

# Impact Assessment of a Single Study

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# Overview

How can the impact of a publication be accurately assessed?  
How might this impact change over time?

- **Assessing impact of publications**
  - “broad” vs. “deep”
  - Clearer picture of contributions to research
- **Background**
- **Methods**
- **Findings**
- **What it all means**

# Background

## **BU ET AL. (2021)**

- Propose “breadth” and “depth” metrics
- Describing impact type
- Qualitatively assess large networks

## **LENG (2022)**

- Qualitative analysis of one study (Paul et al. 1963).
- Believes Paul et al. (1963) is broad
  - Many different topics under one umbrella topic
- Approach is not scalable, prone to biases

**Can Bu’s methods answer the question proposed by Leng?**

# Methods

- Citations to Paul et al. (1963) 1963-1984 from WoS
- Compared my data against Leng's (2022)
- Included publications written in English only
  - 407 publications & 1,728 citations
- Calculated breadth and depth over 20 years
  - Out-degree of citing nodes

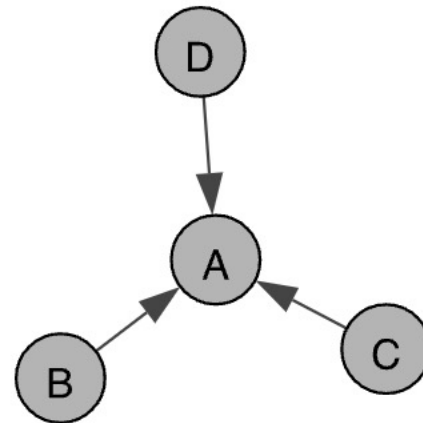


Fig. 1: Broad Network

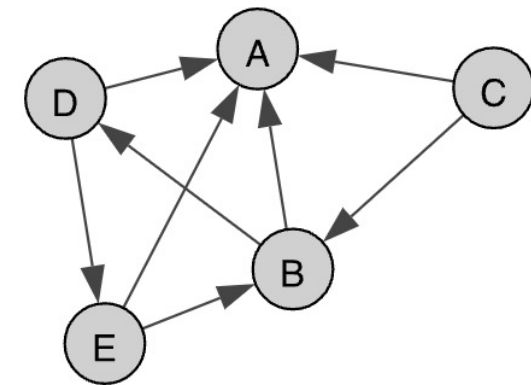
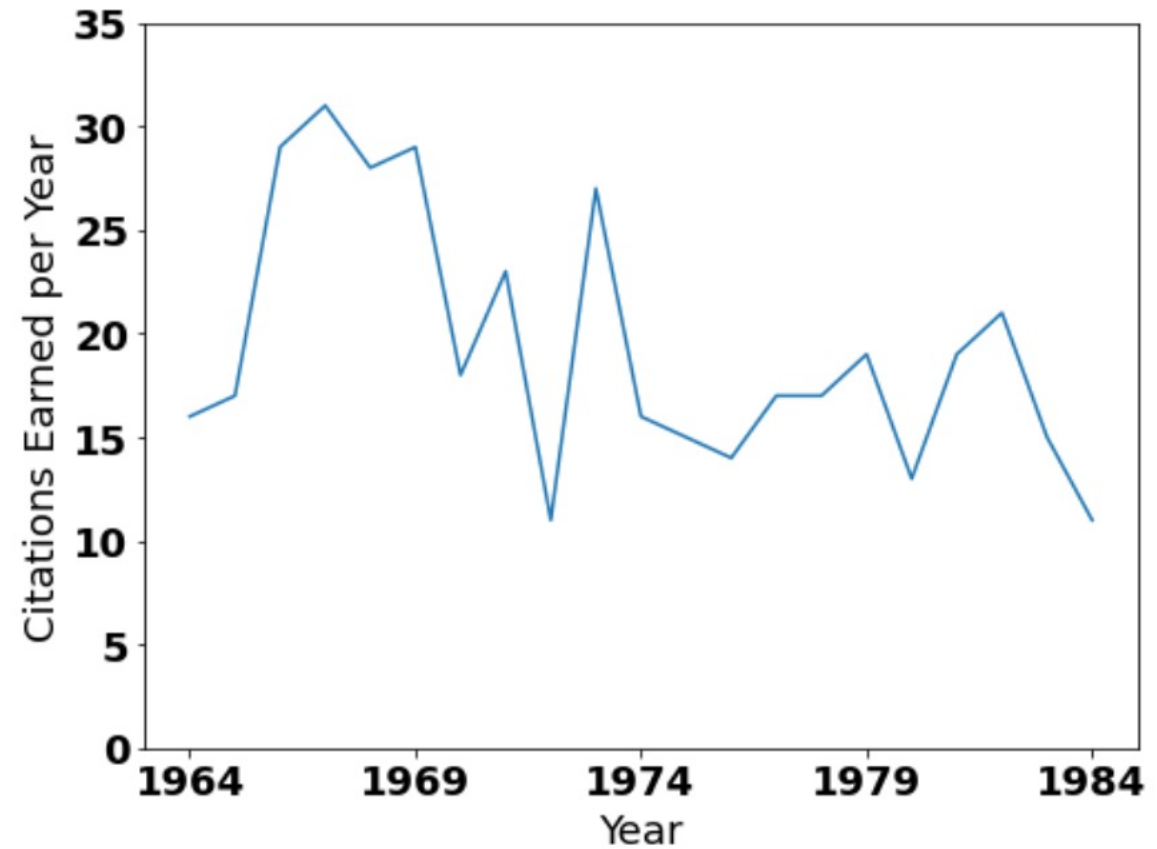


Fig. 2: Deep Network

# Results



**Fig. 3: Number of citations Paul et al. (1963) earned per year over the first 20 years of publication**

# Results

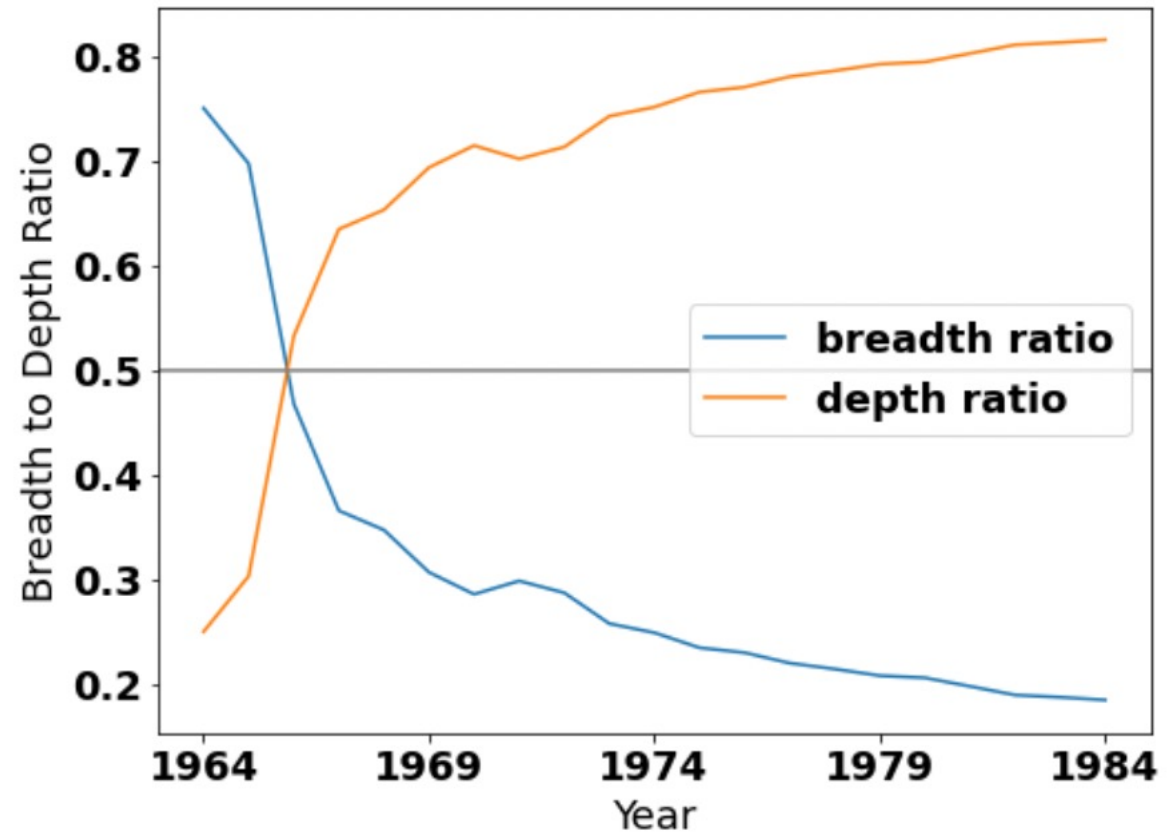
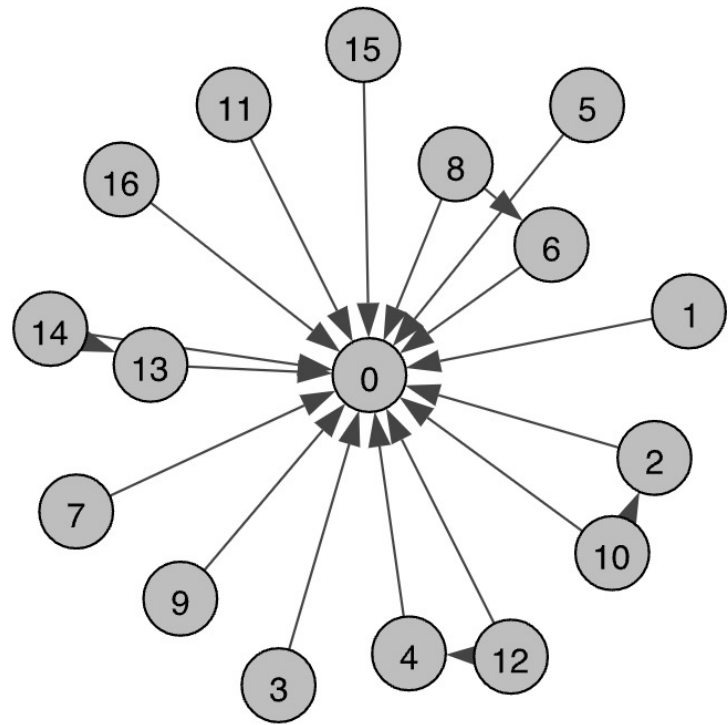
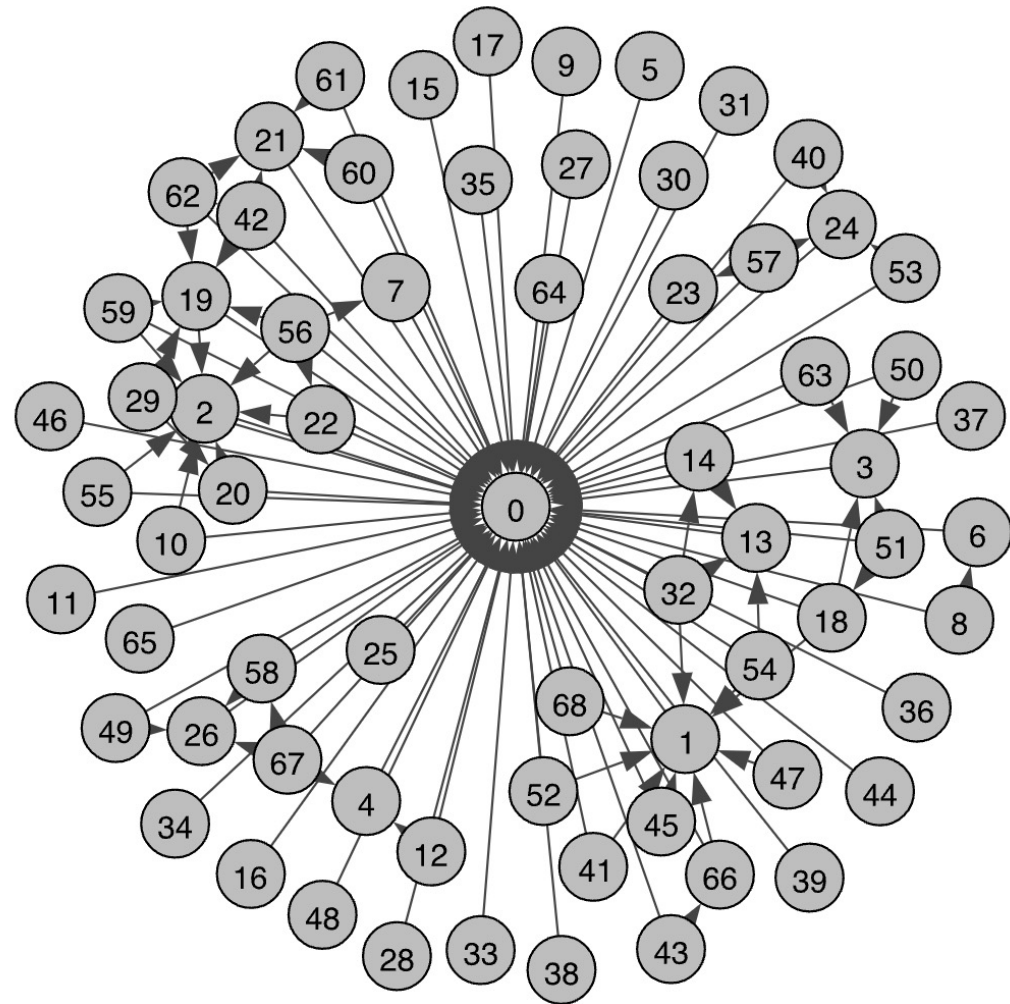


Fig. 4: Ratio of Paul et al.'s breadth and depth spanning twenty years since publication



**Fig. 5: 1964 (year one)**  
**75% broad**



**Fig. 6: 1966 (year three)**  
**47% broad**

# Discussion

- Breadth changes over time? Or with citation counts?
- Breadth and depth are unstable measures at low citation counts
  - Easily influenced by new input
  - Accumulating citations takes time!
- Changes are less dramatic as citation count increases



# Discussion

- Bu metrics show the Paul network is deep
- Leng interpreted the Paul network as broad
  - Who is correct?
- Leng likely over-reported breadth
  - Different topics in the same conversation (CHD)
  - Indicator of depth
- “Breadth” measures too strict for research articles
  - Which papers are broad?
  - Tools, not topics
  - Is there a highly cited “broad” research article?

## Further Questions

- How might Paul et al. (1963) compare against similar research articles?
- Should breadth be weighted differently for research articles?

## References

- Bu, Y., Waltman, L., & Huang, Y. (2021). A multidimensional framework for characterizing the citation impact of scientific publications. *Quantitative Science Studies*, 2(1), 155–183. [10.1162/qss\\_a\\_00109](https://doi.org/10.1162/qss_a_00109)
- Leng, R. I. (2021). Diversity in citations to a single study: A citation context network analysis of how evidence from a prospective cohort study was cited. *Quantitative Science Studies*, 2(4), 1216–1245. [10.1162/qss\\_a\\_00154](https://doi.org/10.1162/qss_a_00154)
- Paul, O., Lepper, M. H., Phelan, W. H., Dupertuis, G. W., MacMillan, A., McKean, H., & Park, H. (1963). A Longitudinal Study of Coronary Heart Disease. *Circulation*, 28(1), 20–31. [10.1161/01.cir.28.1.20](https://doi.org/10.1161/01.cir.28.1.20)

## Additional Data

	<b>Citing Paper</b>	<b>Citation to Paul</b>
1	Georgiou et al. [1978]	Paul O, 1963, Coronary Heart Disea, P469
2	Hennekens et al. [1977]	Paul O, 1963, Circulation, V28
3	Freis [1973]	Paul O, 1963, Circulation, V28, P381
4	Kannel and Feinleib [1972]	Paul O, 1963, Coronary Heart Disea, P469
5	Stocksme [1972]	Paul O, 1963, Circulation, V28
6	Antonovsky [1968]	Paul C, 1963, Circulation, V28, P20
7	Hatch [1968]	Paul O, 1963, Circulation, V28, P30

Table 1: Citations present in Leng (2022) that were not returned in my own WoS search.



Additional  
Data

Year	Total Citation Count	Citations Gained
1964	16	+16
1965	33	+17
1966	62	+29
1967	93	+31
1968	121	+28
1969	150	+29
1970	168	+18
1971	191	+23
1972	202	+11
1973	229	+27
1974	245	+16
1975	260	+15
1976	274	+14
1977	291	+17
1978	308	+17
1979	327	+19
1980	340	+13
1981	359	+19
1982	380	+21
1983	395	+15
1984	406	+11

## Additional Data

Year	Breadth Ratio	Depth Ratio
1964	0.75	0.25
1965	0.70	0.30
1966	0.47	0.53
1967	0.37	0.63
1968	0.35	0.65
1969	0.31	0.69
1970	0.29	0.71
1971	0.30	0.70
1972	0.29	0.71
1973	0.26	0.74
1974	0.25	0.75
1975	0.23	0.77
1976	0.23	0.77
1977	0.22	0.79
1978	0.21	0.79
1979	0.21	0.79
1980	0.20	0.79
1981	0.20	0.80
1982	0.19	0.81
1983	0.19	0.81
1984	0.18	0.82