

## Inter-organisational learning networks and waste minimisation projects

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### Abstract

*The research aims to identify the extent and nature of environmental organisational learning within and between Small and Medium-sized Enterprises (SMEs) participating in waste minimisation demonstration projects. In order to evaluate the effectiveness of waste minimisation projects, the research identifies the networks through which knowledge is shared between companies and through which learning takes place. There has been some discussion of the merits of different vehicles for dissemination of environmental information and knowledge. This paper considers how network literature can be used to further develop understanding of such networks, and to draw up a typology of waste minimisation projects that can be used to improve understanding of learning networks.*

### Introduction

In the last 10 years, waste minimisation projects have formed an important strand of UK policy to promote environmental improvement in businesses. The implied aim of such demonstration projects is to demonstrate the commercial benefits of cleaner technology and waste minimisation, so that the message will spread throughout industry and the concept will take on a momen-

tum of its own. The success of early projects has led to further projects being set up throughout the country (CEST 1995). However, it has been argued that, despite many projects having been completed, still only a minority of firms and few SMEs are affected (Cheeseman and Phillips 2001). Relatively few companies have participated in each waste minimisation project, and many projects have ended once the initial period of funding has finished, thus it has been argued that their impact has been short-term (Shearlock, Hooper and Millington 1999).

The financial benefits of waste minimisation have been emphasised in order to make environmental improvements palatable to SMEs, thus focussing on the importance of 'eco-efficiency' in terms of motivations for greening. Evaluation of waste minimisation projects has focussed on the results in terms of financial savings, and to a lesser extent saved resources, and has been mainly in the form of project reports and case studies. Little attempt has been made to assess the extent of culture change, which has come about as a result of the projects. However, the ability of eco-efficiency to bring about sufficient environmental improvement in business has been contested (Hagen and Larssaether 2000). Concepts associated with organisational learning, in particular those put forward by Argyris and Schön (1996) suggest that, in order for culture change to take place, learning must move beyond adaptive learning (also known as 'single loop' learning), which merely represents a response to a specific problem to generative learning (or 'double loop' learning), where underlying assumptions are challenged and revised. There is a risk that participation in a waste minimisation project, which has been largely promoted on its capacity to produce easy financial savings can result in only single loop learning, and therefore does not lead companies to make the radical changes needed to move towards the scale of

environmental improvement needed to achieve sustainable development.

Waste minimisation projects are based on the development of inter-organisational networks of companies. However, the extent of networking and sharing of good practice varies widely from project to project. Typologies of projects which consider the advantages and disadvantages of different models of waste minimisation projects are beginning to emerge. However, as yet, they have not taken on board work on inter-organisational networks. Exploratory research suggests that some related literature, in particular that on embeddedness of organisations (eg Granovetter 1985, 1992) and literature on diffusion of innovation (particularly Rogers 1995) is particularly helpful in improving understanding of the capacity for organisational learning in different types of waste minimisation projects.

The research seeks to improve understanding of the process of change and organisational learning achieved as a result of such projects. This paper first briefly describes current developments in waste minimisation projects in the UK, based on the listing on the Envirowise website, academic literature on the projects, project reports and interviews carried out with 4 governmental and non-governmental organisations involved with promoting and running the projects, and representatives of 6 projects. It then introduces the main concepts associated with organisational learning. The contribution of inter-organisational network literature to understanding learning and innovation between companies is then examined. A typology of waste minimisation projects is developed, incorporating some of the concepts associated with the embeddedness of institutions and innovation networks into existing work on typologies.

## Waste Minimisation Projects

The first waste minimisation demonstration projects in the UK were set up in the early 1990s with the aim of demonstrating the financial benefits of waste minimisation in order that the approach would be copied throughout industry. The principle normally involves using a technique based on a hierarchy of options; preventing waste by reduction at source, re-use, internal recycling, external recycling or treatment, and dumping only as a last resort. Early projects in West Yorkshire, Merseyside and Leicestershire attracted considerable funding. Following success reported in terms of financial savings, projects were set up around the country. The most complete listing of clubs is held by Envirowise, the government programme charged with supporting resource efficiency and waste minimisation initiatives, and lists around 150 clubs (Envirowise 2001).

As projects have been set up, approaches have evolved. The first projects involved a small number of companies, were well funded and used consultants for training. Their membership was open to companies of all sizes within a particular location. However, a variety of types of project now exist, some still fairly similar in approach to the early ones, but the lack of government funding now available means that project organisers have to apply for other sources of funding or rely to a greater extent on self-help or funding by the participants. Where projects are funded by external sources, they generally have to fulfil criteria demanded by funding, so this has had an impact on the organisation of the projects. Some projects have relied less on training provided by consultants and more on workshops. A number of projects have worked with specific sectors, allowing benchmarking within sectors. Other projects have worked with larger numbers of companies than the earlier ones, and in some cases are also expanding to cover larger regions (Edley, Rees and Sealey 2001). Others have attempted to develop spin-offs (Cheeseman

and Phillips 2001) and to maintain networks after the completion of the project and work with small numbers of companies in greater depth, moving into other areas beyond waste minimisation (WSP Environmental 2001).

Despite the proliferation of projects, their impact still appears to be limited. Cheeseman and Phillips (2001) point to the limited impact of the projects in terms of a small minority of companies participating. There is great variation in the impact of the project, notably regional disparities (Phillips, Read, Green and Bates 1999). Envirowise data shows that some regions have been much more active than others in terms both of numbers of projects and the impact of the projects (Envirowise 2001). And projects have widely reported problems in recruiting companies and in maintaining networks once the initial period of the project has been completed. Although promising developments are taking place, which, as discussed above, are seeking to increase the impact of the projects, there is a lack of comprehensive data and a lack of evaluation. Evaluation has mainly taken the form of project reports, which are criticised by some academic writers for not necessarily being accurate, complete or consistent (Cheeseman and Phillips 2001). Such authors have made some initial steps in evaluating the financial and environmental impact of the project, but call for further work involving detailed cost benefit analysis (Henningsson, Pratt, Phillips and Hyde 2001). The qualitative issues related to the processes of change and learning, which would improve understanding of the impact of such projects, and the extent to which change can be attributed to the project, have been neglected up until now.

## Organisational learning

A number of authors have pointed to the value of organisational learning concepts in understanding environmental improvement in companies (eg Hagen and Larssaether 2000, Hooper,

Jukes and Stubbs 2000, Petts 2000). Building on the work of Senge (1990) and Argyris and Schön (1996), such authors have considered the extent to which environmental organisational learning exists in companies. For Argyris and Schön, organisational learning is achieved by giving a place for reflection, allowing underlying assumptions to be questioned. Mental models can act as a barrier to learning which goes beyond 'single-loop' or 'adaptive' learning, which merely involves a response to a specific situation. They are of the opinion that we trap ourselves in 'defensive routines' that insulate our mental models from examination. Only by uncovering and revising such mental models can organisations move towards 'double-loop' learning, which creates a capacity to challenge underlying assumptions. Senge addresses himself to the pre-requisites needed for companies to develop into learning organisations, stressing the importance of systems thinking and a sense of interconnectedness, in order to build shared vision within organisations.

Hagen and Larssaether (2000) argue that eco-efficiency approaches do not necessarily lead to a change in values or revision of mental models, or in a change from 'single loop' to 'double loop' learning, and thus they do not result in fundamental changes to the way businesses think. Hooper, Jukes and Stubbs (2000) consider the extent to which double-loop learning is taking place in SMEs. They identify a 'problem-solving approach' to environmental issues among the SMEs studied, whereby companies respond to specific issues, but fail to apply the lessons learned to achieve sustained change.

This points to the need for SMEs to move beyond problem solving towards cultural change. Waste minimisation, which is based on eco-efficiency, would, according to Hagen and Larssaether, be symptomatic of single-loop learning. Questions arise as to what would constitute higher level learning as a result of waste minimisation projects.

This demands attention to motivations for green-ing and to the process of change.

Some authors stress the importance of building communities of practice in order to engage upon processes of reflection and learning (Wenger 1998, Ayas and Zeniuk 2001). Nonaka (1994) asserts that a shared system of meaning is important for the communication of 'tacit' knowledge, or less formal types of knowledge which are not normally written down, as opposed to 'explicit' formal knowledge, which may exist in the form of brochures or guidelines. In order to develop an understanding of the extent to which reflective practices and higher forms of learning can occur in the context of such projects, it would appear necessary to understand how communities of practice develop and are sustained. The next section considers features of networks and the extent to which they foster learning.

## Networks

Much of the organisational learning research is about internal learning capacity within companies. Hooper, Jukes and Stubbs (2000) identify characteristics of a learning organisation (LO), based on a number of learning traits. However, they also highlight the need to look beyond the firm towards the network. Several authors in the business and environment field, such as Roome (2001), have recently recognised the importance of networks in solving environmental problems. Roome points to the possibility that innovation directed towards sustainable development can bring actors into new relationships through networks. Halme (2001), in a study of sustainable development in tourism networks, points to difficulties inherent in learning in networks in relation to developing a common language. Earlier stages of this research (Millard 2001), in common with Tomer (1999) and Petts (2000), highlight the need to understand both internal capacity and external influences on companies in order to understand organisational learning.

In networks of companies, the external-internal distinction can become blurred, as is demonstrated by Granovetter (1985 and 1992), who is of the opinion that virtually all economic relationships are shaped by social networks. He sees the two extreme views of embeddedness as represented by neo-classical economics and sociology. Whereas neo-classical approaches portray economic activity as atomised and isolated from social influences, with actors only following their self-interest in a rational way, sociological approaches tend to portray actors as deeply embedded and sensitive to norms and values, to the extent that they have little free will at all. Granovetter argues that neo-classical approaches represent an under-socialised view, contrasted with the over-socialised view of sociologists; his own embeddedness approach incorporating both views. He criticises both of these extremes as paradoxically presenting an under-socialised view, as the sociological approach assumes that norms and values have become internalised, and thus the on-going influence of networks is neglected. He uses this analysis to deal with the problems of trust and malfeasance in economic relations and to refine understanding of motivations for individuals to act honestly in economic transactions, presenting the following three motivations: (1) it is in their interest to do so; (2) the norms and values of society say they should do so; (3) the pattern of relations with that particular transaction partner says that they should do so. Whilst not denying that the first two motives exist, he feels that the third has been neglected in research. In the main individuals prefer to use their own judgement or that of other individuals known to them in deciding whether to carry out an economic transaction with a particular partner, wherever possible preferring these more direct influences to general societal norms and values.

His insights into how this helps understanding of inter-firm networks has been very influential in

the development of the area, in particular his critique of transaction-cost theory advocated by Williamson (1975 and 1985), which suggests that hierarchical control within a firm helps to guard against market-place opportunism and to provide order in economic transactions. Granovetter notes the limitations of the markets/hierarchies distinction, pointing to many forms of inter-organisational networks. Hage and Alter (1997) also stress the limits of this markets-hierarchies distinction, arguing that the 'adaptive costs', or the costs of monitoring the environment for technological and product change, have become the driving force pushing firms into alliances, and that they have become more crucial than transaction costs.

## Networks and innovation

Rogers (1995) stresses the importance of interpersonal influences on individuals and organisations in the adoption of innovations, which further improves understanding of the development of inter-organisational networks. He points out that previous research has found that ideas often flow from mass media to opinion leaders and then to less active sections of the population, the mass media generally being a source of information, and personal influences being more important in persuading an individual to adopt or not adopt. Analysis of waste minimisation projects similarly pointed to the disappointing response to mailings and the importance of networking in terms of recruiting companies.

According to Rogers, communication is easier between those with similar beliefs and mutual understanding (homophily), whereas communication between dissimilar (heterophilous) individuals 'may cause cognitive dissonance because an individual is exposed to messages that are inconsistent with existing beliefs, an uncomfortable psychological state.' (Rogers 1995).

This has some similarities with Nonaka, and others, who emphasise the importance of shared understanding within networks, or communities of practice, in order to facilitate the transfer of tacit knowledge.

However, heterophilous communication channels can be very important, as they link different networks as demonstrated by Granovetter (1973). Rogers also suggests that homophily limits the spread of information to individuals in the same network. In terms of innovation, it would seem particularly important that groups of people within a network receive access to new information and ideas.

Grabher (1993a) demonstrates in the Ruhr Region of Germany that, due to over-cosy alliances and networks, the region suffered from a lack of innovation and went into decline. Consequently, innovations reproduced existing structures, which is symptomatic of single loop learning, '...the learning abilities...are limited in that the system can maintain only the course of action determined by the operating norms and standards guiding it.' (Grabher 1993a). Eventually, economic crisis resulted in change, with environmental technology replacing coal and steel firms. Grabher describes the networks operating in these new industries as loosely coupled, which has the advantage of facilitating the dissemination and interpretation of new information, allowing double loop learning to take place, suggesting that information disseminated through networks is freer than that passed through a hierarchy, and richer than that in the market place.

Halme (2001) also highlights this dichotomy in the context of learning for sustainable development in tourism networks, indicating that, whereas a certain degree of difference is needed to develop a broad understanding of sustainable development, action in favour of sustainable development also requires some common ground. She highlights difficulties in finding a

common language in multi-partner projects. Waste minimisation projects which involve a large number of external partners and different types of companies may also present difficulties in finding a common language.

Halme also notes that several of the networks studied were led by a focal organisation, an issue also addressed by Rogers (1995), who provides some useful insights into the concept of a 'demonstration project'. Rogers suggests some generalised characteristics of opinion leaders related to the extent of their external communication, their accessibility and the extent of their interpersonal networks links, their high socio-economic status and their innovativeness. He does however, guard against selecting innovators to lead opinion in systems with traditional values. In such cases, the innovator may be too innovative to serve as a role model for conservative members of the community. This was demonstrated by a study of 'laboratory schools' in the US. The intention was to use them to demonstrate new educational ideas around 1900. However, as the typical laboratory schools were wealthy and composed of bright children, they were not perceived of as a role model by other schools, and thus the experiment was a failure. There are some parallels with waste demonstration projects, in that it is important for the participating firms to be seen as similar enough to others to serve as a role model.

### Typologies of inter-organisational networks

Many authors have considered typologies of inter-organisational networks (eg Grandori and Soda 1995, Rosenfeld 1996, Hage and Alter 1997, Oliver and Ebers 1998), the most important of which relate to the level of commitment on which the network is based. The distinction is made by Grandori and Soda (1995) between social networks, which include interlocking directorates, industrial districts and sub-contracting, and bureaucratic networks, which are formalised

into some form of agreement, eg associations such as trade associations and consortia, among others. According to Rosenfeld (1996), who summarises taxonomies of networks, the essential difference is between 'hard' networks, which involve such activities as joint production or marketing, and 'soft' networks, which are focused on activities with less commitment such as information exchange and training. Huggins (2000) finds that it is formal groups which are the most potent form of network, but that they are best facilitated initially by an informal structure. He suggests that 'soft' activities, such as information sharing are often a precursor to 'harder' activities, and that it is important to nurture such soft networks, in order that they may develop into ones which involve greater commitment. A further important distinction made in terms of typologies is the extent of similarity between companies co-operating in a network (eg Hage and Alter 1997, Grabher 1993a) which is, as discussed above is a particularly important issue in terms of the diffusion of innovation.

Grabher (1993b) suggests that the most important types of inter-organisational network are; sectoral alliances, supply chain links and regional links. Some of these types of links are discussed in terms of the dissemination of environmental information by other authors (eg CEST 1994, Christie, Rolfe and Legard 1995, Hunt 2000). Christie, Rolfe and Legard identify three channels based on (a) sectoral networks such as trade associations (b) geographically-based networks and (c) supply chain networks centred on a major customer. Their empirical work suggests that knowledge and technology transfer is particularly effective through supply chain networks. Companies in such networks face similar technological problems, and it was felt that a shared understanding already exists, thus facilitating co-operation.

## Typologies of Waste Minimisation Projects

Clarkson, Adams and Phillips (2002) characterise the different clubs methodologies as: demonstra-

tion clubs, sector clubs and facilitated ‘self help’ clubs, the methodologies having advantages and disadvantages, as is illustrated by the following table.

**Table 1. Advantages and disadvantages of the different club methodologies**  
 Source: Clarkson, Adams and Phillips (2002).

| Demonstration clubs  | Sector clubs  | Facilitated ‘Self Help’ project clubs   |
|--|---|---|
| <i>Advantages</i>  |   |   |
| Good forum for discussions.                                    | More issues of common interest.   | Good forum for discussions.   |
| Encourages waste minimisation programmes to become structured. | Can share common problems.  | Appreciation of other sector problems.  |
| Cost savings are achievable and quantified.                    | Training emphasis promotes a company culture.   | Greater potential for waste exchanges.  |
| Short payback times.   | Opportunity to benchmark.   | Encourages waste minimisation programmes to become more structured.<br>Low cost.<br>Draws upon the technical skills in companies. |
| <i>Disadvantages</i>   |   |   |
| Consultancy based, therefore a lack of ‘ownership’.            | Problems with competitors not working together due to trade advantages.                                       | May be hard to solve problems on a group basis as they vary depending on company.   |
| Costs to join are high.  | Poor attendance at club meetings can affect the success of the project due to the distance between companies. | Poor attendance at club meetings can affect the success of the project.   |
| Lack of motivation after project completion.                   |   | A proportion of companies may require more support than is possible during the project.   |
| Very high start up and running costs.                          |   |   |

The discussion on inter-organisational networks presents further insights into the above typology, which improves understanding of the potential for organisational learning inherent in the types of networks.

The distinction between demonstration clubs and self-help clubs put forward by Clarkson et al.

is certainly an important one. Consultant-lead demonstration projects are based mainly on the consultants advising the companies and do not necessarily include workshops, which provide the opportunity for firms to learn from each other. According to Rogers, the exchange of ideas occurs mainly between similar individuals and similar organisations. Therefore, SMEs are more

likely to learn from each other than from consultants. As suggested by the above typology, consultant-lead projects are less likely to be sustained beyond the length of the project than self-help workshops. Granovetter's work would also suggest that, as a pattern of relations is built up between companies participating in the clubs, greater exchange of ideas and potentially greater commitment to the relationship may develop. As suggested by the typology this could for example result in waste exchange. This is potentially a way of developing from 'soft' networks towards 'hard networks' discussed by Rosenfeld (1996) and Huggins (2000) (see Section 4.2.).

If individuals and organisations learn mainly from similar individuals and organisations, there are clearly some advantages to developing projects consisting of similar individuals and similar organisations. The most obvious way of looking at this is according to sector, as in the above typology. Communities of practice have the potential to develop more easily where companies are from the same sector. Other facets of similarity and difference could however also be important, the size of the company being another relatively straightforward way to consider similarity and difference. Innovative SMEs or innovative companies within sectors may be able to be harnessed to influence other less innovative SMEs, however taking note of Rogers' comments on the need to identify opinion leaders, which should be companies that are not too innovative to serve as a role model. Larger firms may equally not be seen as an appropriate role model for SMEs even if they are in the same sector. And, as pointed out in the typology, competition may also serve as a barrier to learning and innovation within sectors. To some extent, the extent to which companies are different or similar to each other can only be understood as a result of in-depth study of the organisations, and thus cannot be known prior to completing research.

For example, key differences between companies may also reflect qualitative characteristics such as culture, rather than size or sector.

Several of the authors discussed in the section on inter-organisational networks also emphasise the need for different partners in producing innovation. Therefore, this could also indicate the need to include different partners within the project. Companies of a different size or a different sector may be more likely to come up with innovative ideas for waste minimisation than companies that are similar. Innovative ideas may also come from different types of partners, such as consultants, universities or business support networks. Therefore, it is important to examine what extent of similarity and difference produces greater innovation and what types of partners are similar enough and different enough to each other.

Work on the embeddedness of institutions also suggests that the network which existed prior to the inception of the waste minimisation project will have an influence on both the initial decision for a company to join a waste minimisation project and on the subsequent development of the project. This means that it would be useful to consider projects where there was more and less likely to be a pre-existing network. The extent of prior existence of a network cannot be known prior to carrying out research with the companies, but as set out below, in certain cases this is more likely than in others. Projects based on supply chains automatically imply the existence of a network, whereas companies from the same sector, and to a lesser extent those of similar size and in close geographical proximity may also have links with each other.

The above suggests that, in order to understand the extent of organisational learning, and the extent to which this leads to cultural change, the typology of waste minimisation projects can most usefully be looked at as follows:

|  |  |
|--|--|
| Extent of interaction between partners and companies | Consultant-lead demonstration projects   |
| Extent of similarity between partners and companies  | <p>Consultant-lead demonstration projects</p> <p>Workshop-based self-help/facilitated self-help groups</p> <p>Sectoral projects</p> <p>Multi-sectoral projects</p> <p>SME only projects</p> <p>Projects with companies of any size</p> |
| Extent of prior existence of a network               | <p>Supply chain projects</p> <p>Sectoral projects</p> <p>SME only projects</p> <p>Projects covering a small area (eg business park)</p> <p>Projects without any defined membership</p>   |

The above typology represents a potentially useful way of incorporating ideas on inter-organisational networks into the understanding of waste minimisation projects, and can therefore be used as a framework for evaluation of such projects which focuses on an understanding of the extent of change and learning resulting from the projects rather than quantitative measures such as financial savings.

## Conclusions

The aims of waste minimisation projects have been to act as ‘demonstration’ projects to demonstrate the value of such concepts in business terms of saving costs. The case for waste minimisation is often now seen as proven, yet evidence shows that only a minority of companies have participated in waste minimisation projects, and thus their impact is still limited. The projects have not been extensively evaluated, and that evaluation which has taken place has focused on quantitative measures, in particular financial savings, which only presents a partial picture of their impact. The extent of cultural

change which results from participation in such a project has received very little attention. This paper has therefore addressed itself to this issue, and in particular has sought to understand waste minimisation clubs in the context of inter-organisational learning. It has considered which types of waste minimisation project or club provide the best forum for developing organisational learning, which can lead to new ways of working which increase resource efficiency and thus contribute to sustainable development. In so doing it has linked developing taxonomies of waste minimisation to wider literature on networks, innovation and learning.

The typology of waste minimisation networks provides a useful starting point for carrying out research with participating companies in order to further understand learning within networks. The next stage of this research will involve completing interviews with such companies in order to further understanding of the learning processes inherent in different types of waste minimisation networks in the UK.

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