

# **Informal and Formal in Balance Theory**

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## **Introduction**

Due to the strong focus on services and technology in the modern economy, organizations are becoming increasingly reliant on complex collaboration. As a result, businesses are increasingly turning to social network theory to diagnose and analyze organizational problems.

Formal organization refers to the effects of organizational constraints, documented in organizational charts and the like. Informal organization, on the other hand, is based primarily on “sentiments,” feelings that organization members have for each other. These sentiments determine whether a working relationship feels “energizing” or “de-energizing”, as discussed in Rob Cross and Andrew Parker’s book on social network analysis. Because these relationships can be represented as a graph with negative and positive edges, they can be understood in terms of Heider’s theory of socio-cognitive balance as generalized by Cartwright and Harary. Unfortunately, this branch of theory, while useful as a heuristic, is insufficient to predict many of the effects of energizing and de-energizing relationships, including Cross and Parker’s observation that the effects of such relationships seem to spread throughout a social network. In particular, balance theory doesn’t account for differences in ability to change relationships, as some individuals have more power to alter formal organizational constraints. The theory also merits further empirical examination in an organizational context.

As modern organizations continue to become more complex and collaboration takes an increasing role, understanding the combined effect of formal and informal structure will be key to good management. As a result, socio-cognitive balance theory and other social network theories will become increasingly important, and business organizations will be an important testing ground for the

application and development of such theories.

## **Formal and Informal Organization**

Two types of organization determine how members of organizations relate and interact. In formal organization, relationships and interactions are dictated by documented organizational constraints, requiring individuals to communicate and collaborate. In modern organizations, these constraints are often hierarchical, defining a chain of command and dividing tasks between organizational branches (Cross 2004: 3-4). Informal organization, on the other hand, is implicitly defined by the free interactions between organization members and the “sentiments” that members have for each other. Of course, there is some overlap between the two. Organization members generally support the goals of their organization, and positive interactions driven by those goals generally leads to positive “sentiment,” leading to an increase in informal interaction. Thus, informal organization may be affected by the desire to collaborate (Kadushin 2005: 1-2). Both types of organization define social networks, consisting of organization members and the relationships between them.

One reason why informal networks are a key facilitator of collaboration is that they provide individuals with access to new information and novel ideas. In his famous paper on “The Strength of Weak Ties,” sociologist Mark Granovetter notes that people’s close friends (“strong ties”) are likely to know each other. As a result, acquaintances (“weak ties”) play a more significant role in connecting a person to unknown individuals. Thus, weak ties serve as “bridges” between social circles, tightly connected groups within a larger social network (Granovetter 1973: 1363-1369). Similarly, people with whom one must collaborate on a regular basis are unlikely to serve as novel sources of ideas. Connections between disparate groups within an organization, unlikely to be represented in formal organizational structure, are therefore vital to collaboration.

Informal networks also address the problem of rapid organizational change, a problem sociologist Alan Toffler discusses in *Future Shock*. The duration of relationships between individuals and organizations is shortening as reorganizations, creation and dissolution of organizations, and movement of individuals between organizations become more common (Toffler 1970: 127-128). The reorganization or dissolution of an organization breaks formal bonds between those who are no longer required to collaborate. Informal bonds may be weakened by a decrease in interaction, but they still may persist after an organizational change removes formal bonds between the same individuals.

Since formal structure requires time to be revised and documented, rapid change in organizational methods and goals also means that past formal structure may be ill-suited for present organizational challenges. Informal structures can fill this gap, as people can form ad-hoc collaborative relationships to get work done despite organizational chaos. Toffler coins the term “ad-hocracy” to refer to this sort of dynamic organizational structure (125).

Toffler also notes some problems with hierarchical structures specifically. In a pure hierarchy, “sideways” connections between organizational branches are non-existent. In heavily hierarchical organizations, such connections are minimized, and tend to occur at higher levels of the hierarchy. Toffler shares an anecdote from an early job working at a foundry:

In the immense shed where we worked, something was always going wrong. A bearing would burn out, a belt snap or a gear break... The worker nearest the breakdown would notify his foreman. He, in turn, would tell the production supervisor. The production supervisor would send word to the maintenance supervisor. The maintenance supervisor would dispatch a crew to repair the damage. (Toffler 1970: 138)

Thus, hierarchical organizations suffer a slowdown when required to communicate between branches, as the message must travel up and down the chain of command (137-140). This problem might be avoided by including formal sideways connections, avoiding hierarchy altogether, or allowing informal

collaboration between workers “on the ground,” giving them more power to make the decisions involved in solving problems.

As Toffler observes, the complex, formal, hierarchical structures of bureaucracy are well-suited to managing routine, repetitive tasks (142-143). These tend to be the sort of tasks that don’t require social collaboration. For example, industrial processes can be broken down into finer and finer subprocesses, with each step executed by an individual worker while management handles optimization of the overall task. This efficiency makes up for the time delays produced by communication up and down the hierarchy. However, as the modern economy becomes more service-oriented and simple mechanical tasks are increasingly automated, the efficiency benefits produced by hierarchy diminish and the need for direct collaboration among workers increases. Thus, managers have an increasing need to understand informal organizational structure.

For this challenge, managers are increasingly turning to the body of theory known as social network analysis (Cross 2004: 3, Morton 2004: 216-217). Social network analysis is a subset of sociological theory that sprung from the “gestalt” theory of Wolfgang Kohler in the 1930s. Gestalt theory took a holistic perspective on social structures. It recognized that the *structure* of a social system might have an influence on the properties of that system. Furthermore, it noted that the structure of a social system might affect the system’s participants. Arguably, the modern field of social network analysis was founded in 1933, when the sociologist Jacob Moreno created the “sociogram,” a method for representing social structures as points, representing individuals, and lines, representing relationships or interactions between individuals. Not only did the sociogram formalize a method for visualizing social networks, this visualization also corresponded to a mathematical graph. This put all the power of graph theory, a developing branch of mathematics, into the hands of social scientists (Scott 2000: 8-10).

Of course, formal organizational structures represent social networks as well, assuming people act in accordance with organizational constraints. However, the social networks defined by formal organization tend to be a small, simple part of an organization's social network. Furthermore, that assumption is not always correct. Some organizational constraints are not followed because they are simply in error. Someone might not interact with their nominal boss if all their work is actually supervised by a different manager, for example. Organizational constraints can also be actively resisted by members of the organization, as when a boss avoids interacting with a particular subordinate due to a personal conflict. Other organization members may foster productive relationships with individuals they would rather avoid in order to achieve various goals.

Understanding the overlapping effects of formal and informal organization requires analysis of the full network of relationships and interactions within an organization, as well as the documentation of formal organizational structure. It also requires analysis of the "sentiments" underlying those relationships. Fortunately, a framework for performing this analysis is provided in Rob Cross and Andrew Parker's *The Hidden Power of Social Networks*, in which they develop a concept of "energy" in social networks.

### **"Energy": Formal and Informal Collide**

Cross and Parker's observations about social network analysis methods come from their experience in management consulting, much of which is in the context of traditional, hierarchical organizational structures. At first, most of the pair's efforts focused on the ability of high performers to gain useful information from their social networks. However, they changed their methods slightly in response to this comment from a manager at a strategy consulting firm:

Our high performers are not just people who are smart... it has much

more to do with what I call buzz than a slight difference in IQ. Our high performers create enthusiasm for things.... They create energy... (Cross 2004: 49)

In response to this comment, Cross and Parker added a question to their network analysis surveys, asking, “When you interact with this person, how does it typically affect your energy level?”

Respondents answered subjectively on a scale from 1 to 5, with 1 corresponding to “strongly de-energizing” and 5 corresponding to “strongly-energizing.” In addition to classifying relationships as “energizing” and “de-energizing”, Cross and Parker used the survey to classify individuals as “energizers” or “de-energizers” based on the average answer for all relationships they received (51).

Cross and Parker make several key observations about this property of “energy”. First, all else equal, energizers were generally more effective, both at getting other people to implement their ideas, and in receiving more attention from coworkers interested in collaboration (54). Second, energy had a significant effect on information-seeking relationships, as people were far more likely to seek out energizers than de-energizers (55-56). Third, the positive effects of energizing or de-energizing relationships appear to spread throughout a network. Individuals closely connected with energizers were, all else equal, generally more effective than those closely connected to de-energizers, even if they never interacted with the energizer or de-energizer directly (50, 55). Finally, de-energizing relationships are often directed at managers within an organization (50).

Energizing and de-energizing relationships can be represented as a signed graph, with energizing represented as positive edges and de-energizing relationships as negative edges. Such networks are the domain of socio-cognitive balance theory. Balance theory is based on the idea that networks of positive and negative relationships can be classified into “balanced” and “unbalanced” structures. “Unbalanced” structures produce social or cognitive tension which pushes the structure towards a balanced configuration (Opp 1984: 31). Thus, this theory may address the phenomena that

Cross and Jordan describe.

## **Socio-Cognitive Balance Theory**

Socio-cognitive balance theory was initially formalized by Fritz Heider in 1946, in his paper on “Attitudes and Cognitive Organization.” In the paper, Heider examines networks containing a person, another person, and a third entity. The third entity could be another person, or it could be an event, an object, a behavior, or an idea. Entities in the network are connected by positive or negative relationships, either of association / non-association, which Heider refers to as “unit formation,” or like / dislike. Heider’s hypothesis states that for two people, balance is achieved if the connections between them are either all positive or all negative. When a third entity is added, balance is achieved if all connections are positive or if two entities are connected positively while sharing a negative relationship with the third (Heider 1946: 2).

Dorwin Cartwright and Frank Harary generalized this theory in 1956 in terms of the theory of signed graphs, in which edges are either positive or negative according to the relationships they represent. In signed graph theory, the sign of a cycle is equal to the product of the signs of the edges in the cycle (Cartwright 1956: 283). Cartwright and Harary noted that Heider’s triads have a positive sign when balanced and a negative sign otherwise. This also applied to the pair relationships that Heider examined, crossing via a positive relationship and returning via a negative one made for a negative cycle. Thus, they suggested that Heider’s hypothesis applied to larger networks, theorizing that networks without negative cycles were in a state of balance (284). The paper goes on to formulate a theorem about the structure of such graphs: Graphs are balanced if and only if all their points can be separated into two distinct subsets such that all connections within a set are positive, while all connections between sets are negative (287). This theorem makes a certain amount of intuitive sense.

Positive relationships between members of hostile cliques will put strain on both the bridging relationship and the larger hostility. Two mutually hostile cliques are unlikely to put aside their differences, so that situation is stable. With three competing entities, however, there is always an incentive for two of the groups to team up against their mutual opponent, destabilizing the situation.

Cartwright and Harary's generalization applies only to social networks, discarding the possibility, present in Heider's theory, that some points in the graph do not represent people. The generalization also makes several other important assumptions. First, it assumes that balance theory holds true for networks of any finite size (290). This assumption must be taken with a grain of salt, as it doesn't account for people's imperfect knowledge of their social network. Since Heider's model is a cognitive theory, it cannot be divorced from the perspectives of individual agents. Fortunately, the paper also provides the groundwork for addressing this problem, in the form of a definition of "local N-balance" (289). This restricts the measurement of balance to cycles including a certain individual, and limits the length of the cycles considered to no more than N. Presumably, the longer a cycle is, the less an individual will be aware of its full extent. To put it another way, people are likely to more concerned with the associations of their close friends than those of someone several jumps away down the social network. Second, the generalization assumes that the different types of relationship mentioned in Heider's theory are functionally equivalent in terms of balance (291). This implies that social balance is not determined by the way people associate, whether by free preference or due to the constraints of some more formal organizational structure. Both of these generalizations allow Cartwright and Harary's generalization of the theory to be potentially useful in an organizational context.

Harary's fundamental hypothesis states that forces towards a balanced state "will arise" from the imbalanced configuration, causing tension which could lead to changes in action or cognitive



structures (Heider 1946: 1). As Karl-Deiter Opp points out in his 1984 critique of balance theory, the “explanatory potential” of this hypothesis is quite low, as the predictions the hypothesis makes are quite vague. For example, the hypothesis doesn’t specify whether the “forces” of imbalance are more likely to produce behavioral changes or cognitive reorganizations. Furthermore, the hypothesis makes no quantitative predictions about the change in relations from imbalanced to balanced states, just asserting that things will move in that direction (Opp 1984: 33). While Cartwright and Harary present a concept of “degree of balance” which at least allows that sort of change to be quantified, their paper doesn’t use that concept to make more specific predictions (Cartwright 1956: 288).

Furthermore, the balance theory hypothesis might not match empirical findings. According to a 2003 paper by Norman Hummon and Patrick Doreian, the results of empirical research on balance theory has been “mixed... at best” (Hummon 2003: 18). Doreian later hypothesizes that this is due to conflict between researchers who followed Heider more directly, focusing on cognitive models, versus those who followed Cartwright and Harary and focused primarily on social networks (Doreian 2004: 277). Hummon hoped to solve this problem by introducing an agent-based simulation model of social balance, in which each actor in a group has their own flawed model of group structure and attempts to minimize imbalance that is perceived by them personally (284). This certainly represents a more sophisticated approach to modeling the problem, but it is still subject to Opp’s concerns. Since the simulation can reach a variety of final states for a given initial configuration, it doesn’t provide much in the way of prediction. The model doesn’t suggest how agents affect their relationships, nor does it account for situations in which someone is more constrained with some relationships than to others (285). Furthermore, it remains to be seen whether the model’s prediction will be confirmed by real-world data.

Opp notes with disappointment that balance theory has been used mainly as a heuristic in the

development of more modern strains of social network theory. The use of balance theory in deriving new hypotheses has been minimal, and the theory has not been presented as an alternative or challenge to new hypotheses (Opp 1984: 44). Opp is similarly frustrated by the limited attempts to expand the scope of balance theory, or to revise it in light of anomalies that don't match the theory's predictions. Opp notes a tendency for social scientists to refer to these anomalies as "exceptions" rather than "falsifiers," and mocks this approach as a "'Gruyere cheese strategy': the range of application is, so to say, perforated... In the extreme case there is only one big hole" (38-39). Opp feels that the lack of rigorous scientific method is hindering the social sciences:

We suppose... that our analysis holds for a great many—if not all—social psychological theories. In other branches of the social sciences the criteria mentioned above are realized to a still lesser extent. Perhaps one may say in general, that the state of the social sciences, regarded by many scientists as disappointing, is—at least in part—caused by the fact that social scientists try to reach their goal by inadequate means. (45)<sup>1</sup>

Opp's excoriating criticism merits further discussion, although that falls beyond the scope of this paper. It is worth noting, however, that heuristics are not without use, and there are some tradeoffs between scientific rigor and immediate exploration and application of a plausible theory. This may hold especially true in the social sciences, as individual relationships and larger social structures often behave in a complex, possibly non-deterministic way. And there is research supporting the usefulness of Heider's balance theory as a social heuristic.

Nehemiah Jordan's 1953 paper presented people with a series of Heiderian triads, instructing them to imagine themselves in the shoes of the first person in the triad, then to rate on a numerical scale

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1 Of course, some social scientists contest the validity of Opp's critique, suggesting that he misidentifies the goal of social science. Social science can be viewed as "an interpretive [science] in search of meaning" as opposed to "an experimental science in search of a law," as such it values "thick description" over predictive rigor (Geertz 1973). However, this line of argument does not vindicate balance theory, which provides little in the way of interpretative description. It seems that social scientists sometimes want the power of mathematics to build complex frameworks from simple ideas (as Cartwright and Harary do with Heider's hypothesis) without the accompanying mathematical precision.

how “unpleasant” the situation seemed (Jordan 1953: 284). People tended to rate balanced situations as less unpleasant, averaging 46 on Jordan’s scale, while imbalanced situations received an average score of 57 (Cartwright 1956: 291)<sup>2</sup>. In addition, subjects preferred positive relationships to negative ones, especially when they imagined themselves as directly involved in the relationship in question (Jordan 1953: 284).

While Jordan followed Heider’s lead in representing “no sort of bond or relationship” between two members of the triad as a negative edge (277), Cartwright and Harary suggest that this is inaccurate. While “likes” is the opposite of “dislikes,” “has no sort of bond or relationship” is the complement, not the opposite, of the association relationship. Therefore, they argue, it would be better to represent that as no edge as opposed to a negative edge. This makes all triads including this absent relationship vacuously balanced, since they contain no cycles. The vacuously balanced triads that Jordan viewed as balanced had a mean unpleasantness score of 51. The vacuously balanced triads that Jordan viewed as imbalanced *also* had a mean unpleasantness score of 51. The remaining balanced and imbalanced configurations produce average scores of 39 and 66, respectively (Cartwright 1956: 291). Not only does this data support Cartwright and Harary’s suggestion, it also strongly supports Heider’s hypothesis that imbalanced structures produce unpleasant cognitive tension. Cartwright and Harary even provide an argument for why Jordan’s other observations might also be predictable from balance theory. If subjects assumed that people who were described as liking or disliking each other had “some sort of bond or relationship”, a reasonable assumption, then “dislike” relationships produce an imbalanced cycle between the two participants, while “like” relationships allow that cycle to remain balanced (292).

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Cross and Jordan’s “energizing” and “de-energizing” relationships seem analogous to balance

<sup>2</sup> Scores were based on a mark on a 90 mm line, with the left end marked as “best” (score of 10), the middle marked as “neutral” (score of 55), and the right end marked as “worst” (score of 99) (Jordan 1953: 277).

theory's "like" and "dislike" relationships, albeit without the assumption that such relationships are symmetrical. Aside from the obvious generalization that people enjoy being "energized" and dislike feeling "de-energized," that analogy is consistent with the observation that people generally seek out energizers over de-energizers for collaboration. Formal relationships within an organization correspond to positive "association" relationships. Thus, combining an analysis of energizing and de-energizing relationships and formal organizational documentation allows the interactions between hierarchy and informal structure to be understood in light of the balance theory heuristic.

### **Applying and Improving the Balance Heuristic**

Cross and Jordan's simplest observation that could be addressed through the balance heuristic is the frequency of de-energizing relationships with managers. Combining association through an organization (positive) with a de-energizing relationship (negative) produces a negative loop, which is unbalanced. Since this observation is in the context of a hierarchical organization, the relative absence of de-energizing relationships with subordinates could be explained by the difference in power. Managers more able to change formal organizational constraints, possibly by firing or transferring employees. They also have more power to change the behavior of de-energizing subordinates than subordinates have to change the behavior of de-energizing bosses, perhaps through assigning additional training in collaboration techniques and social skills (Cross 2004: 52-53). Positive changes in social behavior may lead to positive changes in informal relationships. This is especially true in cases where there is a formal relationship between the individuals in question as formal interaction provides them with the opportunity to demonstrate such change. In order to explain the effects of formal structure, balance theory needs to account for differences in individual's power to influence relationships, both the formal association of individuals and the informal relationship between those associated.

The question of whether balance theory could explain the spread of energizing or de-energizing relationships through a network is even more complex. A simple case to consider is two workers collaborating under the supervision of one manager. The three of them compose a Heiderian triad. If a boss has a de-energizing effect on one of their subordinates, as in the case above, the triad becomes unbalanced. Unfortunately, balance theory says little about how, exactly, the following changes will take place, although it does suggest which final configurations are favored. If the de-energizing relationship cannot be repaired, balance will be restored when the subordinates develop a negative relationship with each other or when the subordinates both develop a negative relationship with their boss. Balance theory would predict that de-energizing relationships create tension that either splits teams along “likes the boss” versus “doesn’t like the boss” lines or create an antagonistic relationship between the team as a whole and their superior. If the heuristic is correct, then one would expect dysfunctional teams to frequently be divided along these lines. Not only does this suggest some weaknesses of hierarchical organization in particular, it also suggests that formal organization in general can be susceptible to this sort of problem. It would be interesting to use balance theory to determine under which sorts of formal structure working teams are most likely to be split in this manner.

Heider and Cartwright’s analysis of local balance also suggests some interesting things about hierarchical networks. They introduce the following theorem:

If a connected  $s$ -graph  $G$  is balanced at  $P$ , and  $Q$  is a point on a cycle passing through  $P$ , where  $Q$  is not an articulation point, then  $G$  is also balanced at  $Q$ . (Cartwright 1956: 289)

“Articulation points,” also known as cut points, are points whose removal splits a connected graph into two or more disconnected subsets (289). This theorem implies that articulation points are the points in a graph where local balance is most prone to changing suddenly. If a network is hierarchical, each

supervisor serves as an articulation point, the only one connecting their subordinates to the larger organization. Thus, balance theory suggests a possible advantage of non-hierarchical networks in avoiding tension within the organization.

## **Conclusions**

The overlapping effects of formal and informal structure can be extremely complex. Understanding these interactions is becoming increasingly important, as many organizations, including businesses, rely on complex formal organization in addition to extensive informal collaboration. Fortunately, social network theory provides tools for analyzing these interactions. Unfortunately, these tools would benefit from additional theoretical complexity and refining these theories will require extensive empirical research.

For example, extending the agent-based balance model of Hummon to account for different individuals having different levels of power in changing relationships could be fruitful. In particular, hierarchical organizations could be modeled by assuming supervisors have much more power than subordinates to change formal organizational constraints that they are involved in. It would also be useful to reconsider the role of asymmetrical relationships in balance theory, since one-way “energizing” or “de-energizing” relationships seem to be a common feature of formal organizations.

As business become increasingly reliant on network theory, business organizations will play an important part in testing that theory and applying the knowledge earned. While currently of limited use as a heuristic, balance theory contains insights that may prove quite useful in understanding the role of positive and negative relationships within an organization.

## Works Cited

Cartwright, Dorwin and Frank Harary. 1956. "Structural Balance: A Generalization of Heider's Theory." *Psychological Review* 1956: 63: 277-293.

Cross, Rob and Andrew Parker. 2004. *The Hidden Power of Social Networks*. Boston: Harvard Business School Press.

Doreian, Patrick. 2004. "Evolution of Human Signed Networks." *Metodološki Zvezki* 1: 2: 277-293.

Geertz, Clifford. 1973. "Thick Description: Toward an Interpretive Theory of Culture." *The Interpretation of Cultures*. New York: Basic Books, 3-30.

Granovetter, Mark S. 1973. "The Strength of Weak Ties." *The American Journal of Sociology* 78: 6: 1360-1380.

Heider, Fritz. 1946. "Attitudes and Cognitive Organization." *The Journal of Psychology* 21. <http://psychclassics.yorku.ca/Heider/attitudes.htm>. Accessed 10/14/2007.

Hummon, Norman P. and Patrick Doreian. 2003. "Some dynamics of social balance processes: bringing Heider back into balance theory." *Social Networks* 25: 17-49.

Kadushin, Charles. 2005. "Networks and Small Groups". *Structure and Dynamics: eJournal of Anthropological and Related Sciences* 1: 1: 5: 1-18.

Jordan, Nehemiah. 1953. "Behavioral forces that are a function of attitudes and of cognitive organization." *Human Relations* 6: 273-287.

Morton, S. C. et al. 2004. "Managing the informal organization: conceptual model." *The International Journal of Productivity and Performance Management* 53: 3: 214-232.

Opp, Karl-Dieter. 1984. "Balance Theory: Progress and Stagnation of a Social Psychological Theory." *Journal for the Theory of Social Behavior* 14: 1: 27-49.

Scott, John. 2000. *Social Network Analysis: A Handbook*. London: Sage Publications.

Toffler, Alvin. 1970. *Future Shock*. New York: Bantam Books.