cultural science

Volterra

Social network analysis of non-economic rules

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Kate Morrison
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Volterra   Outline

o Working definitions

o Goals of social network analysis

o Three examples of SNA:

   • Social exclusion from financial services

   • Binge drinking behaviours

   • Technological webs vs. social communities

o Conclusion & implications

Volterra   Working Definition of Culture

Culture is an emergent characteristic of a group of agents and is determined by the agents' rules of behaviours for acting in their social environment and for interacting with each other. Cultural rules are socially transmitted and learned. (Beinhocker 2007)

Cf.

o   Hayek: social structure emerges from the laws ("nomos") governing the relations between individuals

oPotts/Dopfer: cultural rules can be economic and non-economic, are carried by individuals, diffuse as meso trajectories

Volterra　Goals of SNA

o Determine most likely **structure** of relevant social network

o Why?

o Difference in structure → difference in dynamics

o Can tell us about vulnerability to epidemics, speed of diffusion, fragility

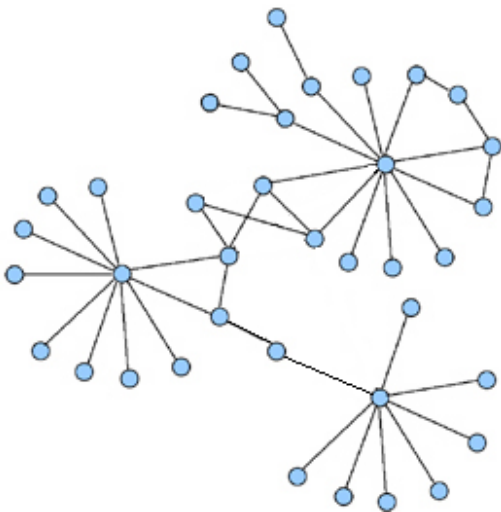## Volterra — Structure/Dynamics
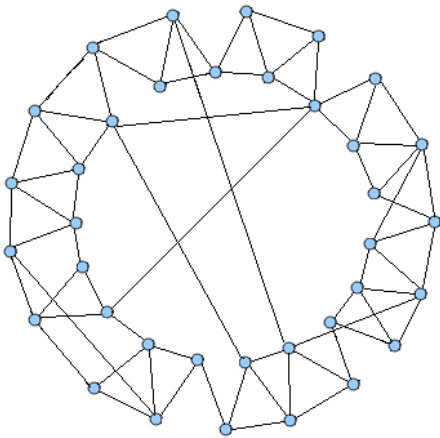
Small world network

- 'Friends of friends'

- Individuals typically influenced only by close associates

- In general, no single individual will influence everybody

- Ideas need to be quite contagious to spread

Volterra   Structure/Dynamics

Scale free network

- Most vulnerable to 'epidemics'

- Why? A small number of highly connected individuals

- Small probability but high impact

- No critical level of contagiousness needed for idea to spread

Putting SNA into practice

o Usually SNA requires vast data sets on every node and connection – to map the network in detail

o But Ormerod (2007)* provides an alternative technique to infer the network structure using very small data sets

   • Relatively cheap (e.g. just 388 respondents provides representation for entire UK population)
   • Use modelling to assess likely diffusion patterns

Extracting Deep Information from Limited Observations on an Evolved Social Networks, Physica A

Volterra   (1) Social Exclusion from Financial Services

o Almost one in 10 adults in Britain do not use mainstream financial services. Most of these are not in paid employment.

o However, most people without paid work have bank accounts.

o Two hypotheses have been put forward to account for the behaviour of the minority without accounts:

   i.   reluctance by financial institutions to serve low-income customers; and,

   ii. information failure on the part of non-consumers.

Volterra   (1) Social Exclusion from Financial Services

First, we can show that having an account is highly correlated with having more f&f who also have accounts:

Use of accounts by friends and family	Proportion of people who have accounts	Proportion of people who do not have accounts
All or most have accounts	87	38
Some have accounts	6	26
Few or none have accounts	2	14
Don't know	6	21
TOTAL	100	100

Source: ONS Omnibus Survey March/April 2000

Logistic regression shows that social network info is a more powerful predictor of non-usage than all the usual attributes: age, gender, ethnic origin, housing tenure, employment status, income or family circumstances

Why would this be so?

o In many complex social and economic contexts, decision makers often pay attention to each other

→ use the behaviour of others as a decision rule when choosing between alternative courses of action

o Why?

- limited information about the problem itself and/or

- limited ability to process even the information that is available

o The decision to use a back account appears to be this type of problem

o Still leaves the question:

What type of social network best describes individual's decision to use a bank account?
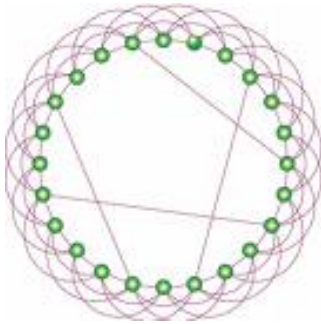
Using survey data from the ONS and network modelling, we have shown that a small world best describes the network in this case.

Recall that small worlds are relatively impervious to epidemics (spread of behaviour change)

This supports the information failure hypothesis.

Volterra   (2) Binge drinking behaviours

o Data on alcohol consumption is fraught with measurement problems

o Some series suggest a sharp rise in binge drinking, especially amongst the young, some suggest a drop since 2002

o Strong media/public/policy consensus that 'booze Britain' is a real and worsening phenomenon

Volterra   (2) Binge drinking behaviours

o Many traditional econometric studies of alcohol consumption over time and relating changes to factors such as disposable income, price and advertising

o All are inconclusive and cannot clearly separate correlation from causation

o What if binge drinking is a social network phenomenon?

Volterra   (2) Binge drinking behaviours

o Precedence: NEJM (2007) quant analysis of the the person-to-person spread of obesity as a possible factor contributing to the obesity epidemic

o Using data on 12,000 people monitored from 1971 – 2003

o Found that social influence is very powerful: the chance of any individual being obese increases by 57% if s/he has a friend who becomes obese

Volterra   (2) Binge drinking behaviours

o We are currently applying this approach to answering the question: is binge drinking a social network phenomenon?

o Simple survey of ~500 young people

- Their own drinking behaviours

- Drinking behaviours of family, friends and colleagues

o We are currently assessing the most likely network structure: expect small-world

o Potentially major policy implications for UK and Europe

(3) Technological webs vs. social communities

o Most physical/technology-based nets are scale-free e.g. internet, power grids, air routes

Protein interaction network

However they differ from social networks in one important respect:

highly connected nodes tend to be connected to less well-connected nodes

## Volterra — (3) Technological webs vs. social communities

o By contrast, in social networks, highly connected nodes tend to be connected to other highly connected nodes

o This gives rise to community structure

    (assortative networks)

informal communities
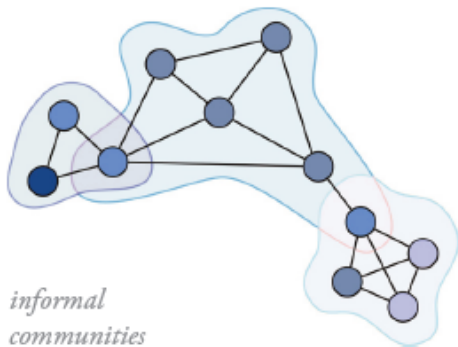
Nodes with high 'betweenness' are the most interesting in community-based networks

Volterra (3) Technological webs vs. social communities

Volterra — Recap and Conclusion
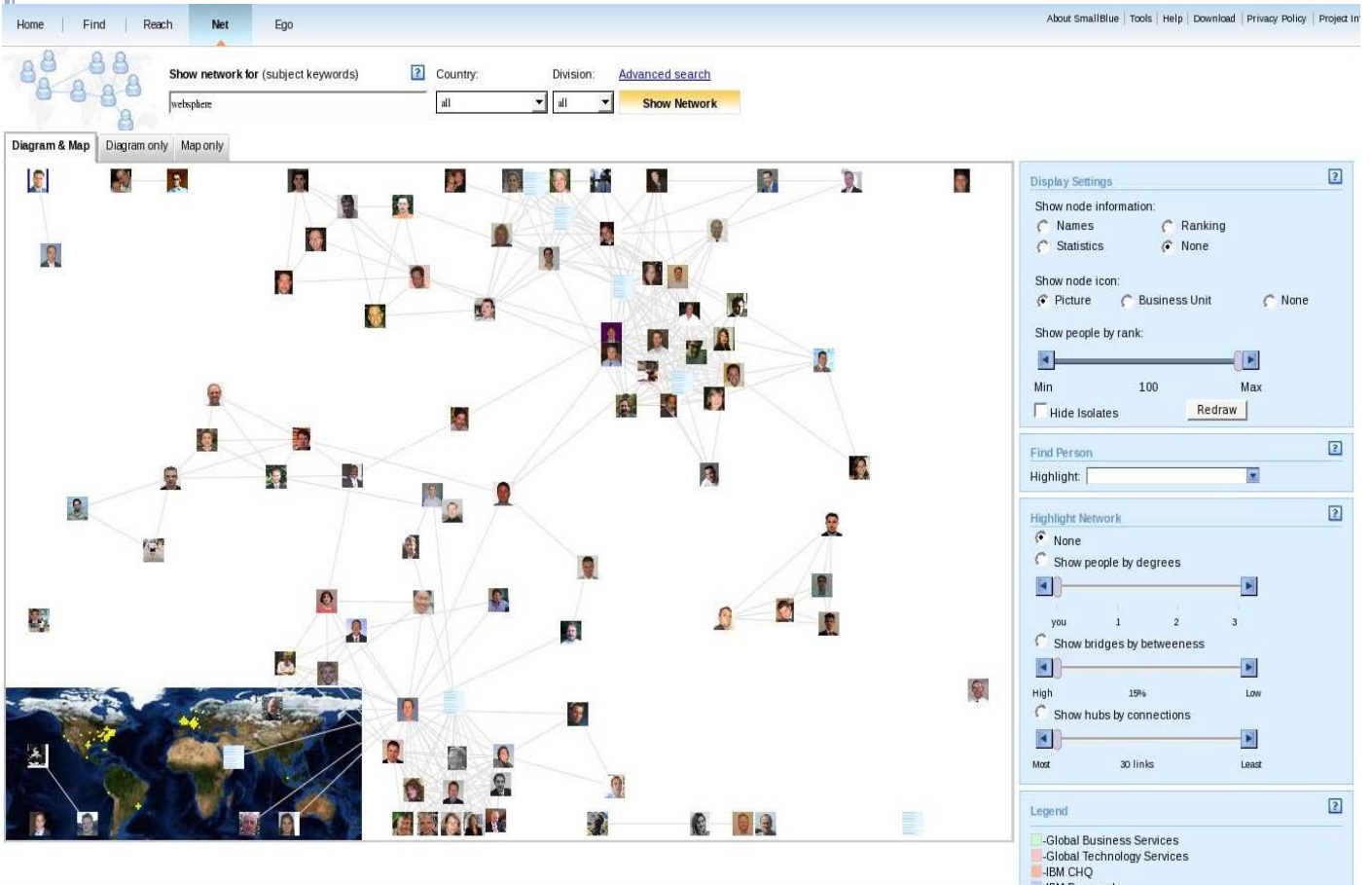
o SNA a powerful analytical technique for uncovering structure emerging from many types of rules/behaviours

o Usually possible to infer the network structure with small amount of data:

o Info on the overall frequency of the rule in the population (e.g. what proportion of people UK-wide have a bank account)

o Sample data on rule usage by people in the social network

o Some evidence on the clustering coefficient (for people-based networks can generally safely assume it is considerably greater than zero)

Recap and Conclusion

o Is using SNA a way to unpack/formalise phenomena usually referred to as 'cultural'?

- the culture of not using bank accounts
- the culture of booze Britain
- the culture of collaboration within an organisation

o At the very least it shows that structure matters for emergent properties that evolve over time

o And provides a very accessible technique when small survey samples and network modelling are combined