshchian, 2021, p. 1) specially in real state industry its totally depend on trust.

1.2.

With the latest development with metaverse (Mystakidis, 2022), I can launch campaigns to design and develop to consumers to buy virtual land plots, virtual visits to fully completed condominium apartments and showcase the upcoming land and property development projects. "*The Metaverse is the post-reality universe, a perpetual and persistent multiuser environment merging physical reality with digital virtuality. It is based on the convergence of technologies that enable multisensory interactions with virtual environments, digital objects and people such as virtual reality (VR) and augmented reality (AR).*"(Mystakidis, 2022, p. 1)

With the emerge of CQA "*Community question answering (CQA) sites have emerged as platforms designed specifically for the exchange of questions and answers among communities of users.*" (Camacho, Luzón and Cambria, 2021, p. 319) its best to introduce platform specified bot assistance, which is not existing currently.

Letting consumers to decide what they want it another way of making it more engaging. "*One of the important ways in which social media differs from traditional media is that content is user-generated.*" (Vandenbosch, Fardouly and Tiggemann, 2022, p. 2) so, for that facilitating to consumers to design their own land plots, home decorations and interior designs using simple tools such as AutoDraw

Its oblivious more and more new SM platforms to popular in future (Vandenbosch, Fardouly and Tiggemann, 2022, p. 1), for an example like TikTok, so It will worthy to sharpening the SM team to work with new trends and new platforms to make this brand popular among youth.

With the introduction of SM platform's integrated wallets approaches, like facebook pay, WhatsApp Pay and TikTok shop I'd like to introduce payment gateways to current brand from these platforms.

Facebook recently introduced Top Fan, Valued Commenter badges for Fan of Facebook pages. Such badges are already introduced for Facebook group fans, i.e Visual storyteller, Conversion starter. Likewise, I'll introduce loyalty program and points-based system to make consumers more attach to the brand. When considering points, it will depend on their SM platform engagements too.
With the rise of IOT (Internet of Things) and WOT (Web of things) it's ideal convince higher management go for introduce smart homes and housing schemes, then based on these we can implement a SM-IOT collaborative systems, that data ans system can use for disaster managements situations like fire, flood, earthquakes, and other community bonding situation. "*With the rapid evolution of web technologies, Web 3.0 aims to expand on current and emerging social media platforms such as Facebook, Twitter, and TikTok, and integrate emerging computing paradigms, including the Internet of Things (IoT), named social media 3.0. The combinations of these platforms in Web 3.0 promises consumers greater integration, interaction, and more seamless movement between physical spaces.*" (Salim, Turnbull and Moustafa, 2022)
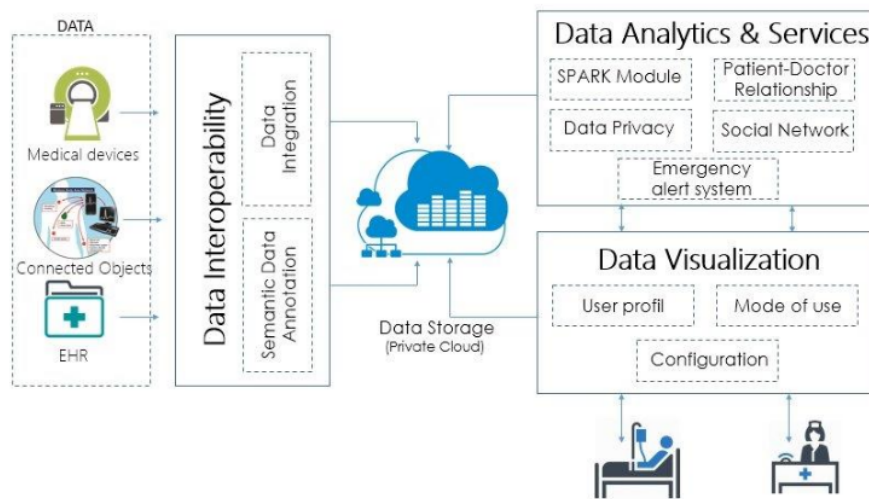
Fig. 1. The functional architecture of the SM-IoT platform (Dridi, Sassi and Faiz, 2017, p. 1423)

2.1.1.

Real Estate industry is another essential area need to improve along with the population growth. As for living standards getting improve, this area needs to improve parallelly. I'd like to select **Prime Group** as for the company. When considering property market Prime Group is one of major player. But with the present market status, it's been a challenge for this property developer to maintain their products such as lands, houses, apartments, housing schemes and commercial buildings. There are few large and small competitors for Prime Group presently, such as, **Home Lands**, **Blue Ocean**, **CBH Lands**, **Sky Line** and **HouseAndLandsLk** companies.

Based on following Real State Companies in Sri Lanka against Revenue and Employees table, it is showing other major players and their revenues in this business.

Rank	Company	Revenue(USD, Million)	Employee Count
1	Trillium Property Management Services	65.8	243
2	Fairway Holdings Pvt	62.3	334
3	John Keells Properties	59	892
4	Upali Newspapers	37.9	151
5	Al Aman Group	37.7	142
6	Xavier Holdings Private	36.7	335
7	Prime Lands	28.2	96
8	Rush Lanka Group	25.1	95
9	JB Lands	20.3	109
10	The Home Lands Holdings	18.5	62
11	Overseas Realty (Ceylon	18.2	271
12	Coral Property Developers	18.2	61
13	Malwatte Valley Plantations	17.2	14
14	Port City Colombo	16.9	49
15	Altair	16.6	47
16	Nivasie Developers	16.3	57
17	Araliya Lands & Homes - Pvt	16	51
18	Dusit Thani	14.4	54
19	Gdc	11.6	65
20	Skyline Pvt	11.5	46
	Total	**548.4**	**3174**
	Average/Mean	**27.42**	**158.7**
	Median	**18.35**	**80**
	Min	**11.5**	**14**
	Max	**65.8**	**892**

(zoominfo, 2022)

We can see Prime Lands is on 7th position, making 28.2 million USD in the year of 2021. when this amount converts into Sri Lankan Rupees its around 980-1000 million, that amount tally in their following **Management Discussion & Analysis report for 2020/2021. (Prime Lands (Pvt) Ltd, 2021)**

Financial Capital

|	For the year ended 31.03.2021 Rs. (Mn)	For the year ended 31.03.2020 Rs. (Mn)	Variance %
Profit before taxation	1,277	182	603%
Profit After Tax	989	131	656%
Net Profit Margin	13%	2%	

(Prime Group (Pvt) Ltd, 2021)

After calculating Total, Median and Average/Mean of above table we can see Prime Lands revenue is $27.25M is above the average revenue which is $27.25M, also it's above the median revenue which is $18.35M

Also, they have around 96 direct employees comparing to Homelands and Skyline its higher amount, it's above the median and average amount of employees which are respectively 78.5 and 36.99.

9

Evolution of Condominium Market in Sri Lanka: A Review and Predict (Prathapasinghe, 2018) and **Real Estate Market Analysis - First Quarter 2022(Statistics Department of the Central Bank of Sri Lanka, 2022)** showing its increasing **condominium product** market in future decade, so all these companies have this common product as one of their business scopes. So, they should prioritize that product, by playing their part properly and maintaining good ethical business practices can keep their space in this field.

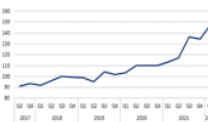Figure 1: CMA Certificates Issued from 2006-2017
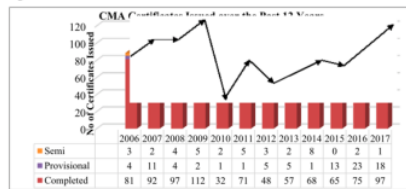
(Prathapasinghe, 2018)

Figure 1: Condominium Property Volume Index

Figure 2: Price Index for New Condominiums

(Statistics Department of the Central Bank of Sri Lanka, 2022)

2.2.1.

As for the SMART goal, promoting condominiums among younger generation, age group of 25-35 will be more beneficial for the company by analysing below data sets. We can estimate that it can reach, by selling 10000 of apartments among these millennials period of Aug 2022 to Aug 2023.

Below is consideration of latest 10 facebook posts from each, Land Sale related posts and Condominium Apartment related posts from Prime Group.

Land Sale Related Reaction Measurements

Date	Type	Comments	Shares	Likes	Angry	Love	Care	Haha	Wow	Sad
11/08/2022	Land Sale	2	4	12	0	0	0	0	0	0
09/08/2022	Land Sale	2	0	404	0	5	1	0	0	0
09/08/2022	Land Sale	1	2	335	0	3	1	1	0	1
09/08/2022	Land Sale	3	1	792	0	3	0	0	1	0
09/08/2022	Land Sale	4	2	533	0	10	2	2	0	0
09/08/2022	Land Sale	9	3	281	0	4	0	0	0	0
09/08/2022	Land Sale	0	11	143	0	0	0	0	0	0
09/08/2022	Land Sale	2	4	31	0	0	0	1	0	0
02/08/2022	Land Sale	10	7	1300	0	14	2	2	1	0
02/08/2022	Land Sale	23	3	1200	1	23	3	1	5	2
Total		56	37	5031	1	62	9	7	7	3
Median		2.5	3	369.5	0	3.5	0.5	0.5	0	0
Average		5.6	3.7	503.1	0.1	6.2	0.9	0.7	0.7	0.3
Min		0	0	12	0	0	0	0	0	0
Max		23	11	1300	1	23	3	2	5	2

Condominium Apartments Related Reaction Measurements

Date	Type	Comments	Shares	Likes	Angry	Love	Care	Haha	Wow	Sad
20/04/2022	Condo	81	8	390	1	27	3	1	0	0
11/03/2021	Condo	77	26	193	0	8	3	0	0	1
09/03/2021	Condo	1100	262	12	3	312	23	19	22	19
16/02/2021	Condo	243	80	767	0	29	8	2	3	1
03/02/2021	Condo	58	13	808	0	22	0	0	0	0
03/02/2021	Condo	158	79	5200	0	85	3	6	5	2
06/07/2020	Condo	17	26	3300	1	26	2	4	2	1
24/06/2020	Condo	94	93	19000	2	158	19	32	18	3
19/06/2020	Condo	0	2	0	0	0	0	0	0	0
12/06/2020	Condo	38	34	1200	0	12	2	1	3	0
Total		1866	623	30870	7	679	63	65	53	27
Median		79	30	787.5	0	26.5	3	1.5	2.5	1
Average		186.6	62.3	3087	0.7	67.9	6.3	6.5	5.3	2.7
Min		0	2	0	0	0	0	0	0	0
Max		1100	262	19000	3	312	23	32	22	19

Total number of comments of condominium apartment related post counts of 1866, is 3332.14% higher than Lands related posts 56 of total comments. For comments mean/average this personage (3332.14%) is same since its same numbers. Also, we can see Maximum number of comments went to 1100 for condominium apartments, but 23 is the most number for the other category. Median is 3160% higher.

Likewise, by comparing these 2 data sets against Total, Median, Average, Min, and Max with criteria of Shares, Likes, Angry, Love, Care, Haha, Wow and Sad we can notice significant difference of user interactions.

With these rates its likely get 150-200 total comments, 50-80 of shares, 2000-3500 of likes, 0-1 of Angry reactions, 50-100 of Love reactions, 5-10 of Care reactions, 5-10 of Haha reactions, 5-10 of Wow reactions and 1-5 of Sad reactions for the next condominium related post.

2.2.2.

Since it has 198,058 of followers in Prime Lands Group facebook followers

For the condominium related post, we can find out following engagement rates as following

"ER post = Total engagements on a post / Total followers *100"

(Katie Sehl and Shannon Tien, 2022)

| Date	Type	Total Interactions	ER post
20/4/22	Condo	511	0.25800523%
11/3/21	Condo	308	0.15551%
9/3/21	Condo	1772	0.89468741%
16/2/21	Condo	1133	0.57205465%
3/2/21	Condo	901	0.45491725%
3/2/21	Condo	5538	2.79615062%
6/7/20	Condo	3511	1.77271304%
24/6/20	Condo	19261	9.72492906%
19/6/20	Condo	14	0.00706864%
12/6/20	Condo	1957	0.9880944%
Total ER			**17.6241303%**

"Average ER by post = Total ER by post / Total posts" (Katie Sehl and Shannon Tien, 2022)
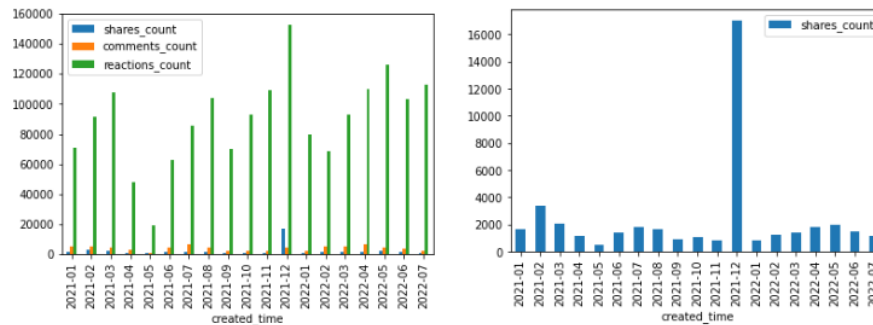
Average ER = 17.62/10 is 1.7%

As we can see in above table engagements are consist around 0.5% to each post

After scraping overall facebook post of Prime Lands, date period of 01st of January 2021 to 01st of August 2022 (13 months), results are like these

Monthly reactions
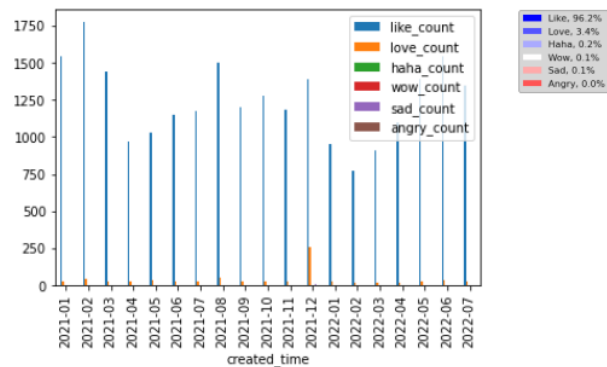
Most user feedbacks are positive and likes to engage (Reactions = like + love + haha + wow + sad + angry)

Share counts also steady when consider overall facebook posts. Around 2000 per month for total shares. reactions are overall above 8000 per month.

After analysing all twitter posts of Prime Lands, its comments outcome as follows

With these healthy stats, it's a good move for social media is a worthy investment for Prime Lands.

2.2.3.

I'm selecting as Facebook post and TikTok as communication platforms.

Facebook post with 1 image and English content would be ideal to share the information between younger generations. By looking at above overall data its user interaction getting higher for riddle related post, there for its will he arranges riddle-based post to boost communities. Since its sharing with English content, it will be easier to do all sentimental analysis and analyse data.

With below 3 surveys, its obvious, millennials are the ones going to become next work force which has more buying power and main users in social media in Sri Lanka.

"Majority of users (77.2%) are belong to age 18-27 which means that young generation in Sri Lanka is much engaged in Facebook."(Rathnayake and Rathnayake, 2017, p. 340)

(Seven Media Group, 2022)   (Seven Media Group, 2022)


(Simon Kemp, 2022)
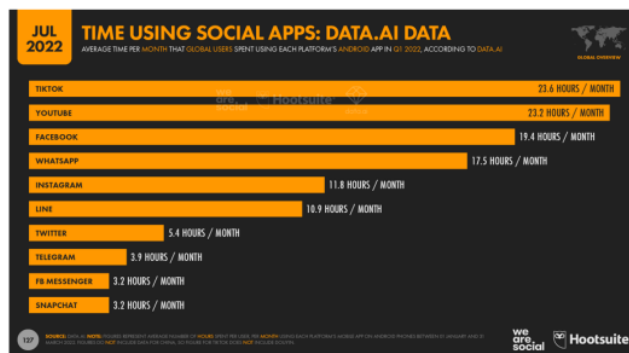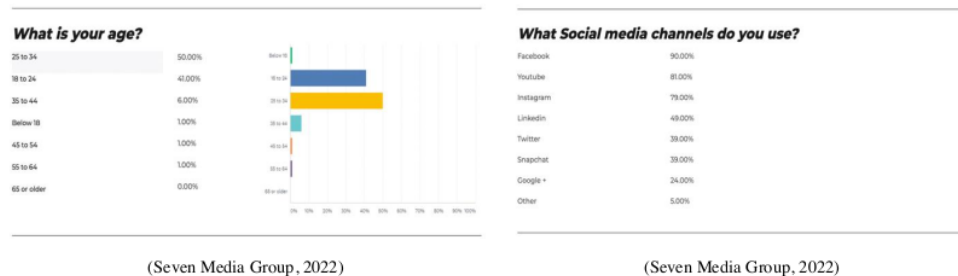
As we see here TikTok is considered as most engaging social media in now and upcoming years. There for it will worthy to share short clips with following topics about condominium, contents like its helping to minimise carbon footprint, easy to waste management, compact environment, secure neighbourhood and read made product.

Then when we talk about this **condominium purchasing** information flows between this group we can focus information diffusion of networks, so let's divide 25-35 age group into following groups.

Group A - people who like buy land plot and build their dream home as they want
Group B - people who like buy ready made apartments

If Prime lands give nice condominium purchasing offer to a Group B person, and then he'll adopt this offer that information will share among close peers, due to this age group are mostly office colleagues, schoolmates, classmates, and university mates.
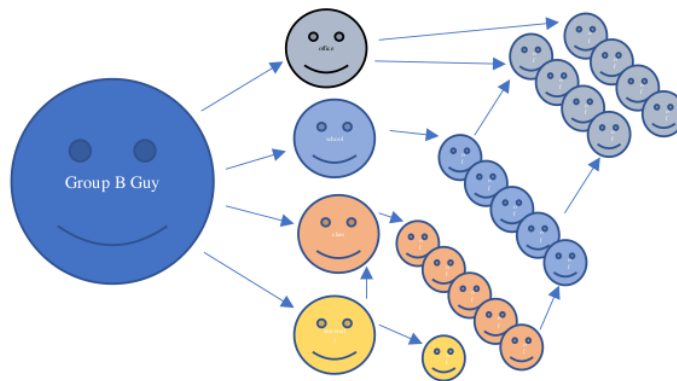
There are about 10-12 million population of 25-35 age group in Sri Lanka, if few Group B people adopt this condominium purchasing behaviour, it will create network phenonium. If its model this complete Group B as network like below every person in this Group B, we can represent as Node, also we can put edge between two nodes if those nodes represented people, are talking to each other, following each other, listen to each other. so this product start somewhere in this network Group B. Group B guys classmates adopting it, then their friends adopting it, likewise in other sub sets. So this condominium purchase movement will diffuse through this social network.

According to this there can be few possibilities with diffusion
1. Entire population in this Group B adopting this
2. It can die away soon, Nobody adopting this
3. Mixture of decision, Very few people adopting

So when above adoption behaviour applying to model, we can analyse to get adopt above behaviour to someone call **X** who is 30 years old, what requirements to fulfil.

Let's apply the model for this now
 Group A represent as **Action A**
 Group B represent as **Action B**
 To do action A, need **10** Millions amount of LKR
 To do action B, need **20** Millions amount of LKR
Let's say, **p fraction** of friends of mine adopted A and remaining **1-p fraction** of adopted B

To get adopt A to me it will be **px10**
To get adopt B to me it will be **(1-p)x20**

so if that **X** to buy condominium apartment(Action B), it should full this
**(1-p)x20 >= px10**

Example :If **X** has 100 friends (classmates, colleagues, schoolmates etc), p is 40 of them adopted Action A

Then with above 60x20 >= 40x10 is true, **X** to adopt Action B

2.2.4.

| Platform	Audience	Influencers	Content Type	Response from
Facebook	25-35 Age group	Actors and Actresses, Sportsmen, Comedians	Images with English Content and Hashtags	25-35 Age group, general public
TikTok	20-30 Age group	TikTok influencers, environmentalist	Clips about Environmental Effects, Short clips with higher Living Standards	Millennials

Prime Lands has, 198091 of Facebook followers and 10400 of TikTok followers
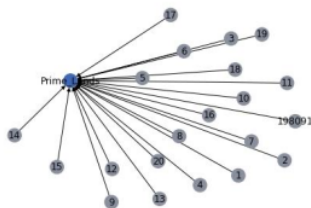
Facebook Graph for Prime Lands
Degree of centrality as follows
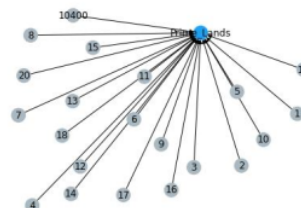
TikTok Graph for Prime Lands

Platform	nx.degree_centrality(g)	nx.out_degree_centrality(g)	nx.in_degree_centrality(g)	nx.closeness_centrality(g)	nx.betweenness_centrality(g)	nx.eigenvector_centrality(g)
Facebook	Prime_Lands Node : 1.0 For Other Nodes 0.00000505	Prime_Lands Node : 1.0 For Other Nodes 0.00000505	Prime_Lands Node : 1.0 For Other Nodes 0.0	Prime_Lands Node : 1.0 For Other Nodes 0.0	Prime_Lands Node : 1.0 For Other Nodes 0.0	0.00
TikTok	Prime_Lands Node : 1.0 For Other Nodes 0.00009615	Prime_Lands Node : 1.0 For Other Nodes 0.00009615	Prime_Lands Node : 1.0 For Other Nodes 0.0	Prime_Lands Node : 1.0 For Other Nodes 0.0	Prime_Lands Node : 1.0 For Other Nodes 0.0	0.01

Clustering coefficient is 0.1-0.9 for both Facebook and TikTok due to there are connection between of their followers, but those followers not connected with each other's.

2.3.1.

As for a Native tool for Facebook going to use is Facebook Insights as for Non-native tool Hootsuite Analytics($49-$739 per month)
As for a Native tool for TikTok going to use is creatorportal and as for Non-native tool Iconosquare($49-$79 per month)

2.3.2.

For the facebook It will consider following data
Page Views based on Gender, Page Views Based on age groups, Interaction based on Gender, Interaction based on Age groups, Demographic Data, Clicks, Comments, Reach, Shares and Trends

For TikTok It will consider following data
Number of views, likes count, comments count, shares count, view time average, full video watch time, traffic source, type and audience territories. Moreover performance, engagement, standalone video detailed analytics, additive videos, ideal time to post, history & density and Media lifespan.

2.3.3.

If we consider we maintain 12 of team member for each platform
2 – Content Creators for Facebook, 2 – Content Creators for TikTok, 2 – Graphic, Designer, 2 – Videographers , 2 – Video editors, 2 – Photo Editors

| Platform	Staff Cost(LKR)	Tools Cost(LKR)	Miscellanies	Total Cost(LKR)
Facebook	900000	500000	200000	1600000
TikTok	900000	500000	100000	1500000

Based on Annual Report of Prime Lands its mentioning they are selling 2000-3000 condominium apartments per year, but according to my goal withing next 12 months I plan to bring this number to 10000. Their current profit is 1000M in LKR
But after execute this it will be 3500M LKR since (1000/2000)(7000).
Apart from this ROI, they will able to make experienced SM Team and in SM channels user base increase too. After 12 months it can find out who are the people bought theses 10000 apartments by giving them survey, like how they decide to purchase this product, any of their friends has buy this before likewise, we can analyse this sets of data and come to conclusion.

2.4.1.

Facebook data 01st of January 2021 to 01st of August 2022 extracted using *facepager* with special settings, since *facebook_scraper* not giving actual datasets. Twitter data extracted via *tweepy* and twitter API. Details description about how extracted data I have mentioned in data_extraction_guide.docx
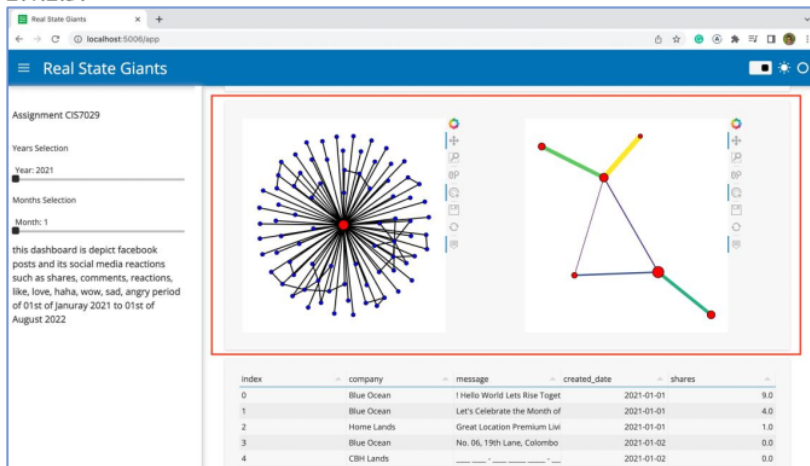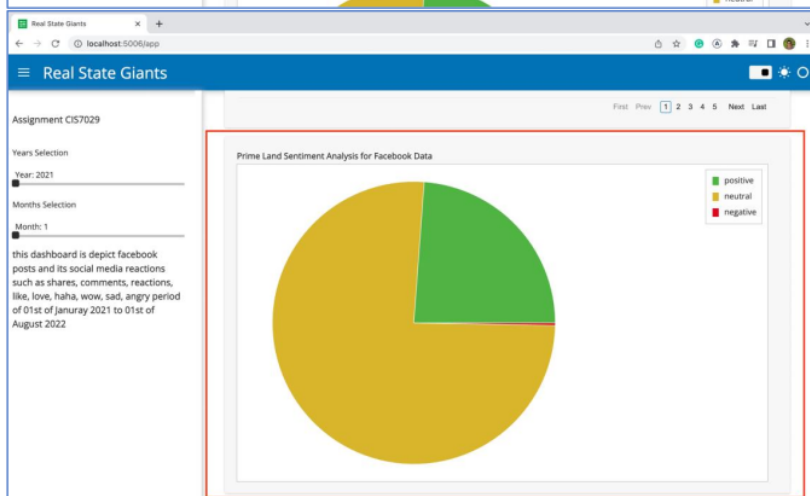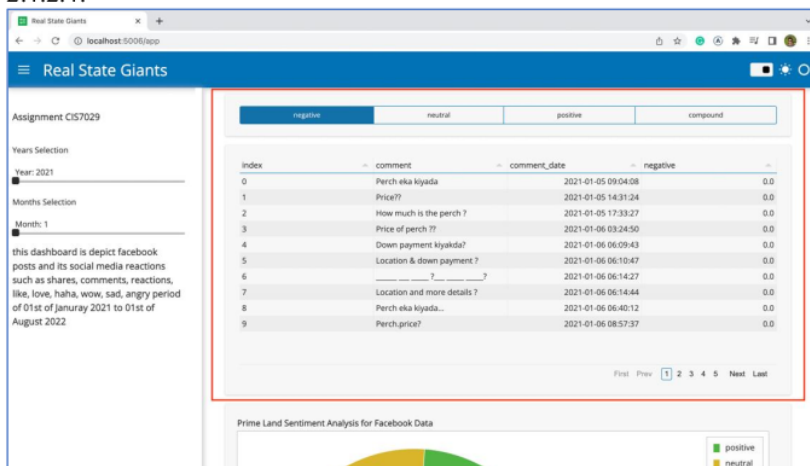
2.4.2.1.   **Hosted URL - https://service-qpjothvhra-as.a.run.app/app**
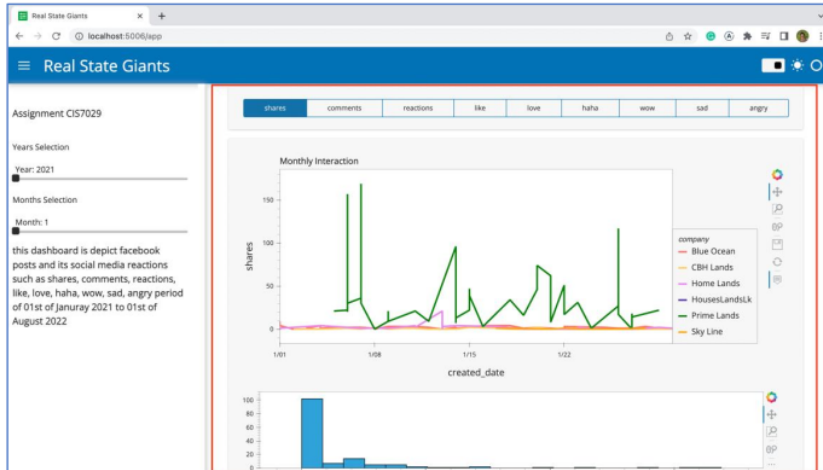
2.4.2.2.
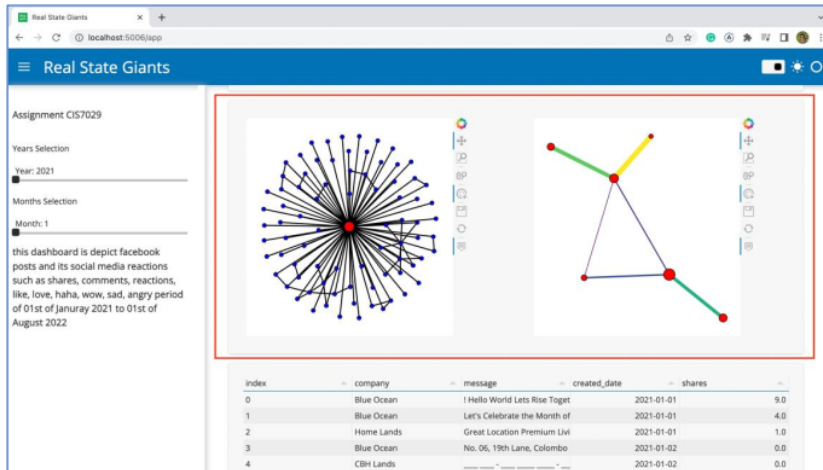
2.4.2.3.

2.4.2.4.

2.5.1.

Collaborative filtering for social media influencer analysis

Suppose we have general user call **U**, whom we want make product recommendation, also there are social media influencers call I^1, I^2, I^3, I^4, I^5. Mapping U with specific influencer(s) we can focus on metrics such as Gender, Age, Languages, Interests, Locations of influencers.

There may some product that both influencers and **U** likes, some products both influencers and **U** don't like. We can call it that influencer group as neighbours of user **U** By analysing influencers choices we can to find group of influencers that who are like and dislike similar to **U**.

Once we found set **N** of influencers or the neighbourhood of users similar to users **U** We can find other products that are likes by set **N**, and recommend those items to the user **U**.

Key trick is to find the users that are similar to user **U**, to do that we need define notion of similarity between influencers.

Products \ Influencers	P^1	P^2	P^3	P^4	P^5	P^6
I^1	8			10	2	
I^2	10	10	4			
I^3				2	8	
I^4		4				6
I^5	2	6		4		

I^1 – 8 out of 10 P^1 product, 10 out of 10 P^3 and 2 out of 10 of P^4
I^2 – 10 out of 10 P^1 and P^2 , 4 out 10 P^2 and so on.
There are some products with empty rating by some influencers.

We can consider influencer **I** and **J** with rating vectors r_I and r_J, we can find similarity matrix **Sim(I, J)**

There are lots of products both I^1 and I^2 not rated, Both I^1 and I^2 rated P^1 as high, I^1 and I^3 rated P^4, P^4 common but there rating are very dissimilar. I^1 likes P^4 dislike P^4 , vice versa for I^3, so we can group I^1 and I^2 are similar while I^1 and I^3 dissimilar which is $Sim(I^1, I^2) > Sim(I^1, I^3)$. Users with similar taste have higher similarity than users with dissimilarities.

To apply this, we can use **Jaccard** Similarity (Rana and Deeba, 2019, p. 3)

$Sim(I^1, I^2) = |\, r_{I1} \cap r_{I2}\,| / |\, r_{I1} \cup r_{I2}\,|$

Jaccard is intersection of r_{I1}, r_{I2} and divided by union of r_{I1}, r_{I2}, it's just take intersection of vectors and divided by union, in the other hand its 1-(Jaccard distance of r_{I1}, r_{I2})

So for above example $Sim(I^1, I^2) = 1/5$ because both together rated P^1 , others 4 separately.

And $\text{Sim}(I^1, I^3) = 2/4$, $\text{Sim}(I^1, I^2) < \text{Sim}(I^1, I^3)$, its measures the quantity of items rated not the qualitative values of it, due to its ignoring rating value we have to abandon this methodology.

Other option we can consider is **Cosine** Similarity (Najafabadi, Mohamed and Onn, 2019, p. 532)

$$\text{Sim}(I^1, I^2) = \text{Cos}(r_{I1}, r_{I2}) = \cos \frac{\overline{rI1.rI2}}{|rI1|.|rI2|}$$

In order to calculate this we have to fill all empty rated rows as 0 for I^1, I^2, I^3

	P^1	P^2	P^2	P^3	P^4	P^5
I^1	8	0	0	10	2	0
I^2	10	10	4	0	0	0
I^3	0	0	0	2	8	0
I^4		4				6
I^5	2	6		4		

$\text{Sim}(I^1, I^2) = 0.41996052556580804$, $\text{Sim}(I^1, I^2)$, $\alpha = 65.16790467078617°$
$\text{Sim}(I^1, I^3) = 0.3368165348543039$, $\text{Sim}(I^1, I^3)$, $\alpha = 70.31696159072192°$

Even though its meet our expectation $\text{Sim}(I^1, I^2) > \text{Sim}(I^1, I^3)$. We can see here it's not a significant difference here, since we made all non-rated as 0 there is a problem here, its treats empty ratings as negative. 0 is the worst possible rating. So we sort of assumption here, if I^1 didn't give rating to P^2, we imposed rating to 0. Which is a bad assumption. Even though it may get some rating for P^2.

To fix above problem there is third option **Centered Cosine/Pearson Correlation** Similarity (Li *et al.*, 2017, p. 204)
To achieve this we have to normalize for a given influencer by subtracting row mean or the average rating of the influencer

	P^1	P^2	P^3	P^4	P^5	P^6	Average Rating
I^1	8			10	2		20/3
I^2	10	10	4				24/3
I^3				2	8		10/2
I^4		4				6	10/2
I^5	2	6		4			12/2

We have to subtract each rating from that row average rating, except blank rating.
After subtract it our matrix is like this, we consider blank values as 0

	P^1	P^2	P^3	P^4	P^5	P^6	Average Rating
I^1	4/3			10/3	-14/3		20/3
I^2	6/3	6/3	-12/3				24/3
I^3				-6/2	6/2		10/2
I^4		-2/2				2/2	10/2
I^5	-8/2	0		-4/2			12/2

If its sum all the values in each row it become 0 here, What we done here is, we centred influencer's rating of each influencer around 0, 0 become average rating for every influencer. Positive rating means influencer like that product more than average, negative means vice versa.

$Sim(I^1, I^2)$ = 0.09245003270420486, $Sim(I^1, I^2)$, α = 84.69542856090239°
$Sim(I^1, I^3)$ = -0.9607689228305228, $Sim(I^1, I^3)$, α = 163.897886248014°

With these values its with bigger margins, showing $Sim(I^1, I^2) > Sim(I^1, I^3)$, reason for success of this is missing rating treated as average, also some rates mean to be tough rates and some people not, this handles it well.

With that we can move to predictions or recommendations to general user **U**

Let's consider $\mathbf{r_I}$ be the vector of influencer **I**'s rating
set **N** of influencers which we call the neighbourhood. who are **K** consist of influencers, most similar to influencers **I**.
Prediction/recommendation for influencer **I** and product **P**

Simple prediction is to take average rating like this from neighbourhood
Average rating of all the users for product **P** in the neighbourhood (Quella, 2021, p. 40)

Option 1 : $\mathbf{r_{IP}} = 1/K \sum_{J \epsilon N} r J P$

Its ignores actual similarity values who are similarity value **P**, there may be range of similarity values within the neighbourhood, it might contain influencers who are highly similar to influencers **I** and few other influencers who're not that similar to influencer **I** (Quella, 2021, p. 40)

Weight the average rating by the similarity values, its weighted average, $\boldsymbol{SIJ} = \mathbf{Sim(I,J)}$

Option 2 : $\mathbf{r_{IP}} = \sum_{J \epsilon N} SIJ\ rYP\ /\sum_{Y \epsilon N} SIJ$

We look at neighbourhood **N**, and for each influencer **J** neighbourhood **N**, weight **J**'s rating for product **P** , by. The similarity of **I** and **J**, then normalize it by taking sum of the similarities.
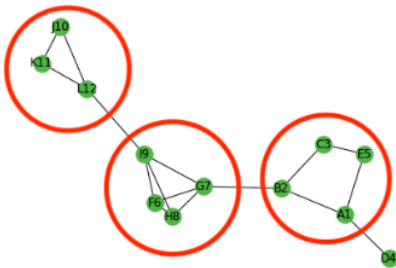
2.5.2.

Community detection in social networks

Let's consider small network example like following
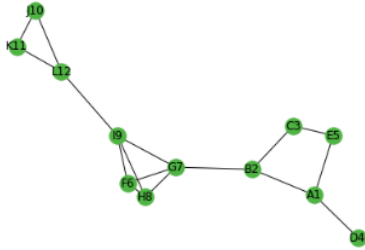
For a plain eyesight we can say there are 3 communities in this network

Since this easy to see visually, it's a small example, but as for nodes and edges adding to this networks in thousands, it's become complex to tell how many communities are there.

So for option we can use **Girvan-Newman** (Girvan and Newman, 2002, p. 7822) Algorithm to make it automatically find these communities.
In order to do, have to calculate matrix of every single Edge of this network, edge is the lines that map these nodes. We have to calculate **edge betweenness** which is one of **network centrality** measures.

Number of Nodes above network = 12
Total Pairs of Nodes above Network = (12 * 11) / 2 = 64

Edge betweenness explain like this, every pairs of node in the network, how many of those pairs have shortest path between those nodes, that have to pass through given edge.
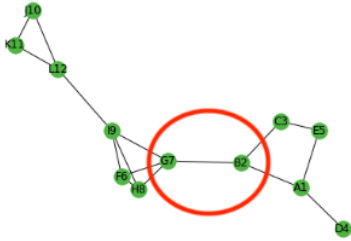
To apply above edge betweenness, If we consider (B2,G7) edge from above network, we can see there are 5 nodes for B2 side community and 7 nodes for G7 side community.

EB of (B2, G7) = (B2 Nodes * G7 Nodes) / Total Pairs of Nodes = (5 * 7) / 64 = 0.54687

Other example,
EB of (L12, I9) = (L12 Nodes * I9 Nodes) / Total Pairs of Nodes = (3 * 9) / 64 = 0.42187

Using following function we can do same calculation above.
nx.edge_betweenness_centrality(G)

('A1', 'B2'): 0.3181818181818182
('A1', 'D4'): 0.16666666666666669
('A1', 'E5'): 0.10606060606060606
('B2', 'C3'): 0.19696969696969696
('B2', 'G7'): 0.5303030303030303
('C3', 'E5'): 0.09090909090909091
('F6', 'G7'): 0.09090909090909091
('F6', 'I9'): 0.06060606060606061
('F6', 'H8'): 0.015151515151515152
('G7', 'H8'): 0.09090909090909091
('G7', 'I9'): 0.36363636363636365
('H8', 'I9'): 0.06060606060606061
('I9', 'L12'): 0.4090909090909091
('J10', 'K11'): 0.015151515151515152
('J10', 'L12'): 0.15151515151515152
('K11', 'L12'): 0.15151515151515152

To identify communities we have to notice most important edges of the network, which are have the highest edge betweenness. If an edge has very high edge betweenness, compared others that means its very often on the shortest path, between some cluster of nodes and to rest of the network, means its holding these two communities to the rest of the network. For the edges that have very low edge betweenness consider lower importance for the shortest path, not contribute hold communities.

Girvan-Newman saying in order to separate communities, identify highest edge betweenness edges, delete them to separate communities from rest of network. Re-evaluate same process up to some context. By doing so we can do the community detection.
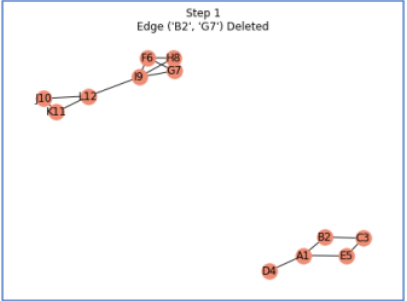Tricky part here is to know how many of deletion need to do, if its doing too many, it will separate all the nodes, which isn't correct. Too few means it's not separating communities which are actually need to separate.

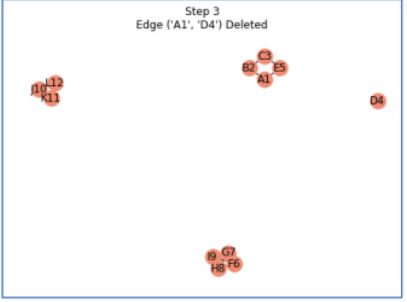Let's try to simulate this.

Original Network

After Step 1

Step 1
Edge ('B2', 'G7') Deleted

After Step 2

Step 2
Edge ('I9', 'L12') Deleted
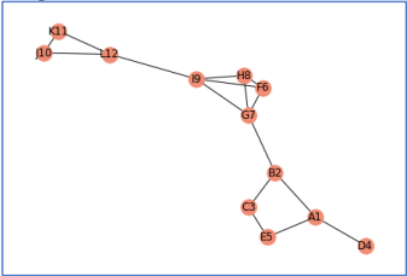
After Step 3

Step 3
Edge ('A1', 'D4') Deleted

Summary
In first section I selected a company discussed discuss the Challenges Issues, and Ethical Consideration in Social Media usage for the specific area. And I'm the one become Lead of SM analytics team how to drive this brand cope with new trends.

Second part of the section discussed about SMART goal and social media strategy. Compared 2 products of the company, analysed it. Implemented ROI and dashboard for those.
Third Section I've discussed important concepts in social media analytics.

Abbreviations

SM - social media
Prime Lands - Prime Group PLC
EB - Edge Betweenness

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