An application of systems thinking to the process used to collect, store and use information to fight organised crime

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Abstract

The Organised Crime Group Mapping (OCGM) Process is the operational way UK police forces collect and analyse intelligence and data on organised crime. This process has been analysed from a systems thinking and complexity perspective. At a workshop held in November 2016 police officers and other personnel from Merseyside Police created multiple cause diagrams and systems maps to investigate possible opportunities for improvement to the OCGM Process. This demonstrated that systems and complexity thinking can be used for this purpose. Analysis of the diagrams revealed a number areas where improvements may be possible. Based on the results of this exercise we recommend a more comprehensive study as the basis for practical improvements to the OCGM Process at local and national levels.

Contents

[1] This work was undertaken on behalf of the Open University Centre for Policing Research and Learning funded by the Police Knowledge Fund, a joint initiative between The College of Policing, the Higher Education Funding Council for England (HEFCE) and the Home Office. The project team consisted of Professor Jeff Johnson, Professor Joyce Fortune and Dr Jane Bromley. The work was conducted in association with Merseyside Police. Contacts: jane.m.bromley@open.ac.uk j.fortune@open.ac.uk and jeff.johnson@open.ac.uk

1. Introduction

The Organised Crime Group Mapping (OGCM) Process is used by police forces across the UK. OCGM data is a dynamic repository for information and intelligence on organised crime groups. It is formatted as an Excel file and computer programs process the data to calculate the level of threats and capabilities of organised crime groups.

Research has been undertaken to investigate how systems and complexity thinking could be applied to the Organised Crime Group Mapping Process in ways that are useful to practical policing. There were two main strands to this research: first, the organisational processes that uses the OCGM data as part of a larger human information and decision-making system; and secondly whether new technical ways of abstracting useful information from the data could be devised. This working paper is concerned exclusively with the first of these. It draws on data collected during interviews with Merseyside Police personnel and background information from published sources but its main focus is on the outputs of a workshop held 29 November 2016 with police officers and other personnel from Merseyside Police.

For those unfamiliar with them already, we sketch the Organised Crime Group Mapping Process and introduce the concept of system and some of the techniques associated with systems thinking in Sections 2 and 3 of this paper. Section 4 describes the workshop and the data collected; Section 5 gives an analysis of the data; and Section 6 gives our conclusions and recommendations.

2. The Organised Crime Mapping Process

The main source for this section is the *Organised Crime Group Mapping Manual* produced in September 2010 by the Organised Crime Partnership Board [1]:

"Organised crime groups dominate much of the organised crime that impacts on the UK. Their activities cover different crime types, including drug supply, robbery, organised immigration crime, firearm crime, vehicle theft, evasion of excise duties, financial and business fraud, intellectual property theft and counterfeiting. " [Page 6]

"Organised crime groups (OCGs) usually consist of a durable core of key individuals, around which there is a cluster of subordinates, specialists and other more transient members, plus an extended network of disposable associates. Different criminal activities require different structures. Most OCGs in the UK are, in practice, loose networks of 'career criminals' who come together for the duration of specific criminal ventures. Individuals may be involved with a number of groups, fulfilling different roles in each and, therefore, engaged in a number of separate criminal ventures at any one time." [Page 7]

"The organised crime group 'map' is an index of OCGs committing serious crime that pose harm, risk and threat to communities across the UK.

The map is being created by UK law enforcement agencies (UKLEAs) and associated organised crime stakeholders. These agencies together are referred to in this manual as 'partners'.

The organised crime group map:

- Identifies geographically where organised crime occurs;
- Identifies who is involved, where they operate and reside;
- Provides an understanding of organised crime locally, regionally, nationally and internationally;
- Creates a consolidated picture of those causing harm to the UK;
- Provides a consistent measure of the scope and nature of the problem.

Partners are using this picture of groups committing serious crime in order to:

- Identify and prioritise interventions across agencies;
- Share intelligence to improve operational response;
- Provide strategic and tactical data to support operational activity locally, regionally, nationally and internationally;
- Make all intelligence assessments from local to national level, including the United Kingdom Threat Assessment (UKTA);
- Reduce harm;
- Ensure the effective use of resources;
- Identify cost savings by improving efficiency;
- Facilitate partnership working.

In addition, a systematic application of the organised crime group mapping (OCGM) process will enable partners to reassure the public that there is an effective response to the threat from organised crime, thereby improving public confidence. " [Pages 7-8]

Table 1 sets out the terms of reference for OCGM.

Vision
Organised Crime Group Mapping is a multi-agency law enforcement process that supports nationally the identification, assessment and management of the threat from organised crime.
Aim
To provide UK law enforcement with a tool that informs understanding of organised crime at local, regional, national and international levels, supporting the management of risk and reduction of harm.
Objectives
Knowledge: Identifying and recording information from law enforcement agencies to build a standardised and comprehensive index of understanding of criminality, and the criminals involved in organised crime, on a shared system. **Understanding**: Working together on assessment and analysis of the collective knowledge to maximise the understanding of organised crime at local, regional, national and international levels. **Response**: Using a common assessment approach to identify opportunities and support prioritisation and coordinated response both at tactical and strategic levels to manage the threat from organised crime. **Evaluation**: Working together, sharing knowledge, understanding and responding to the threat and risk from organised crime to provide a framework for common performance indicators. Ensuring support to law enforcement agency priorities that maximise reduction in harm and increase public confidence.

Table 1. Organised Crime Group Mapping Terms of Reference [Page 9]

"The OCGM process consists of three elements:

- Gathering and collating information and identifying OCGs
- Evaluating and analysing the information and assessing the threat posed by the OCGs identified
- Managing the threat strategically and tactically

OCGM information should be used at all levels, from local, regional, national to international level. At each level, OCGM supports tasking and co-ordination processes by highlighting where operational activity, including relevant specialist assets and techniques available at that level, should be directed in order to manage the threat posed by OCGs committing serious crime.

The activities of OCGs are not restricted by geographical boundaries or partner responsibility, and tackling the threat posed by organised crime may require specialised equipment and skills. Regional intelligence units (RIUs) have been established across the UK which bring together police forces, the Scottish Crime and Drug Enforcement Agency (SCDEA), Her Majesty's Revenue and Customs (HMRC), the Serious Organised Crime Agency (SOCA) and the United Kingdom Border Agency (UKBA) to work together to identify, assess and manage the threat from OCGs. In Scotland, the Scottish Intelligence Coordination Unit (SICU) undertakes a similar function and coordinating role as an RIU. RIUs facilitate multi-agency working, both between police forces within a region, and with partners. " [Pages 9-10]

"Aggregating the data is a key component of the OCGM process and occurs at regular intervals across the UK. The UK multi-agency team (UK MAT) aggregates regional datasets (ie, those incorporating all data contributed by a region's composite forces/units) and those datasets provided by partners. Aggregated data enables the UK MAT to view OCGM data from all partners. In this way, regular aggregation enhances local, regional, national and partner knowledge in relation to organised crime that impacts on that geographic area or partner responsibility. The SCDEA (SICU) aggregates data from across Scotland and work in partnership with the UK MAT in producing a composite picture of the threat from serious organised crime as it impacts on Scotland and the wider UK. " [Page 10].

"The OCGM data requirement is a set of questions to be considered when entering an OCG or individual onto the map. It is the basis for collecting, collating and assessing the information that is needed in order to improve knowledge of OCGs and achieve an informed assessment of the threat posed by them.

It is intended to complement the national intelligence requirement (NIR) by adding detail about the criminal business profile of OCGs and individual members. This knowledge can be used at force, regional, national or international levels." [Page 11].

Thus the OCGM Process is a system that involves people collecting information, entering those data into a computer information system, and processing the data to produce results that can feed into a human system to determine and support tactical and strategic polices for policing. The next section will sketch the basics of systems thinking so that the OCGM Process can be analysed more formally as systems.

3. Systems thinking applied to the OCGM Process

Systems are formed from sets of interacting parts where every part effects and is effected by every other part, and the behaviour of the system emerges from the interactions. Of many more or less similar definitions a *system* is here defined as:

1. an assembly of components, connected together in an organised way
2. the components are affected by being in the system and the behaviour of the systems is changed if they leave it
3. the organised assembly of components does something
4. the assembly has been identified as being of particular interest.

The last of these emphasises the use of systems thinking for designing and managing systems, avoiding or mitigating failure, or improving performance – no matter how simple or complex the system may be. Many systems have a purpose – the organised assembly of components does something useful.

Sometimes systems go wrong because they have systemic weaknesses. Systems thinking can help diagnose, prevent or mitigate such failures. Sometimes systems could be improved to give better performance and outcomes, and systems thinking helps to identify those parts of the system or behaviours where improvements are possible. Our approach has been to consider how systems thinking might help the police to identify opportunities to improve the OCGM Process, and our workshop with Merseyside Police was designed to investigate this.

In our study the participants were asked to identify aspects of the OCGM Process that they felt could be improved. The following is taken from our MOOC on *Systems Thinking and Complexity* (https://www.futurelearn.com/courses/systems-thinking-complexity):

Multiple cause diagrams are used to explore why changes or events happen in systems. They do not predict behaviour, but may give insights into the multiple causes of system behaviour and how to make undesirable behaviour less likely.

The elements of multiple cause diagrams are phrases, and arrows between them.

The rules for drawing multiple cause diagrams are:

- phrases may be things but as the diagram develops it is preferable to use variables associated with them, e.g. 'poor teaching material' might become '35% of teaching material is substandard';
- arrows do not necessarily mean causes, but can be read as 'contributes to', 'leads to', 'enables', or similar terms;
- the diagram may be entirely sequential, or it may contain loops.

The guidelines for using multiple cause diagrams include:

- begin at the factor or event to be explained and work backwards;
- the arrows should be labelled;
- it is not necessary to put blobs around phrases;
- ensure that each causal link is clear, inserting any necessary intermediate variables or factors as necessary;
- these diagrams do not distinguish necessary and sufficient causes – if this is required the diagram will need annotating to show this;
- it is not necessary to draw a system boundary, but drawing the diagram may guide ideas about where the boundary lies;
- although these diagrams are similar to influence diagrams, they are different because they can be read sequentially rather than being a snapshot representation and they do not begin with the structure of the system.

4. The Systems and Complexity Thinking OCGM workshop

Following a number of visits by the research team to Merseyside police, the planned systems thinking workshop was announced internally and 10 participants were recruited. The workshop as held at Mersey Police Headquarters on 29th November 2016. The workshop was led by Prof. Joyce Fortune supported by Dr Jane Bromley and Prof. Jeff Johnson from the Open University team.

Following the briefing (provided here as Appendix A), workshop participants were asked to start to build a model of the system and to use the multiple cause diagram convention to explore the factors affecting the quality of the outputs of the system. Appendix B summarises the activities that make up the system. Examples of the primary outputs of the workshop are shown in Appendices C and D.

Discussion of the outputs of the workshop revealed two areas where opportunities for improvement exist. The first of these is to improve the way that needs for tweaks to the system are raised, responded to and dealt with. The second is the solution of a larger, more major, set of concerns associated with decision-making and knowledge management.

Tweaking the system

Examples were given by workshop participants of suggestions for improving the system that had been identified as a result of day to day operation. Some of these had eventually led to changes and others had not but it was not clear what processes had been followed in order to examine the suggestions and then reject or act upon them. One current concern that was cited is that it is not possible to flag when a piece of intelligence has been returned to a submitter for rework (for example, when it has been sent back because the provenance is missing). As a consequence, when the revised intelligence is submitted it "sits in a pot as a new submission". Furthermore, if a correction is not submitted the "intelligence remains incorrect and in submitter's pot" and therefore remains unevaluated. This is illustrated in Figure 1.

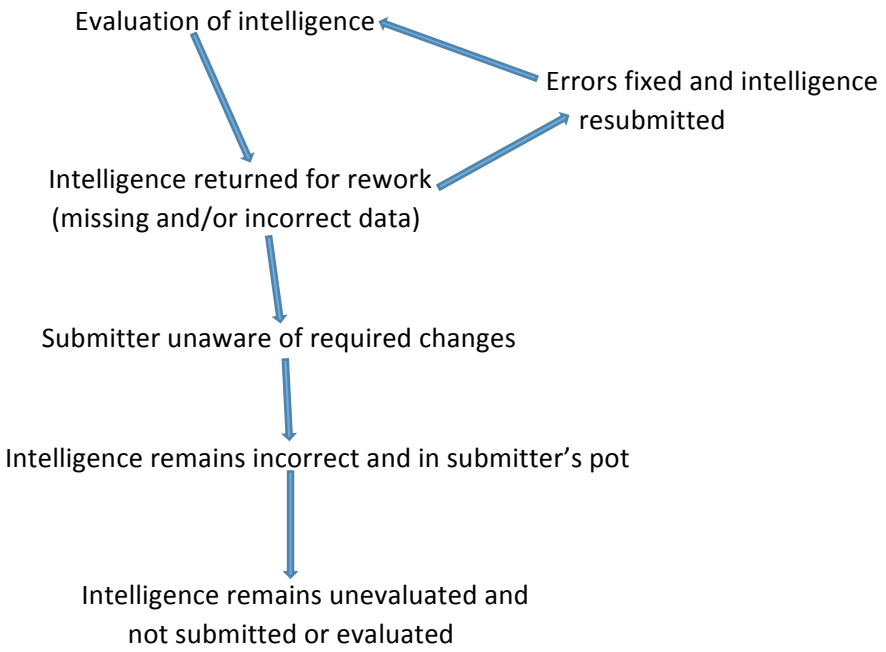

Figure 1 Extract from Appendix D, example 3

Another example identified is the potential to place greater emphasis on providing more useful feedback to those supplying intelligence. Currently, staff from outside agencies or officers on the

beat receive a standard 'thank you' for inputting a piece of intelligence regardless of the value of that input. This procedure could be extended to provide enhanced feedback so that suppliers of intelligence can develop greater awareness of the value of different types of intelligence. It may also act as a motivating force, encouraging the submission of higher volumes of useful intelligence. In could also be useful to provide a second round of feedback when outcomes are known. Another option would be to put together training packages for those supplying intelligence that provide case studies illustrating how the quality of information affects outcomes.

By establishing a formal system for submitting, considering and implementing tweaks to the system problems like this can be considered properly in a timely fashion and the system revised or not as appropriate. It is also likely that users of the system would be more motivated to make suggestions for improvement. Not only would greater use be made of staff members' experience and expertise but genuine improvements to the system would also be achieved more swiftly and in greater numbers.

Decision-making and knowledge management

The cause and effect diagrams also demonstrate problems caused by differences between the perceptions, knowledge and expertise of individuals that affect their decision making and consequently the actions that are taken. An example is shown in Figure 2.

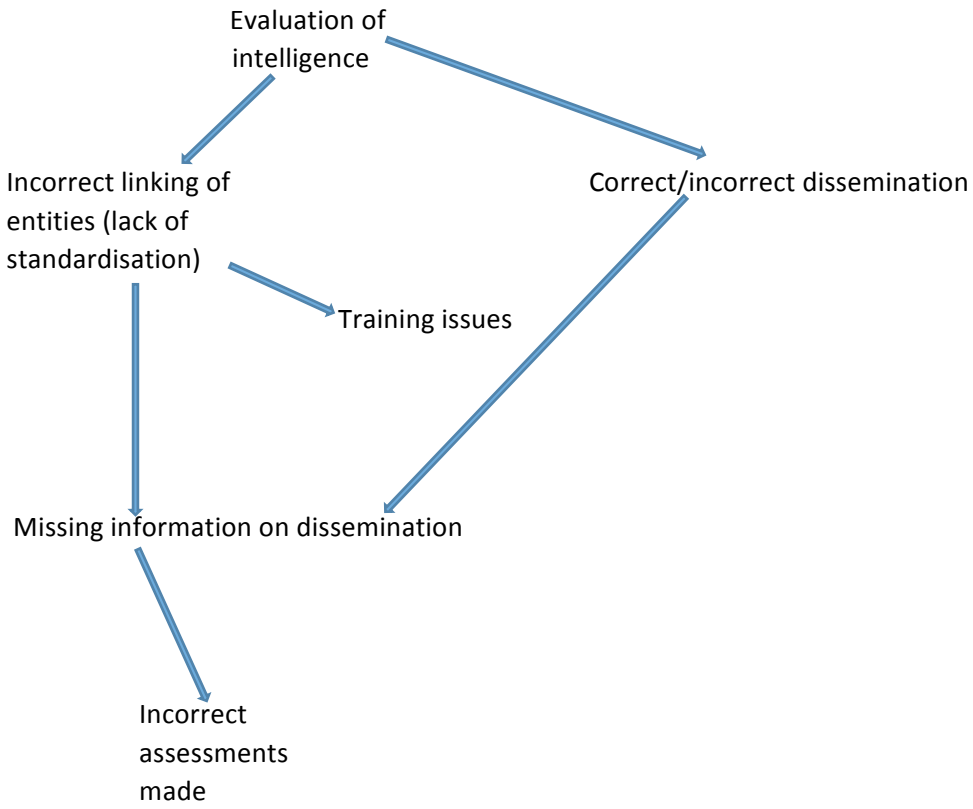

Figure 2 Extract from Appendix D, example 4

Essentially the system is a knowledge management system. As Luen and Al-Hawamdeh (2001) point out:

> There are two type of knowledge that need to be managed within the police force. The first type of knowledge is explicit knowledge, which is used as guidance for police actions and decision making. … The second type of knowledge is implicit or tacit knowledge. This includes the competence, experience and skill of police officers (p. 313).

They go on to say:

> Regarding tacit knowledge, the scope of knowledge management in police work is primarily in the areas of creating and sharing knowledge and information. The two main issues to be addressed here are the willingness of police officers to create and share knowledge and the ability of police officers to create and share knowledge (p. 314).

There is no indication that 'willingness' is an issue here other than at the input stage where police officers and outside agencies are said to sometimes be reluctant to supply intelligence because they are under time pressures and because they do not necessarily appreciate the value of the information they hold. As a consequence some intelligence that could be very useful fails to reach the system. As suggested above in relation to tweaks to the system, this problem could be alleviated by refining the feedback provided to those supplying intelligence. The suggestion to provide case studies illustrating how the quality of information affects outcomes could also be extended to cover those in relevant positions who currently supply few inputs.

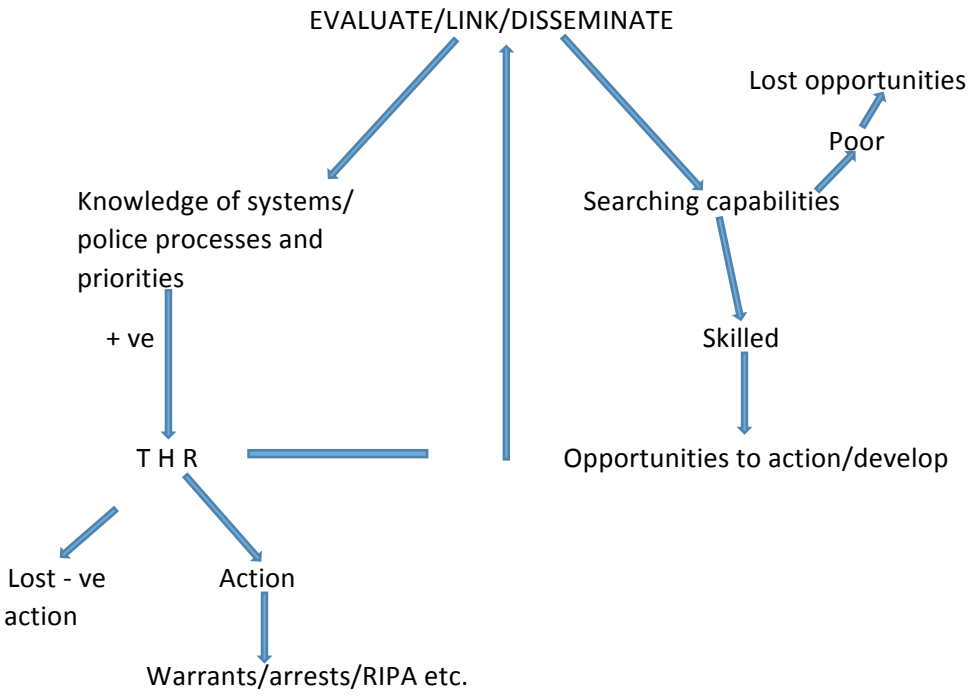

Figure 3 Extract from Appendix D, example 1 (THR denotes threat, harm, risk)

Where ability to create and share knowledge is concerned, however, Figure 2 suggests that it is not uniformly high. This suggestion is also supported by Figure 3 in the shape of lost opportunities and failures to trigger actions. At lower levels in the organisation, increased training provision and stronger encouragement of knowledge sharing could lead to greater and more consistent appreciation of what constitutes high value intelligence and of what constitutes levels. At higher

levels in the organisation greater shared understanding could be achieved by providing opportunities to reflect on the effectiveness of the system.

Whilst further training and staff development are likely to deliver improvements a more significant opportunity may exist. It is certainly the case that part of the tacit knowledge which needs to be managed is ineffable and therefore cannot be codified, but it is very likely that parts of it could be made explicit and that if this were done it would lead to performance improvements. The biggest opportunity to do this lies in the information technology. (A relevant example is provided by Katz (2013) in the shape of a program that uses predictive analytics to verify and cross reference trial cases.) By using a complex systems approach, implicit knowledge can be formalised into models to make the dynamic patterns in the data clearer and their detection more reliable.

5. Conclusions and Recommendations

This study demonstrated the high level of engagement and reflection by the participants in the OCGM Process, and their willingness to use systems thinking to investigate possible improvements. It also shows that there are pinch points in the OCGM Process that are well known to the participants and, very importantly, that the participants have ideas for ways to improve the process. Those emerging from the workshop include:

- Areas with opportunities for improvement include: (i) improving the way that needs for tweaks to the system are raised, responded to and dealt with, and (ii) solving some larger, more major, set of concerns associated with decision-making and knowledge management.
- Some suggestions for improving the system eventually lead to changes but others do not. It is not clear what processes had been followed in order to examine the suggestions and then reject or act upon them.
- It is not possible to flag when a piece of intelligence has been returned to a submitter for rework (*e.g.* missing provenance), and when the revised intelligence is submitted it may "sit in a pot as a new submission". If a correction is not submitted the "intelligence remains incorrect and in submitter's pot" and therefore remains unevaluated.
- There is the potential to provide more useful feedback to those supplying intelligence. Currently, they receive a standard 'thank you' for inputting a piece of intelligence regardless of the value of that input. Enhanced feedback could enable intelligence suppliers to develop greater awareness of the value of different types of intelligence, and may be motivating, and encourage the submission of higher volumes of useful intelligence. It could also be useful to provide a second round of feedback when outcomes are known.
- Training packages could be provided for those supplying intelligence to provide case studies illustrating how the quality of information affects outcomes.
- A formal system is required for submitting, considering and implementing tweaks to the system so that problems can be considered properly in a timely fashion for potential revision. Users of the system could then be more motivated to suggest improvement, making greater use of their experience and expertise, and enabling genuine improvements to the system to be achieved more swiftly and in greater numbers.

- The cause and effect diagrams demonstrate problems caused by differences between the perceptions, knowledge and expertise of individuals affecting their decision making and the actions that are taken.
- At the input stage police officers and outside agencies are sometimes reluctant to supply intelligence because they are under time pressures and because they do not necessarily appreciate the value of the information they hold. Consequently some intelligence that could be very useful fails to reach the system. This problem could be alleviated by refining the feedback provided to those supplying intelligence.
- Provision of case studies illustrating how the quality of information affects outcomes could be extended to cover those in relevant positions who increase their supply of inputs.
- The ability to create and share knowledge is not uniformly high. Poor search capabilities can lead to lost opportunities and failures to trigger actions. At lower levels in the organisation, increased training provision and stronger encouragement of knowledge sharing could lead to greater and more consistent appreciation of what constitutes high value intelligence and of what constitutes levels. At higher levels greater shared understanding could be achieved by providing opportunities to reflect on the effectiveness of the system.
- Tacit knowledge is ineffable and therefore cannot be codified, but some parts of it could be made explicit and this would lead to performance improvements. The biggest opportunity to do this lies in the information technology using predictive analytics to verify and cross reference trial cases. A complex systems approach could formalise implicit knowledge into models to make the dynamic patterns in the data clearer and their detection more reliable.

The OCGM Process is an important element in policing in the UK. This research shows that systems thinking can identify methods for improving it.

These finding suggest that a more comprehensive study of the OCGM Process could identify significant ways of improving it for application across the UK.

We recommend that the Home Office work with the police at local and national level to use systems and complexity thinking to identify areas where the OCGM Process can be improved.

As systems and complexity scientists we are aware that identifying potential improvements and making changes in a process can cause disruption and be counter-productive and have unintended consequences. The following recommendation reflects this.

We recommend that any policies aimed at improvements in the OCMG process be analysed and modelled using the methods of systems thinking and complexity science to investigate their potential effectiveness and risks associated with the dynamics of change.

Acknowledgements

We would like to thank our colleagues at Merseyside Police for enabling this research, and express particular gratitude to all those who participated in the workshop.

References

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Appendix A: The briefing presentation

Session 1 Looking at the quality of the outputs of the system

Use the multiple cause diagram convention to explore the factors affecting the quality of the outputs of the system

Some questions to consider:

What are the outputs? – information, decisions, anything else???

How do the structures (organizational and physical, mainly in the shape of IT) affect the quality of the outputs?

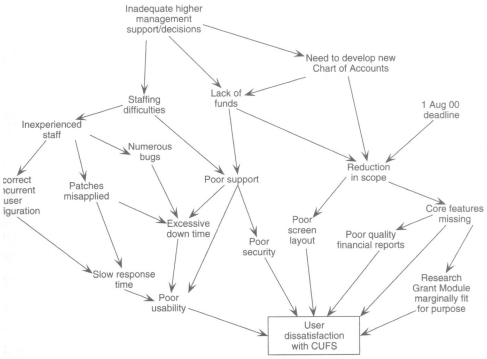
How do the processes affect the quality of the outputs?

How good is the data/information?

What decisions are being made and where do they fit?

Example of a multiple cause diagram

Multiple cause diagram showing user dissatisfaction with CUFS



The multiple cause diagram convention

Elements

- Phrases
- Arrows, which may be labelled

Guidelines

The phrases may simply be 'things' but, as the diagram is developed, it is preferable to describe the relevant variables associated with those things (eg incomplete information instead of just information). Phrases may also represent events.

Arrows do not necessarily mean causes. They may be read as meaning 'contributes to', 'leads to', 'enables' or similar terms. Because the arrows may represent different kinds of contribution/cause, it may be helpful to label them.

You normally begin the diagram at the factor/event to be explained and work backwards. A diagram should include more than one such end factor *only* if contributory factors are related, and explaining both events is important.

The diagram may be entirely sequential, or it may contain loops.

Consider the positive and the negative and the currently neutral.

Session 2 Mapping the system

Identify the components of the system and the components of the environment in which it sits

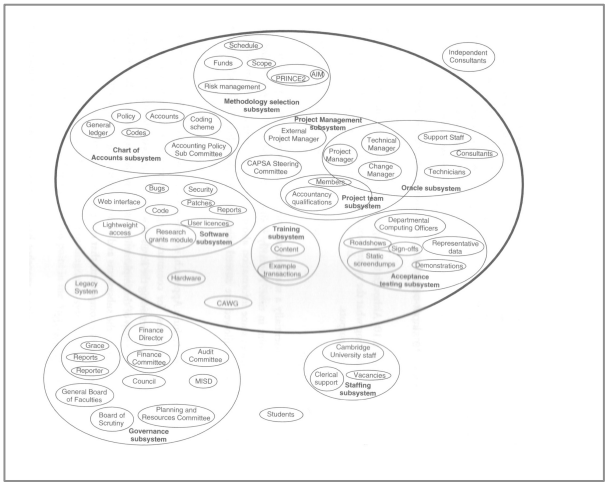
Start to build a model of the system

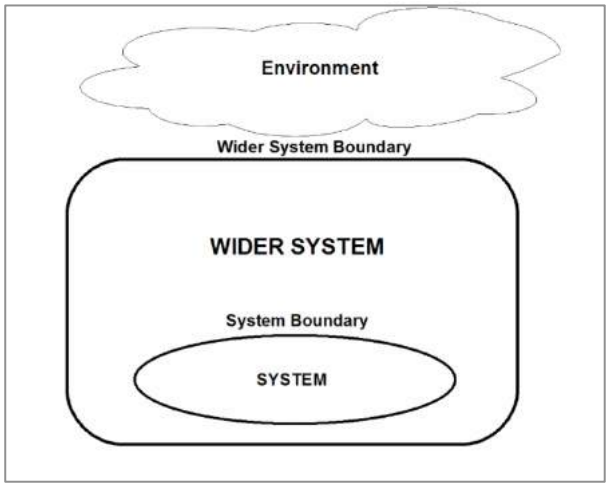
What is the system?

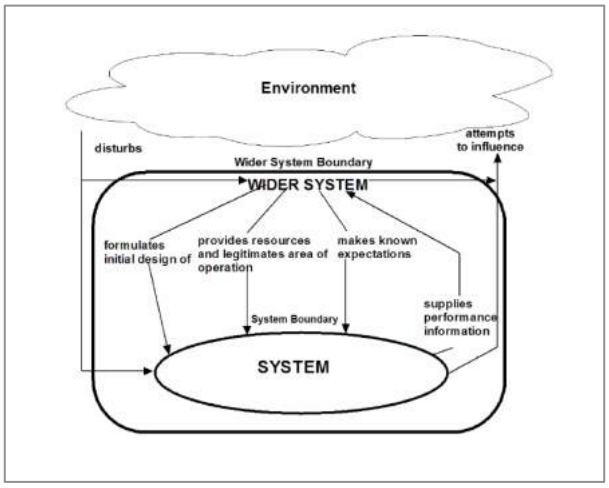
For the purposes of this exercise assume the system is the set of structures and processes in which people use technology to collect, record and assess data/information so that it can be used in the fight against organized crime. An activity sequence diagram has been used to summarise the activities taking place in this system.

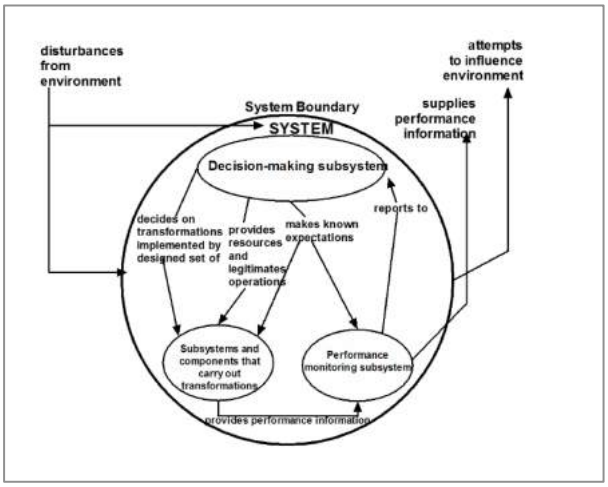
What are the components of the system? - include people (individuals and groups), IT, other infrastructure, etc

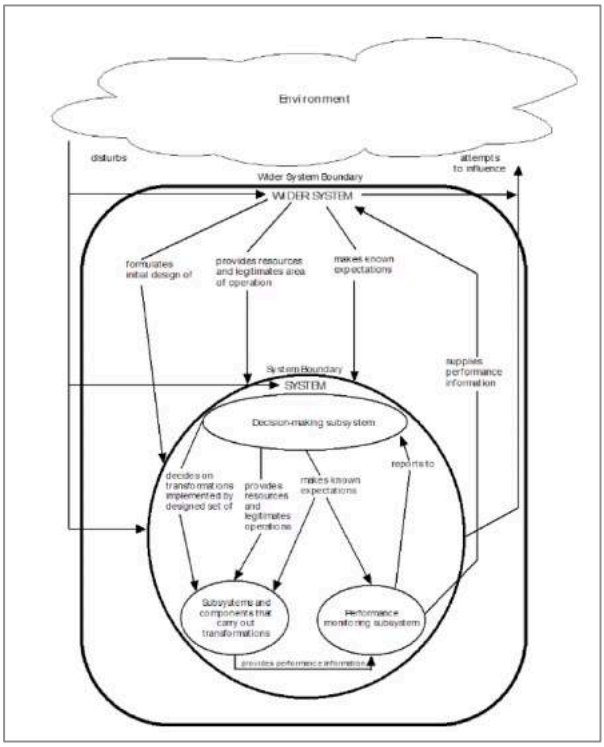
What are the components of the environment in which it operates?

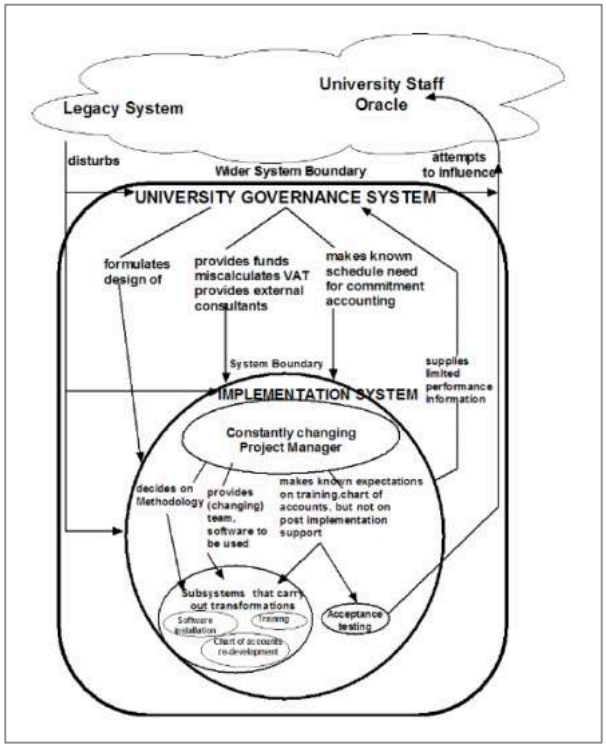












Starting point is list of components

What are the components of the decision-making subsystem?

What are the subsystems and components that carry out the transformations?

What are the components of the performance-monitoring subsystem?

What are the components of the environment?

What is the wider system?

Then look at each link in turn

Does it exist?

What are its properties?

To what extent re its functions/purposes fulfilled?