A Social Network Analysis on Peer Connections in Leadership Development

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INTRODUCTION

The Director's Developmental Experience (DDE) at the Civil Service College Singapore is a leadership development programme for first-time directors in the Singapore Public Service; designed to equip directors with essential skills, perspectives, and support networks needed to perform effectively in their roles. The DDE Experience features an element called 'Learning Groups' which facilitate participants' learning experience in smaller and more intimate settings. This study used Social Network Analysis (SNA) methods to understand how peer connections were formed in the programme, to assess existing learning design (e.g. Learning Groups) and provide improvements for future iterations.

METHODOLOGY

Questions used for data collection:

1. For each DDE participant in the table below, please indicate how likely you would approach him/her for work-related advice now that you have attended the DDE. (Work-related advice)
2. Who might you wish to get to know better after the programme? (Get-to-know-better)

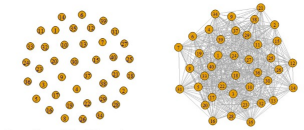
Methods used for analyses:

- **Network graphs** were constructed using participants as nodes and the ratings as weighted, bi-directed edges for responses from the work-related advice question and non-weighted, directed edges for responses from the get-to-know-better question.
- **Network density** was calculated from the network graph to assess the programme's effectiveness in establishing peer connections for professional support.
- **Community Detection** was performed using machine learning algorithms on networks with mutually highly rated connections (i.e. rating 4 and above) to identify sub-groups.
- **In-degree centrality** was calculated to examine if high in-degree centrality scores were linked to specific participant characteristics.

RESULTS & FINDINGS

Insight 1: 2nd DDE was successful in helping participants establish peer networks for professional support

Network density was used to understand how connected the network was, compared to how connected it could be. A network comprises of the entities (nodes) and the connections between them (edges).



Density = 0%, 40 nodes

Density = 75%, 40 nodes

Formula: $\frac{\text{Total actual edges in a network}}{\text{Total potential edges in a network}}$

Figure 1: Examples of Network Density and formula

Figure 1 showed that the density of the network was 73% which was significantly higher compared to a 12-month national leadership programme (in the US), that was ~30% from a group of 30 participants.

Insight 2: Learning Groups played a key role in forming subgroups

Process for Community Detection:

1. Generated a network with only edges representing mutual connections between respondents who rated 4 or 5 for their likelihood to reach out to each other.
2. Ran the network through machine learning algorithms to generate subgroups.
3. Layered on additional information (i.e. sector groups, learning groups, Engagement and Immersion Programme) to identify key participant groupings which might explain how the subgroups were generated.
4. Layered on qualitative feedback from participants to support the SNA findings.

Community A	
Participant	LG
Participant_1	9
Participant_2	9
Participant_4	9
Participant_38	9
Community C	
Participant_14	3
Participant_26	3
Participant_44	3
Participant_20	4
Participant_25	4
Participant_35	4
Participant_37	4

Community B	
Participant	LG
Participant_5	1
Participant_7	1
Participant_10	1
Participant_28	1
Participant_39	1
Participant_24	7
Participant_27	7
Community D	
Participant_8	2
Participant_19	5
Participant_22	5
Participant_30	5

Table 1: Sample table of results from Community Detection

It was observed that most communities had participants that belonged to the **same Learning Group** which could imply that Learning Groups likely played a key role in forming subgroups within the programme cohort.

Insight 3: Participants generally formed closer work-advice connections within their learning groups

Network graphs were used to provide insights on participants' behaviours. Based on the question "**For each DDE participant in the table below, please indicate how likely you would approach him/her for work-related advice now that you have attended the DDE.**" it showed that participants generally sought work-related advice within their Learning Groups, emphasising the strong connections within these clusters.

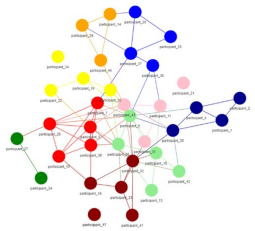


Figure 2: Network of participants who were mutually very likely/ definitely will reach out to for work advice (rating > 4).

Insight 4: Participants generally wished to know a more diverse mix of peers outside their Learning groups

Based on the question "**Who might you wish to get to know better after the programme?**" showed that participants generally expressed a broader interest in diverse peer connections, extending beyond their initial Learning Groups.

It was discovered that the participants with high in-degree centrality score were observed to be more expressive and generally were people that won peer-based awards by the end of the DDE.

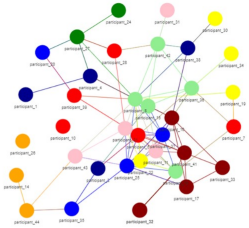


Figure 3: Network of participants who mutually wish to know each other better.

CONCLUSION & FUTURE WORK

- Learning Groups (LG) likely played a key role in forming subgroups. The programme should **continue to incorporate this design feature** to facilitate the formation of deep connections among participants.
- Besides collecting end of programme data, we can **collect data pre-programme and during programme** to observe the change in peer connections throughout the programme.
- To reduce the feedback fatigue, data from social learning collaboration or communication platforms (i.e **trace data**) can be used to gather insights for the study.

LIMITATIONS

- **Missing or null responses** by participants that would affect the data and findings to some extent. For example, the network density score might be higher than presented due to missing or null responses.
- Survey data is collected **only at the end of the programme** hence it provides a snapshot rather than changes throughout the programme. This limits the ability to track the shifts in networks and connections formed across the duration of the programme.
- **Lack of benchmark** for comparison as this is the first analysis conducted.

RELATED LITERATURE

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