GLASS NETWORKS: THE NETWORK STRUCTURE OF WOMEN DIRECTORS ON CORPORATE BOARDS

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Rosanne Jane Hawarden

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A philosophical dedication:

"Whenever nonlinear elements are hooked together in gigantic webs, the wiring diagram has to matter. It's a basic principle. Structure always affects function." Steven Strogatz (2003:237) Sync: The Emerging Science of Spontaneous Order.

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Abstract

Boards of directors are overwhelmingly dominated by men. Globally, only 5-20% of directors of substantial corporations are women. Despite three decades of research and intervention this gender ratio has remained static except where affirmative action has forced change.

Using Carlile and Christensen's (2005) management theory building methodology, I develop a new theoretical approach to the study of women on corporate boards of directors called Glass Network Theory. Using concepts from small-world and scale-free network theory, I suggest that semi-permeable invisible barriers or glass nets, rather than glass ceilings, permit limited directors through to become connector directors with multiple board seats.

Resistance to change in gendered director networks is framed as a structural and normative characteristic of dynamic networks. Like other natural and social scale-free networks, gendered director networks display an emergent and self-perpetuating order. Low levels of diversity are incorporated as adaptive features of stable self-similar director networks responding to environmental pressures and economic fluctuations. Nested director networks at global, national or local levels show self-similarity at all scales, particularly where 'shoulder tapping' or preferential attachment underpins the network formation.

Probing gendered director networks with social network analysis tools shows that women directors in global and national networks are more likely to be found in the largest connected component than in the unconnected network components. Both male and female director networks show the characteristics of small-worlds, that is, high clustering coefficients and short path lengths. Both male and female directors also show 'positive assortativity' where directors of high degree associate with other
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directors of high degree. As the distribution of multiple directorships follows a power law, the model of the expected seat spreads is a useful tool to track the effectiveness of governance or affirmative action interventions such as quotas.

I conclude that female director networks are not inherently different from male director networks except in size.

Figure 1.
Image accompanying the Wall Street Journal article by Hymowitz and Schellhardt (1986) which introduced the term glass ceiling (Eagly & Carli, 2007a, p. 4).

Acknowledgement

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My thanks also go to Professor Gerald Davis, University of Michigan, for making the iconic 1999 Fortune US 1000 data set available. It seems fitting that this should be used in the first women directors' network analysis.

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Glossary of Terms

*New terminology developed in Glass Network Theory

Assortativity	The tendency of network nodes to preferentially join others that are similar or like them.
Betweenness	The proportion of shortest paths from one node to another that pass through a central node.
Clustering coefficient	A measure of how close knit a group of directors are in relation to a director to whom they are all linked.
*Connector director	A director with two or more seats in substantive companies.
Degree	Average number of interlocks or links to a director.
Degree distribution	A frequency distribution that is constructed by counting the number of directors that have one link coming into them, the number that has two etc.
Geodesic distance	The length of the shortest path required to connect two nodes. For a network it is the average number of edges that must be traversed in the shortest path connecting any two nodes.
*Glass net	A transparent but semi-permeable barrier that permits predictable and limited numbers of men and women through to the boardroom.
*Glass network	The invisible or transparent network created when directors sit on common boards together as revealed through the tools of social network analysis.
*Glass Network Theory	A theory developed from an exploration of change-resistant gendered director networks where a glass network or invisible network blocks the path of women directors to the boardroom rather than a glass ceiling.
Homophily	Preference for the similar.
Edge, link or interlock	The relationship that a director has to his co-directors through sitting on a common board.

Power Law	Mathematical law of the 'vital few and the trivial many'.
Preferential attachment	A preference of network nodes to attach to nodes that already have edges.
Queen bee	A woman director with two or more seats, who by adopting the behaviour patterns of male directors is perceived as violating the norms of feminine behaviour.
Salience	Preference for notable and relevant characteristics.
Scale-free network	Networks characterised as having a degree distribution that conforms to a power law and is similar at all scales.
Seat	Alternative term for directorship to clearly distinguish individual directors from the many directorships they may hold.
Seat spread	Frequency distribution of multiple directorships.
Self-similarity	Repetitive smaller network segments which resemble the combined segments.
Shoulder tapping	A method of recruiting directors through personal invitations to known colleagues and acquaintances.
Small-world	A network with a low average geodesic distance between nodes and a high clustering coefficient.
Small-world Quotient	In a director network of *n* nodes with a mean of *k* edges or links per node, let *Lactual* equal the average geodesic or shortest path length between nodes in the largest connected component. Let *Lrandom* equal the average geodesic in which the edges between nodes are random (approximated by *ln(n)/ln(k)* where *ln* is the natural logarithm). Let *Cactual* equal the average degree of local clustering in the largest connected component. Let *Crandom* equal the average degree of local clustering in the randomized network (approximated by *k*/*n*). Then:

Small World Quotient (SW) = [Cactual/Lactual] * [Lrandom/Crandom]