Journal of MultiDisciplinary Evaluation
Volume 8, Issue 19

JMDE
Journal of MultiDisciplinary Evaluation

ISSN 1556-8180
http://www.jmde.com

What's in a Scriven Number?

Abhik Roy
Western Michigan University

Kristin A. Hobson
Western Michigan University

Chris L. S. Coryn
Western Michigan University

Background: Other than Leonhard Euler, one of the greatest physicists and mathematicians ever to have lived and dubbed "…c'est notre maître à tous" or "…the master of us all" by the French mathematician and astronomer Pierre-Simon Laplace, Paul Erdös was a mathematician who published more papers in mathematics than anyone else (Hoffman, 1998). Because of this feat, friends and colleagues created what has been known as an Erdös number. An Erdös number describes a person's degree of separation from Erdös through collaborations directly with him or with others who have collaborated with him.

Purpose: In this paper, we present reasoning similar to that of an Erdös number for Michael Scriven who is widely considered to be one of the leading theorists in evaluation. With his numerous publications and influence on the theory and practice of evaluation, we present not only the hope, but also the need for a Scriven number.

Keywords: *Scriven number*

Setting: Not applicable.

Intervention: Scriven number.

Research Design: Not applicable.

Data Collection and Analysis: Not applicable.

Findings: A collaborative count such as a Scriven number would centralize evaluation. A Scriven number would form new connections and collaborations, thus yielding a robust connectivity.

A Giant in Mathematics

Paul Erdös was born on March 26, 1913 and earned his doctorate in mathematics at the age of 21 in 1934. Working with hundreds of collaborators, Erdös would publish at least 1525 articles in mathematics in areas such as combinatorics, graph theory, set theory, and number theory (Graham & Nesetril, 1996; Grossman, 2010). To date, he has published more papers in mathematics than anyone else except for the mathematician and physicist Leonard Euler (Hoffman, 1998). Because of this great feat, many of Erdös' friends and colleagues created a number that represents an individual's degree of separation from Erdös through collaborations. This number is known as an Erdös number.

The Erdös Number

A collaborative distance is the distance between two individuals measured through some type of criteria. A person's Erdös number is the authorship of mathematical papers using the collaborative distance between an individual and Erdös. For example, a person who has written a mathematical paper with another person who has written a mathematical paper with Erdös has an Erdös number of two because he or she is separated from Erdös by two degrees through collaboration. Erdös himself has the unique number of zero.

Because of the massive amount of collaboration in academics today, many of those outside of the mathematics field also have Erdös numbers. Scholars such as the linguist Noam Chomsky and political scientist Steven Brams have an Erdös number of four and two, respectively.

Variations of the Erdös number have extended to other fields such as in physics with the Einstein number (Albert Einstein), in acting with a Bacon number (Kevin Bacon), and in economics with a Stiglitz number (Joseph Stiglitz). Some people have multiple numbers such as Noam Chomsky who has a Chomsky number of zero in the field of linguistics, but an Erdös number of four as noted above. In addition, approximately 401,000 different authors hold an Erdös' number with approximately 676,000 collaborations (Grossman, 2012a).

The Impact of a Number

The origins of the Erdös number are unknown. It has been purported that mathematicians Casper Goffman (Goffman, 1969) and Ron Graham (Odda, 1977) created of this number. Both have the earliest known discussions of the Erdös number but the idea was thought to be proposed by John Iabell in 1957 (Grossman, 2012b) While, the earliest persons known to have Erdös numbers are mathematicians Richard Dedekind (7), who lived from 1831–1916, and Georg Frobenius (3) who lived from 1849–1917 (Grossman, 2012c).

The distribution of Erdös have a range of up to and including 13 with a mean less than 5, while approximately all of the individuals with an Erdös number has a count less than 8 (Grossman, 2012d). Not only is the number simply for "bragging rights," but it also has centralized mathematics in academic research. Social network analysis has shown that the impact of groups and subgroups of people in mathematics has been affected greatly by closeness and the ability to network (Batagelj & Mrvar, 2000).

In theory, this network has become more dense (Prell, 2012), or robust, resulting in greater collaboration (Jin, Girvan, & Newman, 2001). Thus, there is a tipping point at which papers are no longer confined to the central subject area, but have moved into mixed-subject areas such as mathematics-sociology and linguistics-physics-astronomy. Now the central subject area is richer as it has become applicable outside its theoretical or applicatory construct.

The Need for a Degree Number in Evaluation

The field of evaluation is both old and new (Coryn, 2007). Its historical aspect comes from the birth of humanity where humanoids would have to make evaluative judgments in everyday life (Scriven, 1991). Of course, these judgments were not considered academic as much as a need for survival and expansion.

During the 1960s, evaluation emerged as a distinct field of practice. Academically, there were the evaluation of educational improvements (e.g. new math curriculum), resource allocation (e.g. the Space Race), and societal change programs (e.g. Great Society domestic programs). These laid the foundation of the subdisciplines of fields of evaluation: logic, ethics, aesthetics, medicine, product, personnel, performance, program, policy, proposal, portfolio, phenomenon (disaster), intradisciplinary, and metaevaluation. Evaluations in the aforementioned subdisciplines occur across numerous disciplines including, but not limited to, medicine, public health, engineering, education, and international development.

So why should evaluators care about a degree number? Evaluators, after all, are not only in the very narrow field of "evaluation." They are in almost every subject area where they are constantly "…judging the worth or merit of something or the product of that process" (Scriven, 1991). In this sense, there exists an advantage over a field such as mathematics, which has been so restrictive for a great deal of its academic life. However, unlike a field such as mathematics that has had time to grow from a central cluster of collaborations outwards that has resulted in cross collaboration (see Figure 1), we argue that these specializations create clusters in which evaluators in a specific field collaborate amongst themselves and they rarely stray outside (see Figure 2).

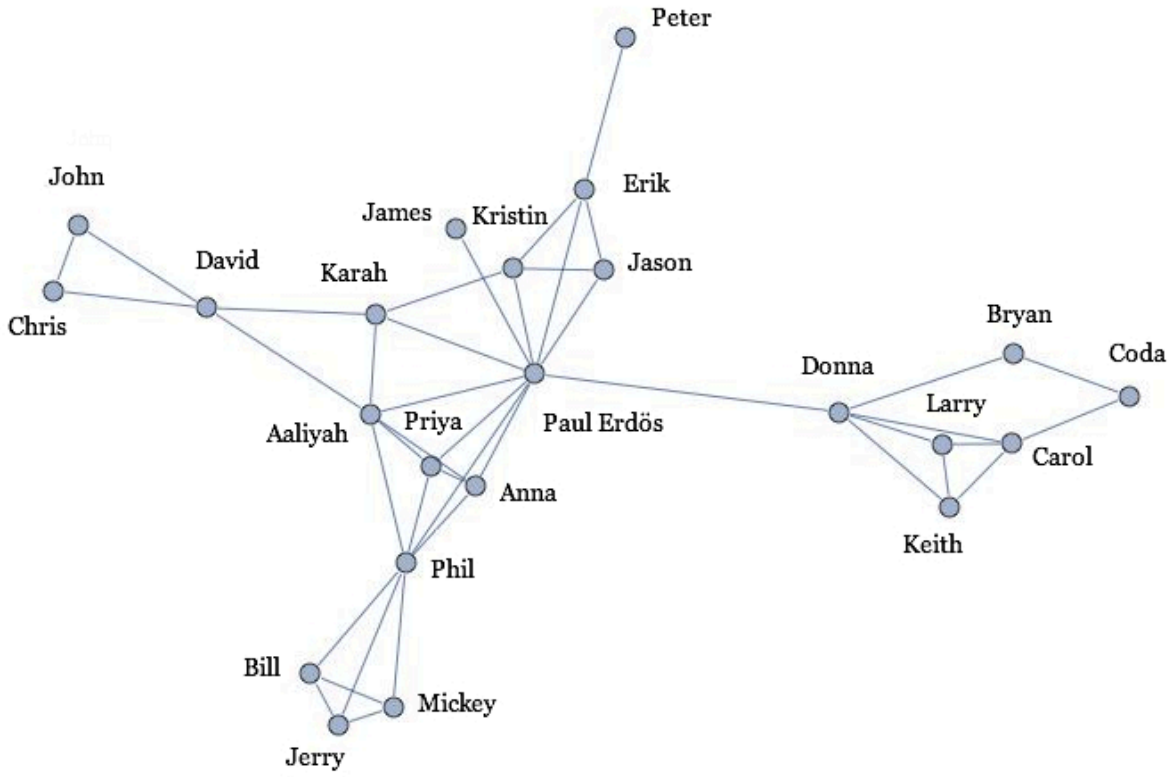

Figure 1. Hypothetical Cross Collaboration of Mathematical Papers

A collaborative count such as mathematics' Erdös number would help to centralize evaluation. Like mathematics, this would form new connections and collaborations, thus yielding a robust connectivity that would not become saturated in the near future, as the field of evaluation is a fast growing field of study. So who could represent such a number?

Scriven Number

There are many worthwhile candidates in evaluation ranging from pure theorists to those who are strictly applied. However, as Michael Scriven is widely considered the father of modern evaluation (his numerous manuscripts total over 400), it is our assertion that he be given such an honor. Thus, the introduction of the Scriven number.

Much like an Erdös number, by which Scriven has a number of five, a Scriven number would follow the same rules and regulations of degree count and regularity. Scriven himself would have the unique number zero. While, each person having a direct collaboration (e.g. Coryn, Hattie, Scriven & Hartmann, 2007) would have a Scriven number of one. In addition, if an individual collaborated with a person who has had a direct collaboration with Scriven (e.g. Coryn & Hobson, 2011) would receive a Scriven number of two. This process continues indefinitely. In addition, if more than one path exists to Scriven, the path of the shortest length (i.e. least degrees of collaboration) is considered that individual's Scriven number.

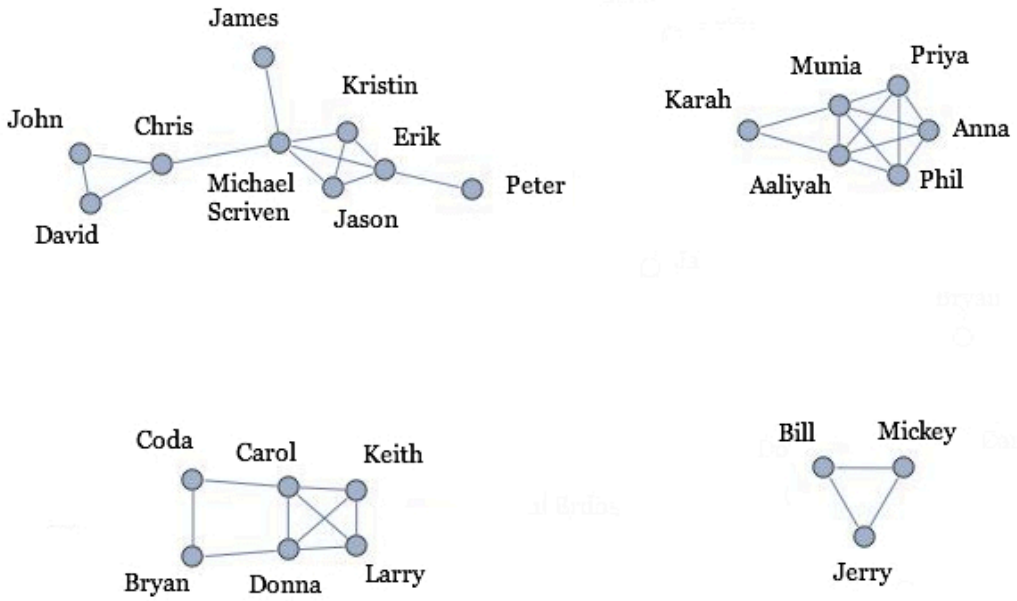

Figure 2. Hypothetical Disconnected Collaboration of Evaluation Papers

Conclusion

There exists a great deal of merit associated with having a collaboration number that is degree dependent. First, it sets in motion a greater collaborative pool, thus allowing mixed studies and papers. Second, it allows those to attempt to reach a goal of gaining a greater Scriven number, ultimately yielding in greater stature and other unknown benefits. Third, it centralizes the field of evaluation, giving evaluation its own separate identity rather than an area in which one studies tools. Fourth, the implementation is quite easy, as it requires only that a person find the degree of their collaboration to Scriven. Finally, it allows the evaluation field to become more robust, creating new theories and applications that continue not only to keep the field healthy, but also to allow it to grow at a greater pace than without such a number. It is because of these virtues that we have determined the need for such a number. While this is not the only method of solidifying the field of evaluation, it is a simple and cost-effective one. And, in general, evaluators appear to admire those attributes.

References

Batagelj, V., & Mrvar, A. (2000). Some analyses of Erdös collaboration graph. *Social Networks, 22*(2), 173 – 186. doi: 046132-1 - 046132-1-8.

Coryn, C. L. S. (2007). *Evaluation of researchers and their research: Toward making the implicit explicit*. Unpublished doctoral dissertation, Western Michigan University, Kalamazoo, MI.

Coryn C. L. S., Hattie J. A., Scriven, M., & Hartmann, D. J. (2007),). Models and mechanisms for evaluating government-funded research: An international comparison. *American Journal of Evaluation. 28*(4), 437-457.

Coryn, C. L. S., & Hobson, K. A. (2011). Using nonequivalent dependent variables to reduce internal validity threats in quasi-experiments: Rationale, history, and examples from practice. In S. Mathison (Ed.), *Really new directions in evaluation: Young evaluators' perspectives. New Directions for Evaluation,* No. 131, 31-39. San Francisco, CA: Jossey-Bass.

Jin, E. M., Girvan, M., & Newman, M. E. J. (2001). Structure of growing social networks. *Physical Review E, 64*(4).

Odda, T. (1977). On properties of a well-known graph or what is your Ramsey number? *Topics in Graph Theory, 328*(1), 166-172.

Graham, R. L., & Nesetril, J. (eds.) (1996). *The mathematics of Paul Erdös II (algorithms and combinatorics)*. (1st ed.). Springer: New York, NY.

Goffman, C. (1969). And what is your Erdös number? *The American Mathematical Monthly, 76*(7), 791.

Grossman, J. (2010). List of publications of Paul Erdös: Update, September, 2010. Unpublished manuscript, Department of Mathematics, Oakland University, Rochester, MI, . Retrieved from https://files.oakland.edu/users/grossman/enp/pub10update.pdf.

Grossman, J. (2012a). *Facts about Erdös Numbers and the Collaboration Graph*. Retrieved from http://www.oakland.edu/enp/trivia/.

Grossman, J. (2012b) Research on Collaboration in Research. Retrieved from http://www.oakland.edu/enp/research/.

Grossman, J. (2012c). *Some famous people with finite Erdös numbers*. Retrieved from http://www.oakland.edu/enp/research/.

Grossman, J. (2012d). *The Erdös number project*. Retrieved from http://www.oakland.edu/enp/.

Hoffman, P. (1998). *The man who loved only numbers: The story of Paul Erdös and the search for mathematical truth*. (1st ed., p. 42). New York, NY: Hyperion.

Prell, C. (2012). *Social network analysis: History, theory and methodology*. (pp. 166 - 174). Thousand Oaks, CA: Sage Publications Ltd.

Scriven, M. (1991). *Evaluation thesaurus*. (4 ed.). Newbury Park, CA: Sage Publications.