Chapter 5

Communication networks and performance of four New Delhi city parks

Introduction

Parks as elements of the cityscape provide numerous benefits ranging from passive and active recreational venues, environmental benefits and habitat for flora and fauna (Solecki and Welch 1995). Social safety, sociability and nature make urban parks more attractive and safe for children (Lloyd et al., 2008). Neighbourhood parks are important for promoting physical activity amongst children and adults (Tucker et al., 2007).

Urban parks need to be maintained well and made accessible to the general public for their well-being. There should be distributional equity and easy accessibility, attributes that are recognized as essential indicators of a well-functioning urban system (Schroeder and Daniel 1982; Nicholls 2001). Safety, aesthetics, amenities, maintenance, shade, cleaness and proximity are key factors encouraging park use (Tucker et al., 2007). The appreciation of scenic beauty by the visitors is an indirect indicator of good management (Wong and Domroes 2005). The success of a park agency is dependent upon the quality of the visitors’ experiences (Hamilton et al., 1991). Thus the managers of urban parks are primarily responsible for providing attractive outdoor recreation resources for city residents.

In India, parks are usually public owned and managed by different public institutions, sometimes with community participation in management. There is a need to understand the governance structure and functioning of different park management and relate them to the condition and performance of the park. This will enable the administrators to have consistent information on the quality and function of the parks while formulation of environmental policies and plans for a city and establishing funding priorities.

Social Network Analysis (SNA) can provide a suitable approach for such studies. SNA involves mapping, modelling and measuring the relationships among suitable
defined players (Wasserman and Faust 1994). Network structure is important for understanding the functioning of the whole group and seeing how the behaviour of individual players depends on the group context.

In recent years, an increasing number of studies have effectively used SNA in the study of natural resource management (Ernstson et al., 2008; Sandström and Rova 2009; Prell et al., 2009; Newig et al., 2010; Swamy and Devy 2014). Carlsson and Sandström (2007) presented an analytical framework for network study of co-management of natural resources. Bodin and Crona (2009) in their review of empirically-based literature, showed that the social networks approach has immense possibility in allowing studies of various cross-scale connections and is significant in investigating natural resource governance practices. They also used SNA for communication of knowledge and information related to natural resource extraction in Kenya. In this study, the goal is to use SNA in measuring the interaction structure among park keepers in Delhi, offering a comparative view on governance and management across multiple parks.

This study aims at creating the communication networks for four New Delhi parks, quantifying their structure by SNA and looking for the relationships between network-independent park attributes and network properties.

**Methods**

**Study Area**

The study sites are located in the New Delhi District of National Capital Territory of Delhi (NCTD). The New Delhi district lies in the centre of NCTD. Delhi has a number of parks and gardens spread across about 8000 ha.

Within New Delhi, four large parks were selected for this study, managed by four different authorities: Buddha Jayanti Smarak park, Lodhi garden, Bhuli Bhatiyari park and Safdarjung’s tomb (Plate 1).

The Buddha Jayanti Smarak Park (BJSP) covers an area of 100 acres, and is situated in the western part of the New Delhi district. The park forms a part of the well-known Delhi Ridge Forests, containing a mix of dry thorny native scrub with planted vegetation on a rocky undulating, partially flat plain with high native biodiversity,
located within Delhi city. BJSP is managed by Central Public Works Department of Government of India (CPWD). There are 30 permanent gardeners, about 30 temporary workers and 7 security guards. The major problem reported by park staff is the lack of availability of water for gardening, especially during the summer, as also evident from the presence of dry tanks within the park. The gardeners however express trust that administrators will find a solution to the problem of water scarcity (Plate 1a).

The Lodhi Garden (LG), having an area of 90 acres, is located in the southern part of New Delhi district. The garden is maintained by New Delhi Municipal of Council (NDMC). The park is very well maintained and harbors about 200 species of trees. The park employs 85 gardeners and 7 private security guards. Most visitors, as well as park staff are very satisfied with the quality of the park. Some minor problems mentioned are the insufficiency of water for plants, littering by visitors and incursions by street dogs (Plate 1b).

Bhuli Bhatiyari Park (BBP) is located on the northern part of the district and also forms a part of the ridge. The 60 acre park is maintained by Delhi Development Authority (DDA). Out of 60 acres, 28 acres are under maintenance in the park by 10 permanent gardeners. The park has a large number of trees that have been planted in compensatory plantation initiatives, leading to overcrowding of trees. The park is not well maintained, with leaf litter and animal droppings strewn around. The park faces problem of lack of water for the plants. The staff size is insufficient for monitoring, personnel are old and unable to traverse the park, leading to an unsafe condition and presence of anti-social activity within the park premises (Plate 1c).

Safdarjung’s Tomb (ST) is a garden of 32 acres, laid out in the form of four squares with wide foot paths and water tanks, which have been further subdivided into smaller squares. This is a historical funerary garden remodeled into a public park. There are 11 gardeners and 19 security guards working here. The park is well laid out with neatly pruned and widely spaced trees, yet all parts are not equally maintained. Lack of sufficient personnel has led to less visited areas of the park becoming somewhat messy, with dried leaf branches and leaf litter found on the paths. The park is impacted by water scarcity, yet very few gardeners seem to be concerned by this (Plate 1d).
Plate 1: The four parks under study: (a) Buddha Jayanti Smarak park, (b) Lodhi Garden, (c) Bhuli Bhatiyari park and (d) Safdarjung's Tomb.
Data collection

Social network data describing the communication interactions among the park keepers have been collected on the basis of personal face to face interviews, in the month of April to August 2013. A total of 53 park keepers were interviewed (12 in BJSP, 21 in LG, 7 in BBP and 137 in ST). The questionnaire (see annexure) contains questions regarding the respondent’s personal information, their involvement in the park and about their contacts.

In order to access their satisfaction and knowledge about the park, the visitors of the parks were also quizzed. The respondents were randomly selected amongst visitors irrespective of gender, education or professional background. A total of 123 interviews were carried out (26 in BJSP, 28 in LG, 37 in BBP and 32 in ST). 9 visitors did not respond to the survey (2 in BJSP, 2 in LG, 1 in BBP and 4 in ST).

Visitors and the park keepers were approached for participation and were informed that the purpose of survey was to make a comparative study of the functioning and condition of the four selected parks. It took 5 to 7 minutes for the visitors and park keepers to answer the questionnaire and ensured that it reflected their immediate experience. The surveys of the visitors were conducted both on week days and weekends, in the mornings between 8.30 am to 10 am to collect views of the morning walkers and evenings from 5 pm to 6 pm for the other respondents. The park keepers were interviewed on week days.

Data Analysis

The data on the report or relation has been compiled in an adjacency matrix, where each respondent in the network has one cell. The second matrix is of attribute data. In this one interviewee has a cell corresponding to one attribute. Social network data matrices were analyzed using the standardly used software programmes by Ucinet (Borgatti et al., 2002) and the CoSBiLab Graph (Valentini and Jordán 2010). The qualitative and quantitative data from the interviews were summarized and subsequently coded. Both the numerical approach and the graphic display are effective way of describing a social structure. The graphic display of the social network of the park keepers is also called socio-grams. It is visualised by the Netdraw software (Borgatti et al., 2002), here the points (nodes) represent the actors and their
pattern of reporting is displayed by lines (or edges). We used three macroscopic (global) measurements of network structure.

Centre of gravity (CG) shows how “tall” or “flat” a hierarchy is. In a directed hierarchy, sources are at the bottom of the network (like producers in a food web) and sinks are at the top (like top-predators in a food web). CG determines how long the distance is, between the source level and the middle of the network. In a “flat” network, the CG is low, the hierarchy is wide and not tall (Figure 5.1 b). In a “tall” network, the CG is high, the hierarchy is narrow and not flat (Figure 5.1 a).

![Figure 5.1: Networks with (a) High center of gravity; (b) Low center of gravity.](image)

The status measure of Harary quantifies the relative power (prestige) of individuals in the hierarchy. High status means more important network position and the largest status (maxS) shows how important (influential) is the most important person.

![Figure 5.2: Networks with (a) High compactness value; (b) Low compactness value.](image)
Compactness quantifies how close the nodes of the network are to each other and how tightly the network is linked (Figure 5.2). The minimal value, zero, means isolated nodes with no interaction and the maximal values, one means a complete graph where each pair of nodes are connected. This is a measure for undirected networks, where the direction of the hierarchy not considered here.

**Results and Discussion**

From the network indices, it is observed that the Bhuli Bhatiyari park has the smallest network with 8 nodes and 7 links, while Lodhi Garden has the largest network consisting of 22 Nodes and 36 links (Table 5.1, Figure 5.3).

In terms of CG, Lodhi Garden (0.15), followed by Buddha Jayanti Smarak park (0.18) have the low CG, indicating a flat network. On the other hand, Bhuli Bhatiyari park has high (0.25) CG denoting a tall network.

In Lodhi Garden, Max S is highest (11), signifying the importance of the most important person in the network and Max S in Safdarjung’s Tomb (3) is the lowest among the 4 parks.

In general, all the parks have low compactness. Still amongst the 4 parks, Safdarjang’s Tomb (0.06) has the lowest compactness, followed by Lodhi Garden (0.08). Buddha Jayanti Smarak park has the highest compactness value amongst the 4 parks.

The park keepers were questioned about their satisfaction regarding the park (Table 5.2). It has been observed that the park keepers of Lodhi Garden are highly (4) satisfied with the quality of the park, whereas Bhuli Bhatiyari park keepers’ average satisfaction with the quality of the park is least among the 4 parks.

The park keepers were also asked about the problems of the parks. The average number of problems cited by the keepers of Safdarjung’s Tomb is higher (5) than the rest. On the other hand the average problems faced by park keepers are relatively less in Buddha Jayanti Smarak park.

The visitors to each of the parks were asked about the improvements they would want to see in the park. The visitors to Bhuli Bhatiyai park tend to have a higher average of
expected improvements in the park in comparison to the other 3 parks. The average expectation of visitors is lowest in Lodhi Garden. Visitors to Buddha Jayanti Smarak park could identify an average higher (4.5) number of species than the visitors to the rest of the parks.

**Table 5.1:** Network indices of parks.

<table>
<thead>
<tr>
<th>Parks</th>
<th>Nodes</th>
<th>Links</th>
<th>CG</th>
<th>MaxS</th>
<th>Compactness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhuli Bhatiyari park</td>
<td>8</td>
<td>7</td>
<td>0.25</td>
<td>6</td>
<td>0.11</td>
</tr>
<tr>
<td>Buddha Jayanti Smarak park</td>
<td>13</td>
<td>21</td>
<td>0.18</td>
<td>4</td>
<td>0.13</td>
</tr>
<tr>
<td>Safdarjung's Tomb</td>
<td>15</td>
<td>13</td>
<td>0.2</td>
<td>3</td>
<td>0.06</td>
</tr>
<tr>
<td>Lodhi Garden</td>
<td>22</td>
<td>36</td>
<td>0.15</td>
<td>11</td>
<td>0.08</td>
</tr>
</tbody>
</table>

**Table 5.2:** Performance indicators of parks.

<table>
<thead>
<tr>
<th>Parks</th>
<th>Average satisfaction</th>
<th>Average problems</th>
<th>Average expected improvements</th>
<th>Average number of Species identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhuli Bhatiyari park</td>
<td>2.57</td>
<td>3.67</td>
<td>3.84</td>
<td>4</td>
</tr>
<tr>
<td>Buddha Jayanti Smarak park</td>
<td>3.25</td>
<td>3</td>
<td>3.11</td>
<td>4.5</td>
</tr>
<tr>
<td>Safdarjung's Tomb</td>
<td>3.62</td>
<td>5</td>
<td>2.71</td>
<td>3</td>
</tr>
<tr>
<td>Lodhi Garden</td>
<td>4</td>
<td>3.67</td>
<td>2.14</td>
<td>2.5</td>
</tr>
</tbody>
</table>
Figure 5.3: The organization chart of the four parks under study: (a) Bhuli Bhatiyari park, (b) Buddha Jayanti Smarak park, (c) Safdarjung's Tomb and (d) Lodhi Garden. Arrows point at higher officials in the hierarchy.
Figure 5.4: Relation between Center of Gravity (CG) and average satisfaction of the parkkeepers.

We have found simple and clear relationships between the structure of social networks and the performance of parks.

If the social network has a larger CG value, the average satisfaction by the parkkeepers is lower (Figure 5.4). This means a larger distance and poorer communication between the lower-level (workers) and higher-level (leaders) individuals. One reason for satisfaction seems to be a flat and wide hierarchy (small CG), where workers feel like being closer to decision-makers. The lower CG of Lodhi Garden is associated with higher average satisfaction of the parkkeepers, while for Bhuli Bhatiyari park, high CG is associated with lower average satisfaction. It has been observed that the managers of Lodhi garden interact with the park gardeners and security personnel on a regular basis indicating better communication. In Bhuli Bhatiyari park, managers seldom visit the parks, hence poorer communication is seen between workers and higher level managers. Timely and smooth flow of communication is a vital feature of a strong relationship. It works through development of trust by support in solving disagreements and in lining up views, opinions and anticipations (Morgan and Hunt 1994; Moorman et al., 1993). Hence intense interaction and mutual communication in a network having low CG, leads to higher satisfaction of the parkkeepers.
Figure 5.5: Relation between Center of Gravity (CG) and average expected improvements by the park visitors.

On the other side, Figure 5.5 shows that higher CG results in higher average expected improvements by visitors. It is observed that the condition of Bhuli Bhatiyari park is not very good in terms of maintenance and security and visitors expect more improvement of the park. On the contrary, Lodhi Garden is better maintained than rest of the parks and hence visitors’ expectations for park improvements are less. There are two possible reasons for this: Firstly, Lodhi Garden’s network has low CG signifying that the flow of information is faster in Lodhi Garden. This enables the manager to disseminate new ideas, information and knowledge and hence supervise the workers in a better way. Being closer to the higher authority leads to development of trust and loyalty which in turn leads to better performance by the workers as envisaged through good maintenance of the park. On the other hand, in Bhuli Bhatiyari park, distance between subordinates and supervisor is longer, which leads to impeded flow of information and ideas resulting in weak management and subsequent poor maintenance of the park. Secondly, Lodhi Garden being a more participatory organization tends to have lower CG. In a participatory organization, there is active participation of the workers and officials keep their members well informed, especially on a local level where most people may know one another and the organization is able to meet the needs and preferences of the users (Cnaan 1991). On the other hand Bhuli Bhatiyari park being less participatory in nature, tends to have
higher CG. Lesser participation within the park management is reflected through
dearth of man power, inactive and ageing staff, thereby failing in maintenance of the
park. Hence, this raises the visitors’ expectations for further improvement of the park.

Figure 5.6: Relation between Max S and average expected improvements by the park
keepers.

In concert with CG, maxS also correlates with higher average expected improvements
by the park keepers (Figure. 5.6). Again, this supports our conclusion that workers
expect more from strong leaders in the studied parks. It is observed that Lodhi Garden
has the strongest leader amongst the four parks. Lodhi Garden is frequented by
influential bureaucrats and politicians. Thus the park has to be maintained well to
meet to expectations of the elite group and hence the leader plays the crucial role in
the management of the park. The leader’s initiatives are reflected in the setting up of a
butterfly conservatory, construction of an open air gym and training of stray dogs for
security purposes in the garden. Hence, it is evident that a strong leader is capable of
effective articulation of a convincing vision which leads to settling of high
expectations by the followers and also inspires others to participate. The leaders tend
to look into details of roles, responsibilities, structures and rewards in an organization
(Nadler and Tushman 1994; LeMay and Ellis 2006) and their attention and ability
leads to planning, organizing, implementing and evaluating projects to maximize
results (Hoppe and Reinelt 2010). In Bhuli Bhatiyari park, the absence of a leader
who takes strong initiative is conspicuous from the dismal condition of the park. Here,
the workers don’t see dynamism in their supervisors and hence have lesser hope for further improvement in the park condition.

![Graph showing the relation between Compactness and average problems faced by the park keepers.](image)

**Figure 5.7**: Relation between Compactness and average problems faced by the park keepers.

In a compact network, on average problems seem to be less serious (Figure 5.7). This means that more intense communication may really solve problems or at least give the feeling of problems being less severe. Peer interaction can foster cognitive development by enabling individual to acquire new expertise and realigning their ideas through discussion (Azmitia 1988). In Buddha Jayanti Smarak park, network compactness is high, indicating more interaction between the workers leading to collaborative problem solution. Hence perceived problems are less. On the other hand, Safdarjung’s Tomb, has a lesser compact network, indicating lesser interaction between the workers regarding the park. It is observed that the chain of reporting of security guards and the gardeners culminate to two different nodes. There is hardly any interaction or collaboration between the security guards and the gardeners, thus lessening the chances of resolving problems. Here there is dearth of constructivism amongst the workers and indifferent attitude towards the park and authorities leads to larger perceived problems.
According to Figure 5.8, compactness also contributes to a larger number of species being identified. This suggests that communication is also helpful in providing a better maintained park where visitors are more aware of their surroundings and thereby promoting greater connection between people and nature in urban settings. The enhanced interaction of the park keepers of Buddha Jayanti Smarak park and Bhuli Bhatiyari park might have facilitated conversation, discussion and information about the species seen in the park leading to incidental learning. Studies have shown that bystanders observing flora or feeding wildlife tends to stimulate responses towards flora and fauna by others (Dick and Hendee 1986, Randler et al., 2007).

**Conclusion**

Till date, SNA has been applied to look into the organizational structure, comparative analysis of organizations (Tichy et al., 1979) and performance of individuals and groups in organization (Sparrowe et al., 2001). This study advances previous research by examining relationships between social network structure of park management communication system and the performance of parks. Three key takeaways have emanated from this analysis. Firstly, it is evident that networks having lower CG render greater satisfaction to the park keepers, owing to better communication between the highest and the lowest levels of the network. Low CG also makes the
organization more participatory, wherein needs of people are heard and fulfilled which in turn raises the expectation of the visitors from the park.

Secondly, it is also observed that parks having stronger leadership as indicated by high MaxS, raises the expectation of the workers for further development of the parks. A strong leader ensures that there is effective control, involvement and also a certain level of dynamism in the management of the park. Initiation and implementation of novel ideas for the betterment of the park is reflected in positive acceptance by the lower levels, translating into better work output. Demonstrated strong and dynamic leadership i.e value of the highest person in the chain, also translates into more expectations for improvements in the park.

Thirdly, greater closeness of the nodes in the network as indicated by high compactness is indicative of better collaboration amongst the workers which leads to lesser perceived problems. Having a sound interactive relationship between workers and their levels of control ensures that participation in the park upkeep is more inclusive and in turn increases quality, better management and expectations.

The results of this analysis can be used for strategic restructuring of the informal structure of parks, so that so that a ‘more robust, resilient, responsive, flexible, innovative, adaptive and sustainable network structure is built and a creative organization emerges’ (Manso and Manso 2010). Thus in order to accomplish the status of well performing park which is capable of meeting the needs of the urban community, there should be restructuring initiative by integrating strong dynamic leadership, capable of providing guidance, encouragement and support to help them overcome any difficulties the park may encounter (Quinn and Spreitzer 1997). Better communication and dissemination of information from the upper level to the lowest level of the park must also be ensured. The interaction and relationship of the coworkers on the parks should be strengthened and maximized so that the communication is broader wherein they can share job experiences and collaborative learning.

All of this can be achieved if SNA arrives at the intended combination of high Max S, high compactness and low CG. In the final analysis, this combination is the perfect match to ensure that the park management works at maximum efficiency, translates itself into effective upkeep of the park and the ability to raise expectations of visitors.
Arriving at any other balance among the three would be a calculated decision that policy makers would have to make and may have the desired results with certain limitations. What works best for each park would remain limited by local considerations but variation from the ideal Social Network considerations would reflect itself in the overall park management.

Even though the study of four parks brings out the correlation between the network indices and park performance, future research on social network structure should consider more number of parks to make statistically robust statements. The relationship between other network indices and quality of park also needs to be further studied.

Opinion about the leadership, the consideration of problems and the scientific output all seem to be correlating with the structure of the social network. This suggests that (1) social network analysis can be used as a monitoring tool to assess the performance of parks and to indicate their internal problems and (2) social network analysis can also be used as a strategic, consultancy tool for designing better-functioning parks.