BURGE HUGHES WALSH

The Systems Thinking Tool Box

Dr Stuart Burge

".. bump, bump, bump, on the back of his head. It is, as far as he knows the only way of coming downstairs, but sometimes he feels that there really is another way, if only he could stop bumping for a moment and think of it."

Winnie the Pooh - A. A. Milne

Influence Diagram (ID)

What is it and what does it do?

An Influence Diagram (ID) is a tool for identifying and capturing the important relationships or influences that exist between the elements of a system. Figure 1 shows an example Influence Diagram constructed to understand the relationships and interaction between groups of people and individuals in a complex supply chain situation.

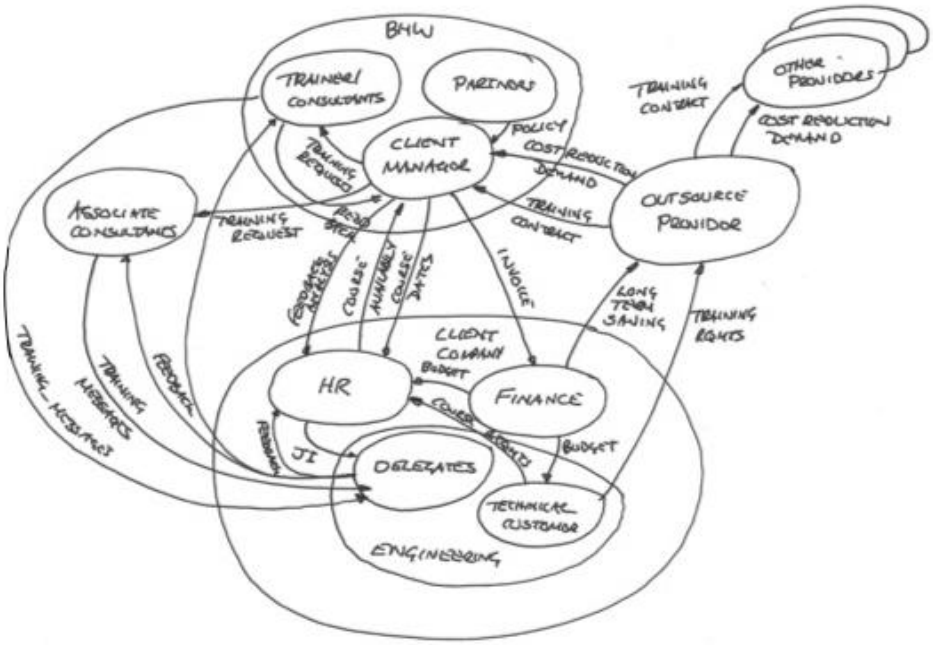

Figure 1: An Influence Diagram for a supply chain situation

The content of Figure 1 will be described in more detail later. Its purpose here is to show the overall format and elements of an Influence Diagram. It is very similar in construction to a Systems Map [1] with groups of system elements. It differs in that the diagram also shows the important relationships and interactions between the groups and elements.

© Stuart Burge 2011

Tel: 01788 550015 | E-Mail: enquiries@burgehugheswalsh.co.uk | Web: www.burgehugheswalsh.co.uk
Burge Hughes Walsh - Suite 13b Davy Court - Castle Mound Way - Central Park - Rugby - Warwickshire - CV23 0UZ

Why do it?

The behaviour of a system is driven by its underlying structure and the relationship between the elements. By constructing an Influence Diagram, those relationships can be identified and documented such that they can be explored with a view to understanding or modifying a system's behaviour.

Where and when to use it?

An Influence Diagram can be constructed as part of the effort to understand a system. It is particularly useful for Human Activity Systems where different groups of people or individuals interact in a formal and semi-formal manner. Whereas, hardware (product) intensive systems and to a large extent software intensive systems have concrete formal interconnections, Human Activity Systems will also contain less tangible, but equally important interconnections. Watch any family having a restaurant meal and you will see formal interactions via the use of a menu to select and order food items. You may also experience parent-child interactions regarding manners and behaviour at the table which semi-formal but none-the-less important.

Who does it?

An individual or team can undertake the construction of an Influence Diagram. In general, the outcome is more complete if a team performs the map construction. Moreover, when attempting to capture Human Activity Systems the various team members will bring their own unique and important viewpoint. It is important to emphasise that the quality of the outcome is dependent upon the experience of team or individual.

How to do it?

The process for constructing an Influence Diagram comprises four steps:

Step 1: Brainstorm all potential elements of the system of interest. An element can be a person and groups of people, a process, equipment or hardware, building and places. Basically anything.

Step 2: Identify natural groups of elements that have similar/common views/features/aspects. These groups should be given a collective name. The combination of steps 1 and 2 is a Systems Map.

Step 3: Using the groups construct the Influence Diagram by identifying and documenting the influences between the various groups. The approach here is to consider each system element on the map and determine the presence and nature of any relationship with any other group. The relationships can be physical entities, information and controls flows or less tangible influences.

© Stuart Burge 2011

Tel: 01788 550015 | E-Mail: enquiries@burgehugheswalsh.co.uk | Web: www.burgehugheswalsh.co.uk
Burge Hughes Walsh - Suite 13b Davy Court - Castle Mound Way - Central Park - Rugby - Warwickshire - CV23 0UZ

Finally, record any relationships on the map to create the influence diagram:

- Show only definite influences or relationships, but do not ignore influences, because they are not tangible.
- Try to avoid influence lines crossing.
- Make sure that the diagram is easy to follow.
- Show the direction of the influence.
- Name the influence.

Step 4: Review the completed Influence Diagram to explore and understand observed system behaviour or potential behaviour. At this point it may be necessary to consider the "components" inside the groups on the Influence Diagram and determine whether or not to redefine the groups or consider the interrelationships inside a group.

When constructing the Influence Diagram, a number of rules apply:

1. A title defining the system of interest captured in the Influence Diagram should be defined.
2. The arrow joining components should be labelled with the influence.
3. A double-headed arrow should *never* be used. Two separate arrows should be used.
4. Arrows denote capacity to influence, not a sequence in time.
5. An Influence Diagram is a snapshot of the system.

Some exponents of Influence Diagrams say that the arrows should not show "material flows". I disagree with this. A customer providing a set of requirements is a "material flow", but I believe the requirements will influence the receiving element and therefore should be included. An Influence Diagram is a model of a system to aid understanding, if that understanding is enhanced through including "material flow" then include them. However, the caveat is that over complicating an Influence Diagram with every possible interconnection may not be helpful.

Illustrative Examples

Stakeholder Influence Map

The following example concerns the development of a Stakeholder Influence Map for a robotic/autonomous lawn mower. This particular system will be able to mow a domestic lawn without any human intervention. This opens up a number of possibilities including night-time operation and frequent mowing over several hours (robotic/autonomous lawn mowers do not get bored and can easily take many hours to mow even a small lawn!). The purpose for conducting the analysis would be to determine the potential stakeholders and groupings of stakeholders who have similar requirements. By grouping the stakeholders offers the opportunity to reduce the effort in eliciting and capturing requirements through focus groups or customer

© Stuart Burge 2011

Tel: 01788 550015 | E-Mail: enquiries@burgehughleswalsh.co.uk | Web: www.burgehughleswalsh.co.uk
Burge Hughes Walsh - Suite 13b Davy Court - Castle Mound Way - Central Park - Rugby - Warwickshire - CV23 0UZ

clinics. It may also be possible to prioritise the groups again to reduce the effort in gathering requirements.

Step 1: Brainstorm all potential stakeholders

Figure 2 shows the outcome of a brainstorm of potential stakeholders onto sticky notes. A stakeholder is anybody who comes into contact with the System of interest or has an interest in it.

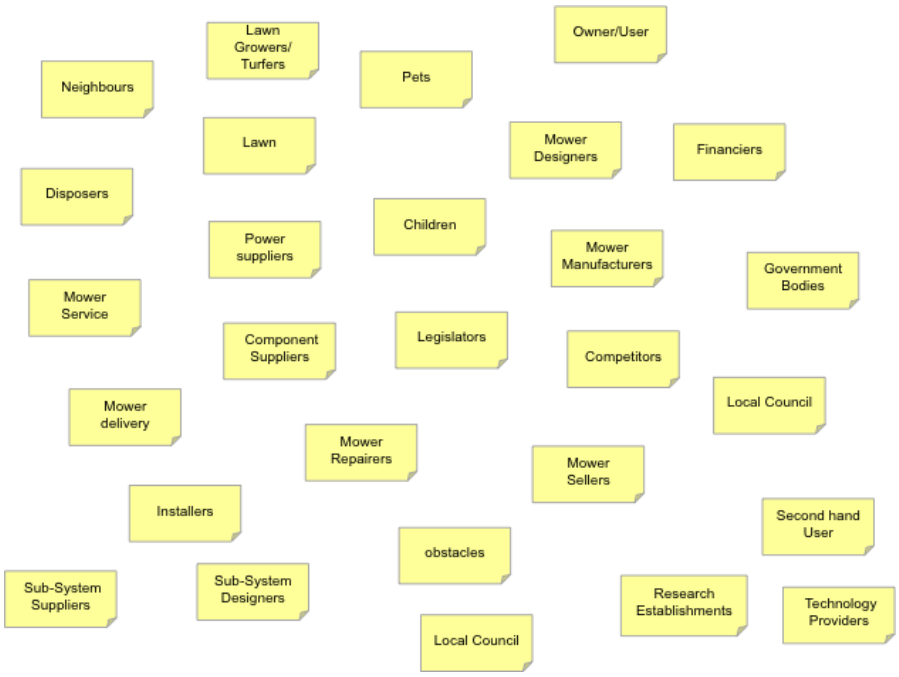

Figure 2: Sticky note brainstorm of potential robotic lawn mower stakeholders

In this particular case the brainstorm was facilitated hence there are no duplications[1].

Step 2: Identify natural groups of elements (stakeholders)

Figure 3 shows the outcome of grouping the various stakeholders found in step 1. The grouping is based on stakeholders that we believe have common or similar requirements. There is a danger, of course, that we group stakeholders that have differing requirements and by not eliciting these believe we have their needs and expectations when we do not. Best practice for gathering requirements includes some form of validation.

[1] There are several brainstorming approaches that can be used with a team. One is to let individuals conduct the own personal brainstorm and subsequently form a team brainstorm. This will result in duplications that have to be discussed and removed. The other approach is to use a facilitator to capture stakeholders as voiced by the team members.

© Stuart Burge 2011

Tel: 01788 550015 | E-Mail: enquiries@burgehugheswalsh.co.uk | Web: www.burgehugheswalsh.co.uk
Burge Hughes Walsh - Suite 13b Davy Court - Castle Mound Way - Central Park - Rugby - Warwickshire - CV23 0UZ

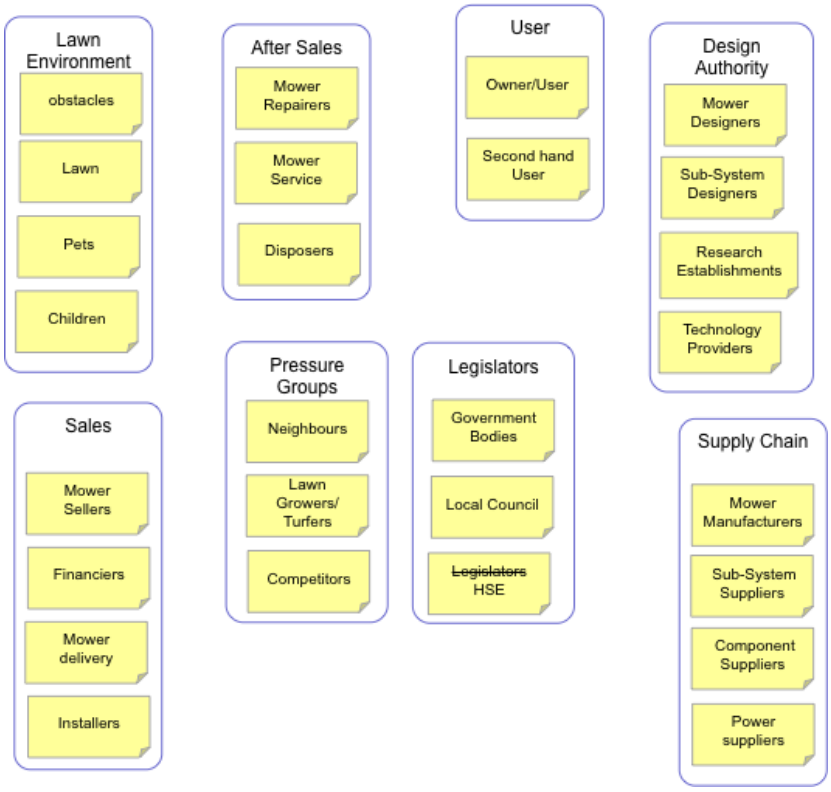

Figure 3: Grouping of potential stakeholders

The groups of stakeholders should be reviewed and a suitable name identified for that group as shown in Figure 2. If difficulty is experienced in determining a suitable name it is likely that the group is wrong and a new grouping should be considered. It can also be useful at this stage to consider missing stakeholders. In other words, review each group to see if any further stakeholders can be identified. For example, Figure 4 shows a revised Figure 3 with the inclusion of additional stakeholders.

© Stuart Burge 2011

Tel: 01788 550015 | E-Mail: enquiries@burgehugheswalsh.co.uk | Web: www.burgehugheswalsh.co.uk
Burge Hughes Walsh - Suite 13b Davy Court - Castle Mound Way - Central Park - Rugby - Warwickshire - CV23 0UZ

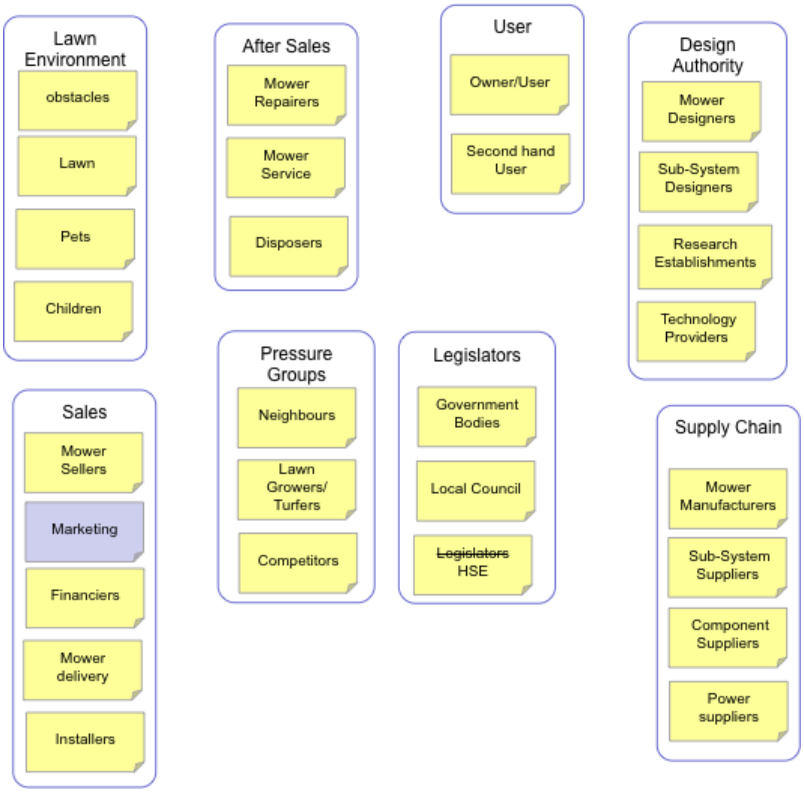

Figure 4: Revised Figure 2 with additional stakeholders

Step 3: Using the stakeholder groups construct the Stakeholder Influence Map

Figure 5 shows the completed Stakeholder Influence Map. It is a partial view since not all possible connections have been captured. It does however, represent the understanding of the team in terms of the likely influences and interaction between the various stakeholder groups.

Purists, of influences maps would argue that only “influences” should be captured. Physical flows between groups of stakeholders should not be captured. In practice this is difficult and moreover, since we are attempting to capture the views of a team in terms of their common understanding of the situation. Therefore, if a flow between two groups of stakeholders is “physical” yet the team considers it useful to include – include it! It must be remembered that an Influence Map (stakeholder or otherwise) is a model - a representation - of reality for a purpose and like all models is wrong.

© Stuart Burge 2011

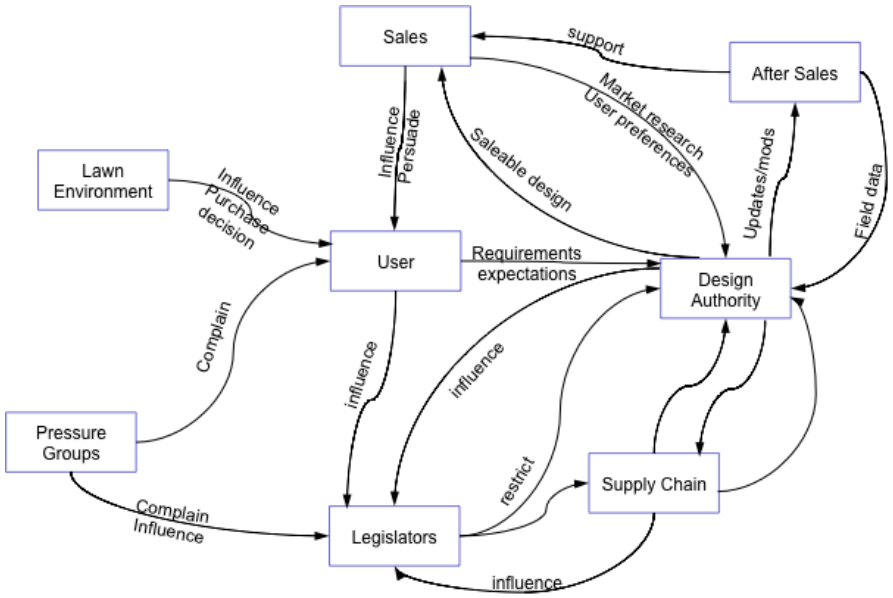

Figure 5: Stakeholder Influence Map

Step 4: Review (Stakeholder) Influence Diagram

Having generated an Influence Diagram, the last step is to review it. Context and purpose is important at this point. In the case of a Stakeholder Influence Map, it is constructed to manage the effort, cost and time in eliciting and capturing stakeholder requirements. There never is enough time to elicit requirements every stakeholder. Grouping stakeholders provides one mechanism to reduce the requirements gathering effort. It is also possible, dependent of course on the particular project and phase, to decide not to collect requirements from a particular group.

Influence Diagram for my Training/Consultancy Company

Figure 1 is an Influence Diagram of an aspect of my Training and Consultancy Company. It was drawn to capture and understand the interactions of between my company, BHW, a client company, the client company's outsource provider, other competitor providers and our associate trainers. It started life a Systems Map, but with no environmental elements. This was a deliberate choice because I wanted to focus on the internal elements of my company and the client company. Exposing levels of detail like this is perfectly acceptable (although I am on the upper limit of Miller's 7±2). Note also that the arrows are all tangible.

Figure 1 has proven useful on several counts. Firstly, it does present a simple business model that can be used to explain how we operate and how some clients chose to operate. This model is particularly useful in explaining to new staff the typical interactions. Moreover, as a baseline model, it is easy to see how other clients interact with us, particularly if we put names the various elements. It also highlights what information is needed and the interfaces between the elements which in turn helps us without ISO9001 accreditation.

© Stuart Burge 2011

Tel: 01788 550015 | E-Mail: enquiries@burgehugheswalsh.co.uk | Web: www.burgehugheswalsh.co.uk
Burge Hughes Walsh - Suite 13b Davy Court - Castle Mound Way - Central Park - Rugby - Warwickshire - CV23 0UZ

What Goes Wrong: The limitations of the Influence Map

Missing key system components/element. It is possible, typically by not including appropriate personnel, to miss key system component and/or element. Before running the session with a team to construct an Influence Diagram, I always "have a go" on my own! This means that I am prepared to ask about any unspoken stakeholders that I have considered, and the team have not.

Grouping the System components. This is a common problem where what appears to be a sensible grouping of components in to higher-level elements turns out to be inappropriate. This usually manifests itself as a Diagram with a large number of influences. This could of course be correct, but often a simple regrouping can cut down on the clutter.

Trying to model everything. Attempting to do an Influence Diagram for a whole organization, is possible, but not recommended. When faced with potentially a very large system always start with the Systems Map first in order to control the complexity through "chunking" (remembering Miler's 7±2 to produce a very high level Map. At this point either consider:

- A very high-level Influence Diagram before moving on the lower-levels and producing a set of lower-level Influence Diagrams.
- Each element on the high-level Systems Map in turn and construct an Influence Diagram. This usually provides enough information to confirm the groupings so that the highest-level Influence Diagram can be attempted.

Success Criteria

The following list represents a set of criteria that have been found to be useful when constructing an Influence Diagram:

- Team size
  - For Systems between 4 and 8
  - For Sub Systems between 2 – 5
- Team constitution has expertise and experience in the system of interest but can (and perhaps should) include members with limited experience and expertise.
- Use an experience independent facilitator.
- Plan for one to two hours effort.
- Define clearly, what we are trying to do.
- Start with a Systems Map to define the system of interest at the highest level.
- Be pragmatic with influences, we are trying to understand what are influences between elements that affect the system behaviour – they can be tangible and intangible.

© Stuart Burge 2011

Tel: 01788 550015 | E-Mail: enquiries@burgehugheswalsh.co.uk | Web: www.burgehugheswalsh.co.uk
Burge Hughes Walsh - Suite 13b Davy Court - Castle Mound Way - Central Park - Rugby - Warwickshire - CV23 0UZ

References

[1] Burge S. “Systems Map” www.burgehugheswalsh.co.uk

© Stuart Burge 2011

Tel: 01788 550015 | E-Mail: enquiries@burgehugheswalsh.co.uk | Web: www.burgehugheswalsh.co.uk
Burge Hughes Walsh - Suite 13b Davy Court - Castle Mound Way - Central Park - Rugby - Warwickshire - CV23 0UZ