Using Business Network Analysis™
Techniques in Project Management

by

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Seminar Administration

- Ablutions
- Fire escape
- Seminar organised as five sessions
  - Session 1: The Project Knowledge Model
  - Session 2: Business Network Analysis™
  - Session 3: A Short Case Study
  - Session 4: BNA™ Design
  - Session 5: Concluding Remarks
- Break between each session
- Do ask questions
- Do challenge
- Do participate

In seeking wisdom, the first step is silence, the second is listening, the third remembering, the fourth practicing, the fifth – teaching others.

— Solomon ibn Gabirol
Session One
The Project Knowledge Model™

‘Project outcomes are simply milestones in a knowledge management activity and the various deliverables are just knowledge exploitations in meaningful formats. The implied conceptualization is that project deliverables consist of knowledge artefact integration through a social communication process’.

Lytras & Pouloudi (2003, p. 237)
A project makes change happen to a system. It moves something from one state to another state. And to do this it needs two elements – a **Vehicle** and **System**.

The **Vehicle** has a start and finish point, and consists of people, artefacts, and processes. The **Vehicle** manages the transition of the **System** from an existing state to the required state.

**Examples:**
- Upgrade an IT system.
- Implement a financial management system.
- Move an organisation to a new location.
- Buy an existing business.
- Develop a new product.
- Build new facilities.
Projects are the vehicles to transition these systems and help deliver better ROI for the business.

They are pivotal strategic and operational level business tools.

**Revenue - Expenses**

**Investment**

Projects

- Outputs based around strategic plan.
- Effectiveness.
- Doing the Right Thing.

New products.
Upgraded/modified products.
New services.
Upgraded/modified services.

Short term costs.
Efficiency.
Doing the Thing Right.

Better processes.
Better support.

Projects

- New/upgraded infrastructure.
- New machinery.
- New facilities.
- Purchasing another business.
- New/upgraded software.

Long term capital expenditure.
Project Knowledge

Project Knowledge is the sum of the knowledge required about the Vehicle and the System to have a successful Vehicle and System.

Project Knowledge = Vehicle Information Set + System Information Set
## Project Knowledge Sectors

### Requirement
- **Vehicle**: Requirement For Vehicle
- **System**: Requirement For System

### Solution
- **Vehicle**: Solutions For Vehicle (Deliverables)
- **System**: Solutions For System (Deliverables)

### Process
- **Vehicle**: Process To Transform Vehicle Solutions
- **System**: Process To Transform System Solutions
An organisation runs numerous “systems” that are used or accessed all over the organisation. They become fundamental to the “core competence” or “core capability” of the organisation and are critical to its effective functioning and strategic outlook.

**Note:** Could also be a “product” or “service” or “facilities” suite.
Particularly between people and between projects at various stages of a project:

- Are there bottlenecks?
- Who is the gatekeeper?
- Are the right organisations being engaged?
How are the systems being developed, procured and/or changed related:

• Are there timing/schedule conflicts?
• Are there development shortcut opportunities?
• Can we use current systems more efficiently?
How much synergy or cross over or conflict is there in the various vehicles and their impact on the various systems.

- Can we combine project teams?
- Can we reduce project teams by allocating work differently?
- Can we slip a project without impacting other program elements?
‘Each of us is part of a large cluster, the worldwide social net, from which no one is left out. We do not know everyone on this globe, but it is guaranteed that there is a path between any two of us in this web of people’.

Albert-Laszlo Barabasi, Physicist, 2002
A **node** is the smallest unit in the network. It is also known as a **vertex**.

A **tie** is a line between two nodes indicating there is a relationship between them.

A **graph** is a set of nodes and a set of ties between pairs of nodes.

A **network** consists of a graph and additional information on the nodes or the ties of the graph. It is also known as a **map**.
Social Network Analysis is a research methodology that focuses on relationships between and among social entities, and on the patterns and implications of these relationships.

- It is focused on uncovering the patterns of people's interconnectedness and interactions.
- There is no researcher intervention in the network.
Organisational Network Analysis

- Organisational Network Analysis is a research methodology and business technique that uses SNA methods to examine the social arrangements of organisations.
- The unit of interest is the group or organisation.
- There may be researcher or organisation intervention in the networks. (action research)
Business network analysis is a **diagnostic methodology** that elicits the capacity of an organisation to effectively engage in its activities.

- BNA uses both SNA and ONA methods, but extends the analysis beyond people or organisations to include, amongst other things, data flows and policy relationships.
- Almost always followed up with interventions.
BNA™ Components

Business Network Analysis

Organisational Interface Maps
Project Interface Maps
Information Flow Maps
Collaboration Maps
Social Capital Maps
Policy Relationship Maps
Quantitative Analysis
Report

Graphical and Qualitative analysis
Organisational Interface Maps

- The business unit or organisation is the unit of analysis.

- These maps can be used to:
  - Accelerate the flow of information and knowledge across functional and organisational boundaries by detecting and correcting information bottlenecks.
  - Identify opportunities for intra-departmental knowledge flow improvements.
  - Improve decision making in senior leadership and middle-management networks by mapping intra-organisational dependencies.
  - Assess business operations by mapping communication and process integration following a restructure or reorganisation.
Projects are the unit of analysis.

Project interface maps can be used to:

- Accelerate the flow of information and knowledge across functional and project boundaries by detecting and correcting information bottlenecks.
- Identify opportunities for intra-departmental knowledge flow improvements.
- Improve decision making in senior leadership and middle-management networks by plotting project dependencies.
Information Flow Maps

- Individuals, teams, departments or organisations are the unit of analysis.

- These maps can be used to:
  - Accelerate the flow of information and knowledge across functional and organisational boundaries by detecting and correcting information bottlenecks.
  - Accelerate the flow of information and knowledge across functional and organisational boundaries by identifying where increased knowledge flow will have the most impact.
  - Assess business operations by mapping communication and process integration following a restructure or reorganisation.
  - Assess business operations by plotting the path and time taken for a decision to propagate through an organisation.
  - Support collaboration by raising the awareness of the importance of informal networks.
Collaboration Maps

- The individual or project team is the unit of analysis.

- These maps can be used to:
  - Assess the state of individual and project team social capital by identifying trust, support, and advice networks.
  - Assess business operations by mapping the formal and informal process flows of an organisation.
  - Support collaboration by identifying potential partnerships and connecting people to people to ensure effective knowledge creation and sharing.
  - Support collaboration by identifying and weaving communities of practice.
Social Capital Maps

- Individuals are the unit of analysis.

- Social capital maps can be used to:
  - Assess the state of social capital by identifying individual trust, support, and advice networks.
  - Assess the state of social capital by identifying individuals who have central roles, such as key knowledge brokers.
  - Support social capital by identifying potential partnerships and connecting people to people to ensure effective knowledge creation and sharing.
  - Improve decision making in senior leadership and middle-management networks by identifying and correcting structural holes in personal networks.
Policy Relationship Maps

Policy relationship maps provide a powerful way to understand how work, documents and policy relate to each other.

A policy relationship map can be used at the level of business units, departments or organisations to:
- Identify and then integrate current practice across core processes.
- Ensure internal consistency between documents and policies.
- Understand inter-departmental document relationships.
- Identify opportunities for knowledge flow improvements.
‘An immense and ever-increasing wealth of knowledge is scattered around the world today; knowledge that would probably suffice to solve all the mighty difficulties of our age, but it is dispersed and unorganised. We need a sort of mental clearing house for the mind: a depot where knowledge and ideas are received, sorted, summarized, digested, clarified and compared.’

H.G.Wells, Novelist, 1938
The Organisation

About 200 Major Projects
>$20m Managed

Government Approval

About 200 Major Projects
>$20m Monitored

Requirements

Acquisition

In-Service

Disposal

100+ Minor Projects
<$20m Managed and Monitored

AU$50bn worth of projects in pipeline.
The Study Design

- 4 demographic questions.
  - ‘What projects, if any, are you responsible for?’

- 12 project questions, some with sub-questions.
  - ‘What projects are your project dependant on for part of its capability outcome? Please weight the importance of the project as minor, important or critical.’

- 3 organisational interface questions, some with sub-questions.
  - ‘Which external to CDG Defence organisations does your position interact with the most for work purposes, and what is the frequency of the interaction? (annually, monthly, weekly or daily).’

- 4 collaboration questions, some with sub-questions.
  - ‘In the workplace who do you go to for information that helps you solve problems?’
The Population

- Sample population were project officers and support staff = 130 staff.
  - 104 staff interviewed (80%), comprising 62 project officers and 42 support staff.
  - 19 staff (20%) either declined to participate (5), failed to attend multiple appointments (5), or were deployed overseas (9).
- Adjusted population = 111
  - 104 staff interviewed (94%).
    - 43 Aerospace staff interviewed (98%).
    - 14 Maritime staff interviewed (100%).
    - 32 Land staff interviewed (89%).
    - 15 Integrated Capability staff interviewed (88%).
Q5&6 – These Projects are Dependent on Each Other for Part of Their Capability Output (All Dependencies)

Nodes coloured by branch
- Light Blue = Aerospace
- Purple = Integrated Capability
- Red = Land
- Dark Blue = Maritime
- Grey = Other

Nodes sized by incoming links

Links coloured by type of dependency

Both way dependency
Q5&6 – These Projects are Critically Dependent on Each Other for Part of Their Capability Output. The Dependency is Physical Mobility Services.

Nodes coloured by branch
- Light Blue = Aerospace
- Purple = Integrated Capability
- Red = Land
- Dark Blue = Maritime
- Grey = Other

Nodes sized by incoming links

Links coloured by type of dependency

Specific dependency

2nd level dependencies

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Q5&6 – “Most Important” Projects by Dollar Value

Nodes coloured by branch
• Light Blue = AD
• Purple = ICD
• Red = LD
• Dark Blue = MD
• Grey = Other

Nodes sized by Value

Links coloured by dependency
• Black = Minor
• Blue = Important
• Red = Critical

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Q5&6 – “Most Important” Projects by Degree (links)

Nodes coloured by branch
- Light Blue = AD
- Purple = ICD
- Red = LD
- Dark Blue = MD
- Grey = Other

Nodes sized by Degree (links)

Links coloured by dependency
- Black = Minor
- Blue = Important
- Red = Critical
Q7 – All Project Critical Contributions to Strategic Capability Effects

Nodes coloured by branch
- Light Blue = Aerospace
- Purple = Integrated Capability
- Red = Land
- Dark Blue = Maritime
- Grey = Other

Effects Nodes sized by incoming links

Projects changing core business

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Nodes coloured by branch
- Light Blue = Aerospace
- Purple = Integrated Capability
- Red = Land
- Dark Blue = Maritime
- Grey = Other

Effects Nodes sized by incoming links

Projects changing core outcomes
Q7 & Q8 – Project Contribution to Strategic and Operational Effects

Project changing core business

- Intra-Theatre Lift
- Force Application
- Force Information Assurance
- Minor
- Critical
- Critical
- Important
- Land Battlespace
- Critical
- Critical
- Important
- Strategic Situational Awareness
- Operational Situational Awareness
- Strategic Lift

AIR 5410 PH 481
Q9 – Project Critical Fundamental Inputs to Capability Vulnerabilities

Nodes coloured by branch
- Light Blue = Aerospace
- Purple = Integrated Capability
- Red = Land
- Dark Blue = Maritime
- Grey = Other

FIC Nodes sized by incoming links

Primary risk to successful delivery
Q10 – My Project is Informed by this Study

Nodes coloured by branch
• Light Blue = Aerospace
• Purple = Integrated Capability
• Red = Land
• Dark Blue = Maritime
• Grey = Other

Study nodes sized by incoming links

Artefact and business process
Nodes coloured by branch
- Light Blue = Aerospace
- Purple = Integrated Capability
- Red = Land
- Dark Blue = Maritime
- Grey = Other

Roadmap nodes sized by incoming links

Artefact and business process
Q14 & 15 – These Projects Engage Navy

Nodes coloured by branch
- Light Blue = Aerospace
- Purple = Integrated Capability
- Red = Land
- Dark Blue = Maritime
- Grey = Other

Organisational nodes sized by incoming links

Collaboration and stakeholder management
Q16 – Navy Engages These Projects

Nodes coloured by branch
- Light Blue = Aerospace
- Purple = Integrated Capability
- Red = Land
- Dark Blue = Maritime
- Grey = Other

Collaboration and stakeholder management
Position nodes coloured by type
• Red = Project
• Blue = Support
• Black = Other
• Pink = Technical

Nodes sized by incoming links

Links coloured by type:
• opportunities
• problem solving
• advice

Internal collaboration
‘Science is built with facts, as a house is with stones. But a collection of facts is no more a science than a heap of stones is a house’.

Henri Poincare, Mathematician, 1901.
The Generic Process

- **Determine the unit of analysis.** This is arguably the most important step, as it determines how data is collected and which tools and analysis techniques should be employed.

- **Determine the questions.** The questions depend on the unit of analysis, and what you want to discover.

- **Collect the data.** Typically the questions are answered using a survey. The survey can be done in person, on paper, or be web-enabled. Where appropriate data collection can also be done using data-mining techniques. For example intra-departmental e-mail traffic could be mined. In the case of a policy relationship mapping exercise the documents are parsed for key words, headings and other relevant attributes.

- **Import the data into a visualisation tool.** Typically data is entered into an Microsoft EXCEL workbook or database, and then imported into a visualisation tool.

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## Sample Questions

<table>
<thead>
<tr>
<th>Type</th>
<th>Example Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organisational Interface Mapping</strong></td>
<td>Please identify up to 10 people who work in external departments and who are important to you in your professional network. These can be people who provide you with information to do your work, help you think about complex problems posed by your work, or provide developmental advice or personal support helpful in your day-to-day working life. These may or may not be people you communicate with on a regular basis and must come from an organisation external to yours.</td>
</tr>
<tr>
<td><strong>Project Interface Mapping</strong></td>
<td>Please identify the people in other project teams that you rely on to provide information for your project. For each person you have identified please assign a score based on the amount of contact you have with them. 1 is the most amount of contact. 10 is the least amount of contact. Each score should be different.</td>
</tr>
<tr>
<td><strong>Information Flow Mapping</strong></td>
<td>Please identify the people in your department you have passed documents or e-mails to in the last month. These may or may not be people you communicate with on a regular basis, but they must be part of your department.</td>
</tr>
<tr>
<td><strong>Collaboration Mapping</strong></td>
<td>Please identify the people who are important to you in your professional network. These can be people who provide you with information to do your work, help you think about complex problems posed by your work, or provide developmental advice or personal support helpful in your day-to-day working life. These may or may not be people you communicate with on a regular basis and must come from within your organisation.</td>
</tr>
<tr>
<td><strong>Social Capital Mapping</strong></td>
<td>In your workplace who do you go to for information that helps you solve problems or capitalise on opportunities?</td>
</tr>
</tbody>
</table>
A BNA™ Question Design

- 4 demographic questions.
  - ‘What projects, if any, are you responsible for?’
- 12 project questions, some with sub-questions.
  - ‘What projects are your project dependant on for part of its capability outcome? Please weight the importance of the project as minor, important or critical.
- 3 organisational interface questions, some with sub-questions.
  - ‘Which external to CDG Defence organisations does your position interact with the most for work purposes, and what is the frequency of the interaction? (annually, monthly, weekly or daily).
- 4 collaboration questions, some with sub-questions.
  - ‘In the workplace who do you go to for information that helps you solve problems?’
Node-sets, Attributes, Adjacencies, and Affiliations

CDG BNA v1.3
# One-Mode (Adjacency) Networks

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<th>James</th>
<th>Peter</th>
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<th>David</th>
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One-Mode (Adjacency) Networks
## Two-Mode (Affiliation) Networks

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Two-Mode (Affiliation) Networks
Visualisation and Analysis Tools

- Microsoft EXCEL 2007
- NodeXL
- UCINET and NetDraw
- NetMiner II and NetMiner III
- NetMap Analytics
- PAJEK
- Mage
- Condor
- ENet
- Visone
- KeyPlayer
- Inflow
- StocNET
- PNet
- and many more

http://www.insna.org/INSNA/soft_inf.html
Strengths and Weaknesses of the Tools

- Colours and layers are more easily applied in NetDraw.
- Spring diagrams are easier to layout in NetDraw.
- NetMap Analytics is very good at Step Analysis.
- UCINET is good for analysis, but the understanding of the measures is assumed.
- NetMiner brings analysis and visualisation together. The strength of NetMiner is the visualisation of many of the measures, and particularly centrality measures.
- PAJEK, NetMap Analytics, and NetMiner III are best at handling very large datasets.
- NodeXL is emerging as a simple to use tool.
# Data Collection

For each person you have identified please indicate the primary benefit that you currently receive from them.

<table>
<thead>
<tr>
<th>Information that helps me solve problems or capitalise on opportunities</th>
<th>Access to decision makers that allows me to move my plans ahead.</th>
<th>Political support that allows me to move my plans ahead.</th>
<th>Problem-solving interactions that challenge my thinking on important or opportunities in my work</th>
<th>Career advice or other developmental feedback that helps me be more effective in my work.</th>
<th>Personal support and the ability to vent or discuss a tough problem in my work in ways that help me to get back on track</th>
<th>Purpose or a sense that what I do at work has a positive impact and matters.</th>
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<tbody>
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<td>Person 1 *</td>
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Please contact Graham Duport-Law at graham@duport-law.info or Professor Trish Milne at trish.milne@canberra.edu.au if you have any questions regarding this survey.
### Data Structure

#### Excel Sheet

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#### Text File

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n=18 format = edgelabels embedded
data:
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ROMUL PETER 3
ROMUL ALBERT 1
BONAVEN ROMUL 3
BONAVEN VICTOR 2
BONAVEN ALBERT 1
AMBROSE ROMUL 2
AMBROSE BONAVEN 3
AMBROSE ELIAS 1
BERTH PETER 3
BERTH LOUIS 1
BERTH GREG 2
PETER BERTH 3
PETER HUGH 2
PETER MARK 1
LOUIS ROMUL 1
LOUIS BERTH 3
LOUIS JOHN 3
```
Data Importation
• Ethics in network analysis is a vexed question.
• Non-response does not immediately guarantee omission from the study.
• It is very easy for data, and the visualisations to be used in unintended ways and/or to be misinterpreted.
• Must read “Toward ethical guidelines for network research in organizations” by Professor Steve Borgatti.

Presentation

- To remove ambiguity always include the question on the slide.
- Remove node labels unless they are necessary for understanding.
- Try to space the diagram to minimise link crossovers.
- Where appropriate include arrowheads to show direction.
- Do use colour, size and shapes.
- Do filter data to show only what is necessary for understanding.
- Always remember there are multiple ways to present data, and hence multiple interpretations.
Session Five
Concluding Remarks

‘The most incomprehensible thing about the world is that it is at all comprehensible’.

Albert Einstein, Physicist, 1921.
Projects are the vehicles to help deliver better ROI for the business.

They are pivotal strategic and operational level business tools.

The Program can add value or destroy value just as changing an eco-system can enhance or reduce bio-diversity.

Understanding the complexity of the eco-system is what the PKM and BNA does for a program.
Some Issues

- Must clearly define the ‘unit of analysis’ – that is what are nodes, what are ties, and what are attributes.
- Must define the population, and then cover the whole population to get meaningful network statistics.
- Requires specialist software.
- Usual limitations of survey techniques.
- Few research exemplars.
Cautions

- Mathematical approaches to network analysis tend to treat the data as ‘deterministic’. That is, measurements are viewed as an accurate reflection of the ‘real’ or ‘final’ or ‘equilibrium’ state of the network.

- Observations are usually regarded as the population of interest rather than a sample of some larger population of possible observations.

- You must understand your organisation, the data, the resultant network and the assumptions you are making!

Web Resources

- Connections - The official journal of INSNA. It has full text articles back to 1977. [http://www.insna.org/indexConnect.html](http://www.insna.org/indexConnect.html)
- Vancouver Network Analysis Team [http://www.sfu.ca/~richards/](http://www.sfu.ca/~richards/)
- Ronald Burt's homepage [http://gsb.uchicago.edu/fac/ronald.burt](http://gsb.uchicago.edu/fac/ronald.burt)
- Visible Path – the web pages and blog of Stanley Wasserman [http://www centralityjournal.com/](http://www centralityjournal.com/)
Essential Reading


More Advanced Reading


‘The real questions refuse to be placated… They are the questions asked most frequently and answered most inadequately, the ones that reveal their true natures slowly, reluctantly, most often against your will’.

Ingrid Bengis, Author, 1973
Contact Knowledge Matters™

Knowledge Matters™
Understanding business knowledge relationships

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- Website: http://www.durantlaw.info
- Blog: http://www.durantlaw.info/blog
- Email: mailto:graham@durantlaw.info
Contact HolisTech® Pty Ltd

- **Phone:** +61 2 6255 0122
- **Email:** pat.byrne@holistech.com.au
- **Website:** http://www.holistech.com.au
- **Blog:** http://www.patbyrne.biz.au
Using Business Network Analysis™ Techniques in Project Management

by

Graham Durant-Law

BSc, MHA, MKM, Grad Dip Def, Grad Dip Mngt, Grad Cert Hlth Fin, psc.