

## Impact case study (REF3)

<b>Institution:</b> University of Greenwich		
<b>Unit of Assessment:</b> 17 – Business and Management Studies		
<b>Title of case study:</b> Identification of roles within social networks for transformation in business collaboration, productivity and leadership across the globe		
<b>Period when the underpinning research was undertaken:</b> January 2000 – September 2015		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b>	<b>Role(s) (e.g. job title):</b>	<b>Period(s) employed by submitting HEI:</b>
Prof. Martin Everett	Head of the School of Mathematics and Computer Science	01/01/1980 – 31/12/2002
Dr Paola Tubaro	Reader in Economic Sociology	01/12/2009 – 31/12/2015
Dr Francesca Pallotti	Associate Professor in Economic Sociology	22/04/2013 – present
<b>Period when the claimed impact occurred:</b> August 2013 - July 2020		
<b>Is this case study continued from a case study submitted in 2014? N</b>		
<b>1. Summary of the impact</b>		
<p>A major problem for businesses is effective use of employee' skills, particularly to collaborate effectively to meet competitive challenges; the CIPD reports 37% of UK employees seek skill utilisation. Greenwich-developed mathematical techniques to detect structurally equivalent roles within social networks opened a way to better collaborative skill utilisation. Heuristics developed from these models have been deployed in human resource management practice by more than 300 major US and UK corporations (e.g. Amazon, Cisco, General Motors) with collaboration effectiveness improving more than 20%, impacting 30 million employees. There is great potential for many more businesses to benefit from these practices.</p>		
<b>2. Underpinning research</b>		
<p>In social groups individuals are often characterised by roles such as leader, influencer or follower. This is particularly so in organisations where roles such as manager, designer, engineer, salesperson, receptionist represent common sets of tasks and social relationships. An individual who has a role as manager thus has a distinct set of social relationships within the organisation than does a receptionist. Two individuals with the same role, thus are likely to have the same pattern of connections in a social network; they are 'structurally equivalent'.</p> <p>This concept was originally formulated by Lorain &amp; White (1971) to refer to individuals who had the same specific set of relationships. If A was connected to B and C, and D was also connected to B and C, then A and D were defined as equivalent.</p> <p>Between 2000 and 2002 <b>Martin Everett</b> (University of Greenwich), Steve Borgatti (Boston College), Joseph Luczkovich and Jeff Johnson (East Carolina University), demonstrated the superiority of a generalised version of structural equivalence in identifying distinct roles within a network. <b>Everett</b> and Borgatti contributed a mathematical model to the work, positing that <b>regardless of the specific individual connections</b>, if A was connected to B and C and D was connected to E and F, then A and D were structurally equivalent. The proposition was validated empirically in the research and published in well-regarded peer-reviewed journals [3.1, 3.2].</p> <p><b>Everett</b> (Greenwich) and Borgatti (Boston College) implemented algorithms for calculating structural equivalence implemented in UCINET software for social network analysis [3.3], the most</p>		

widely used such software. This provided an important channel for the deployment of the structural equivalence model in a wide range of applications, including the development of a set of heuristics that have greatly influenced human resource management practice by major US and UK corporations to guide people on how to improve their effectiveness at work.

**Prof Everett** (Greenwich) published extensively with Prof Borgatti (Boston College), collaborating closely on many mathematical models at the forefront of social network analysis. **Prof Everett** left Greenwich in 2004 but continues to work closely with the university's Centre for Business Network Analysis (CBNA), which he helped establish as a Visiting Professor with Prof Bruce Cronin, who remains Director. The CBNA is the largest concentration of business network analysts in Europe, applying organisational network analysis to a wide range of business problems, through consulting, commissioned research and short courses.

CBNA members have continued to apply structural equivalence in research and consultancy. For example, Greenwich staff members **Francesca Pallotti**, **Paola Tubaro** (as well as Visiting Professor Alessandro Lomi) demonstrated that organizations occupying similar positions within an interorganizational network are more similar in terms of performance [3.4].

### 3. References to the research

1. Johnson, J.C., Borgatti, S.P., Luczkovich, J.J. & **Everett, M.G.** (2001). Network role analysis in the study of food webs: an application of regular role coloration. *Journal of Social Structure*, 2.  
[https://www.researchgate.net/publication/220449644\\_Network\\_Role\\_Analysis\\_in\\_the\\_Study\\_of\\_Food\\_Webs\\_An\\_Application\\_of\\_Regular\\_Role\\_Coloration](https://www.researchgate.net/publication/220449644_Network_Role_Analysis_in_the_Study_of_Food_Webs_An_Application_of_Regular_Role_Coloration)
2. Luczkovich, J.J., Borgatti, S.P., Johnson, J.C., **Everett, M.G.** (2003). Defining and measuring trophic role similarity in food webs using regular equivalence. *Journal of Theoretical Biology*, 220(3), February, 303-321. <https://doi.org/10.1006/jtbi.2003.3147> [Refereed Journal Article: 113 Scopus citations; [Received on 8 October 2001, Accepted in revised form on 13 August 2002 whilst Everett was at University of Greenwich].
3. Borgatti, S.P., **Everett, M.G.** and Freeman, L.C. (2002). *Ucinet for Windows: Software for social network analysis*. Harvard, MA: Analytic Technologies. Computer Software available: <https://sites.google.com/site/ucinetsoftware/home> Computer Software: 10,046 Google Scholar citations; 6,242 Scopus citations; 'the most widely used software package for SNA in public administration' (Kapucu, N., Hu, Q., Khosa, S., (2017). The state of network research in public administration. *Administration and Society*, 49(8), p. 1108. [doi.org/10.1177/0095399714555752](https://doi.org/10.1177/0095399714555752)).
4. **Pallotti, F.**, **Tubaro, P.** and Lomi, A. (2015) How far do network effects spill over? Evidence from an empirical study of performance differentials in interorganizational networks. *European Management Review*, 12(3). pp. 189-208.  
<https://doi.org/10.1111/emre.12052>

#### Indicators of research quality:

- In addition to the output-specific indicators provided above, all articles were published in respected, international peer-reviewed academic journals

### 4. Details of the impact

A major problem for businesses is effective use of employee' skills, particularly to collaborate effectively to meet competitive challenges. According to the Chartered Institute of Personnel and Development (CIPD, 2018), for example, 37% of UK employees report their skills are underused and seek skill utilisation [5.1]. The structural equivalence model embodied in the UCINET software developed by **Everett** and collaborators, and a set of heuristics, has been deployed by more than 300 major corporations in the US and UK, employing up to 30 million people, improving

collaboration effectiveness by more than 20%. Beyond these firms, the methods have been adopted and found effective by a third of leadership development practitioners, with cascading impact on their clients and their employees.

### **Translation of the research: pathways to inform private and public sector organisational policy and practice**

After contributing to the original research, the University of Greenwich CBNA has used UCINET and structural equivalence models since 2014 in projects with Ernst and Young, Nesta, the University Alliance, Wandsworth Council and Transport for London, to identify key influencer positions in workplace collaboration. The CBNA has organized annual winter and summer schools on social network analysis with UCINET, introducing 300 practitioners to the techniques. Practitioners have broadly used the techniques to inform a variety of policies and practices on collaboration and communication in organisations.

### **Translation of the research: development of heuristics to inform Human Resource Management practice in large businesses**

Most prominently, Professor Rob Cross, a Greenwich visiting professor 2015-16, has used UCINET extensively to this day applying existing social network analysis (SNA) techniques to large businesses, with great impact on Human Resource Management (HRM) practices. 'We typically rely on ... measures of centrality ... structural equivalence, structural holes, and several of the subgroup measures.' [5.2 p.196]. In particular, he used structural equivalence to demarcate four major roles in organisations: 1) *Central connectors* - managers typically with more than 45 people regularly seeking them, accounting for 20% of all connections and consequently leaving them overloaded; 2) *Peripheral people*, underutilised and prone to leave; 3) *Boundary spanners* – providing informational channels between formal groups; 4) *Information brokers* – providing channels across informal subgroups, thus providing integration [5.2]. While these roles had previously been recognised intuitively, structural equivalence provided precise and measurable definitions that were deployed through such practical heuristics to manage these roles to improve organisational performance.

The wide application of SNA to HRM practices in large corporations originates in Prof Cross' work for IBM's Institute for Knowledge Management 1999-2003. Prof Borgatti was engaged to provide 'guidance on the technical side of social network analysis' ([5.2] 'Acknowledgements'). Working with Fortune 500 firms, this programme identified areas where SNA could improve collaboration to add business value and developed practical heuristics for management practice.

For example, the 'finding and fixing critical disconnects' heuristic involves creating problem-solving sessions aimed to foster new productive relationships among identified 'peripherals'. 'Developing a sense and respond capability' uses 'knowledge fairs' or job rotation to make people aware of others' expertise so they can gain timely access to this when they need it. 'Collaborative overload' is addressed by work reassignment and new information dissemination processes [5.2].

These methods, findings and practitioner recommendations were widely disseminated via Cross & Parker's book *The Hidden Power of Social Networks* [5.2]; (2161 Google Scholar citations) and through many practitioner-oriented papers in *Harvard Business Review* and *MIT Sloan Business Review* (3495 Scopus citations since 2014). A review of the 25 main contributions to network-enhancing leadership development research and practice listed **nine** authored or co-authored by Cross [5.3].

### **Applying UCINET and associated heuristics in major US and UK corporations to inform guidance and practices that improved collaboration and productivity**

After leaving IBM, Cross established a corporate consortium, 'The Network Roundtable', later the 'Connected Commons' to continue the work programme to this day developing applications of structural equivalence models using UCINET. Consortium membership has grown to more than

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300 major corporations, including Merck, Microsoft, Gore, Johnson & Johnson, Workday, Amazon, General Motors, Ford Motor Company, John Deere, Cigna, Boeing, Bill & Melinda Gates Foundation, General Electric, Ford, Cisco, Pfizer, Corning, Dolby, Booz Allen Hamilton, Halliburton, Allstate, AIG, Capital One, General Mills, Intel, Pfizer, Proctor and Gamble, WL Gore, Associated British Foods and The World Bank Group ([5.4] 'Perspectives', 'Representative Member Organizations').

Undertaking SNA projects with senior executives from these corporations, using UCINET over 15 years, Cross has developed various heuristics as actionable guidance for managers to analyse their networks and influence them to add business value. These feature as 'Research Highlights' and 'Toolkits' on the Connected Commons website, often co-authored with the executives, such as 'Accelerating Transitions', with Greg Pryor (**Workday**), 'Groundswell' with Michael Arena (**General Motors**), 'Organizational Agility' with Chris Fussel (**McCrystal Group**), and 'Collaborative Overload', all in 2017 and 'Rapid Transition Success' with David Sylvester (**AWS**) 2020. These summarise articles published in practitioner outlets such as *Harvard Business Review*, *MIT Sloan Management Review*, *Forbes*, *Wall Street Journal* ([5.4] 'Research Highlights').

Examples of Collective Commons members deploying these heuristics in their own organisations since 2014, include **Amazon** optimising 'the potential of its talent, through retention, succession and organizational interventions' [5.5], **Cisco** 'to understand how teams and leaders collaborate' and to 'improve team productivity' [5.6], **Deloitte** saving 2 million hours replacing a standard annual performance review with a real-time SNA-based online system for 65,000 staff [5.7], **General Motors** creating 'adaptive space' networking engineers and designers to rapidly prototype new models, including the 2017 Car of the Year [5.8], **Pfizer** understanding changing patterns of collaboration [5.9], **Workday** designing its employee development programmes around purposeful connections ([5.4] 'Perspectives'). These six firms alone employ more than 1.3 million people.

### Widespread deployment of the SNA techniques and heuristics to improve collaboration and transform leadership development

A 2017 survey of 282 leadership development practitioners found **34%** had used such social network analytic techniques in leadership development programs, 82-94% finding these techniques effective [5.3]. Social network analyses of the **300 Connected Commons organisations**, found 20-35% of value-adding collaborations concentrated among 3-5% of employees [5.10]. **20 of these global organisations** using SNA and structural equivalence-derived heuristics to more effectively target collaboration reduced time spent on internal communication by 18-24% [5.11]. These examples discussed demonstrate collaboration effectiveness improvements of more than 20% are being experienced by large numbers of employees in major corporations and there is great potential for many more businesses to benefit from these practices.

### 5. Sources to corroborate the impact

1. Chartered Institute of Personnel Development (CIPD) Report, Oct 2018, 'Over-skilled and underused: Investigating the untapped potential of UK skills': [https://www.cipd.co.uk/Images/over-skilled-and-underused-investigating-the-untapped-potential-of-uk-skills\\_tcm18-48001.pdf](https://www.cipd.co.uk/Images/over-skilled-and-underused-investigating-the-untapped-potential-of-uk-skills_tcm18-48001.pdf)
2. Cross, R. and Parker, A. (2004). *The hidden power of social networks. Understanding how work really gets done in organizations*. Harvard, MA: Harvard Business School Press. 'Acknowledgements', pp. 71,143, [**Demonstrates** the pathway to impact from Research Outputs 1, 2 and 3 to Prof Cross and Fortune 500 firms]. *Hard copy available by university on request.*
3. Cullen-Lester, K. Maupin, C., Carter D. (2017). Incorporating social networks into leadership

development: A conceptual model and evaluation of research and practice. *The Leadership Quarterly* 28, pp. 130-152. <https://doi.org/10.1016/j.leaqua.2016.10.005> [**Demonstrates** the dissemination of Prof Cross' heuristics to mainstream leadership development research and practice]

4. Connected Commons (2020a). <https://connectedcommons.com> [**Demonstrates** the engagement of Fortune 500 executives with Output 3 and Prof Cross's heuristics and evidence of measured change from deployment of heuristics]
5. Cross, R. (2017). *Connected Commons Fall Forum showcases networks' role in innovation, collaborative efficiency, talent optimization, well-being & more.* <https://www.linkedin.com/pulse/connected-commons-fall-forum-showcases-networks-role-innovation-rob/> [**Example** of Fortune 500 executive deploying a heuristic within their firm]
6. Barrozzi, G. (2018). <https://www.linkedin.com/pulse/h-r-tists-h-r-team-ars-electronica-2018-gianpaolo-barozzi/> [**Example** of Fortune 500 executive deploying a heuristic within their firm]
7. Buckingham, M. and Goodall, A. (2015). Reinventing performance management. *Harvard Business Review*, April. <https://hbr.org/2015/04/reinventing-performance-management> [**Example** of Fortune 500 executive deploying a heuristic within their firm]
8. Arena, M. (2018). *Adaptive space*. New York: McGraw-Hill. [**Examples** of Fortune 500 executives deploying a heuristic within their firm]. *Hard copy available by university on request.*
9. Morgan, J. (2018). *Everything you need to know about people analytics from Pfizer's Head of Talent Analytics.* <https://thefutureorganization.com/wp-content/uploads/2018/06/Arun-Transcript.pdf> [**Example** of Fortune 500 executive deploying a heuristic within their firm]
10. Cross, R., Rebele, R. & Grant, A. (2016). Collaborative overload. *Harvard Business Review*. January-February, pp. 75-77. <https://hbr.org/2016/01/collaborative-overload> [**Evidence** of measured change from deployment of heuristics]
11. Cross, R., Taylor, S. and Zehner, D. (2018). Collaboration without burnout. *Harvard Business Review*. July–August, pp. 134–137. <https://hbr.org/2018/07/collaboration-without-burnout> [**Evidence** of measured change from deployment of heuristics]