"Collaborative learning within a network and the role of action research"

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Abstract

Organisations need to improve their ability to learn and to continue learning to keep pace with the environment. However, the learning process does not stop at the boundaries of the single organisation, but should be placed in an inter-organisational setting in which companies complement each other in competences, capabilities and knowledge. This paper presents a number of practical results of a Dutch case on how learning and continuous improvement take place at an inter-organisational level. An action research approach is adopted and implemented through a cycle of workshops to facilitate and stimulate collaborative learning.

Keywords: Inter-organisational learning, Action Research, Extended Manufacturing Enterprise

Introduction

Over the past decades markets are being confronted with a number of changes. Wheelwright & Clark (1992:2) summarise these changes as: intense international competition, fragmented and demanding markets and diverse and rapidly changing technologies. These changes have created new imperatives for competition between organisations, moving increasingly from the level of individual firms to that of networks of companies, leading to the concept of the Extended Manufacturing Enterprise (EME). Considerable emphasis is placed on the ability firms to learn and to continue to learn to keep pace with the environment (Bessant et al., 2003), whereby the learning does not stop at the boundaries of the single company.

Firms operate within a value stream involving many firms within a supply network, and the competitive performance of the value stream depends upon learning and the development of the whole system (Bessant et al., 2003). So, CI and learning in a collaborative context, where companies can complement each other in competences, capabilities and knowledge. Inter-organisational collaboration is suggested to catalyse the organisational learning process, by stimulating reconsideration of current practices and challenging assumptions, which can result in more innovative outcomes (Dodgson, 1993). This offers potential to enable learning and competence development through accessing and internalising the skills and capabilities of partners (Kerrin, 2001, Bessant et al., 2003).

In 1999 the EU research project CO-IMPROVE was started with the objective to develop a tool for the implementation and support of collaborative (inter-organisational) improvement and learning with the expectation of improving performance as a network of organisations as a whole.

This paper will focus on the research approach adopted for the entire research project, where we will report on the part of a Dutch EME. The research is being undertaken through an action research approach where the researchers are both involved in managing and (simultaneously) studying the project (Coghlan and Brannick, 2001; Coughlan and Coghlan, 2002). In this article we describe how the action research approach is modeled and implemented in order to enable learning processes on the level of the EME and we present the first results of the Dutch EME, consisting of a (medium sized) system integrator in the automotive industry and three of its suppliers. The results have already provided the academics and the companies involved in the COIMRPOVE project with several learning experiences, which are discussed in order to identify the added value of the methodology in supporting and establishing the learning.

Extended Manufacturing Enterprise

Theories about networks of firms are developed since the early eighties. This development is fuelled, according to Douma (1997), by a number of global developments: internalisation of the markets, increasing complexity of technologies and increasing speed with which innovation takes places. Therefore companies have to look outside their own boundaries to find all the resources and competencies needed.

The basic mechanism that characterises network relations is collaboration. Collaboration brings about the idea of interdependence, shared goals and visions, trust, joint work and activities (Lamming, 1993). All these ideas are combined in enterprises, which extend each other in knowledge and capabilities, leading to the concept of Extended Manufacturing Enterprises (Busby and Fan, 1993). An EME is a collection of strategically aligned dyadic relationships and the inter-dependencies between the dyads (see Figure 1). Within this structural, durable and joint relationship improvement and learning is to increase the overall performance of the EME. Performance is the result of the interaction between and the integration of inter-company processes (Cagliano, 2000). The improvement of the performance of the EME is depending on the ability of the companies to learn from the inter-organisational collaboration and applying the created knowledge in their current work practices (both within and between the companies) and in the management of the inter-organisational relationship.
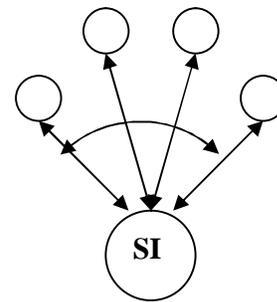

Figure 1 EME

The learning process and action research

Most of the discussion of learning in the literature has been on the level of the single company, but there is a growing interest in the learning process between companies in a network. Organisations collaborate with customers, suppliers and competitors forming a network of learning (Powell, 1987). Such knowledge links enable organisations to access and internalise the skills and capabilities of the other members (Hamel, 1991).

In literature on learning a distinction is often made between different levels of learning, such as single and double loop learning (Argyris and Schon, 1970), adaptive and generative learning (Senge, 1990). In the context of the EME, single-loop or adaptive learning refers to, for example, the reconsideration of current inter-organisational work practices, whereas double-loop or generative learning is linked to questioning and challenging the way business

is performed between the organisations. In line with individual and organisational learning, double-loop or generative learning is much more difficult to achieve than single-loop or adaptive learning, since it requires the ability to step back and reframe. Where this is difficult for single firms it becomes even more difficult at the level of inter-organisational collaboration since here learning together is not considered to be a natural behaviour. Therefore explicit attention within this inter-organisational collaboration should be paid to the accumulation and development of knowledge that offers competitive advantage and the long-term development of a capability for learning and continuous improvement. This recognition places a greater emphasis on mechanisms and approaches through which knowledge and capabilities can be developed. A powerful enabling resource is the active participation of others in the process of challenge and support. Although these ideas originated at an interpersonal level there is clear potential for their application in inter-firm learning (Bessant and Tsekouras, 2001).

A widely used approach, which allows the active participation of an independent observer, is action research. Action research challenges and supports (inter-) organisational change and moves the system through a cyclical process in which the approach stimulates the development of capability for learning and improvement. As stated by Westbrook (1995) a main contribution of action research to learning, which is not available to other methods, is that when participants involve themselves in change experiments, they engage in non-trivial learning, and they think and reflect seriously on what they are doing.

Methodology

Action research has become increasingly prominent and represents a potential useful qualitative research method in the study of organisations. Action research is a cyclical process of diagnosing, action planning, action taking, evaluating and specifying learning (Lau, 1999). Action research focuses on research in action, rather than research about action, in which members of the studied system actively participate in the cyclical process. In this way the researcher aims to contribute both to practical concerns of people in an immediate problematic situation and to the goal of science by generating emergent theory. The action researcher is not an independent observer, but becomes a participant, and the process of change becomes the subject of research (Westbrook, 1995). Several broad characteristics define action research (Eden and Huxman, 1996; Coghlan and Brannick, 2001; Coughlan and Coghlan, 2002):

- Research in action, rather than research about action;
- Participative;
- Concurrent with action;
- A sequence of events and an approach to problem solving.

But action research is not without problems. In particular, the "double challenge" of action and research creates many difficulties. One of the frequently heard criticisms is the lack of repeatability of research and the generalisability of results, since the research of this kind will be 'one-offs' (Eden and Huxman, 1996). This may partly explain why researchers have been reluctant to use this approach. But this approach provides the researchers with insights, which could not be gained in other ways, since contribution is being paid to practical concerns of people in an immediate problematic situation. It also makes clear, as Clark (1972) emphasises, that action research contributes to enlarge the stock of knowledge of researched system. Action research distinguishes it from common forms of qualitative research by not only applying to the social scientific knowledge but also to add to the body of knowledge (Myers, 1997).

The CO-IMPROVE project has overcome the additional methodological problems of the rigour of the research method and generalisability of results. Within the project three different action research groups (in the Netherlands, Denmark and Italy) are working according to the same action research approach. The findings of the three groups are regularly fed back to the whole project and discussed and reflected upon in a workshop setting where all the researcher attend. In this way, the findings can be further generalised since they have been compared to other research. Furthermore, in the Dutch case a group of four additional companies is invited to reflect upon the findings from the Dutch EME, comparing these results with there own experiences to further mitigate subjectivity of the research and achieve further generalisability.

But why is action research an appropriate method for researching for collaborative learning in a network? In general, action research is appropriate when:
- The research questions relate to describing an unfolding series of actions over time in a group;
- The understanding of a member of a group how and why their action can change or improve the working of some aspects of a system plays a role;
- Action research is concerned to enlarge the stock of knowledge of the group.

The Action Research approach is adopted to facilitate the learning process within the Dutch EME through a cycle of workshops with the goal to, on the one hand, identify and select collaborative improvement projects and, on the other hand, to present and discuss the results of the collaborative improvement projects in order to identify learning moments. In between the workshops the companies in the EME work on the selected improvement projects

The Action Research approach is put in place in the Dutch EME over a period of 15 months through a cycle of 12 joint EME workshops (see Figure 2). These workshops involve all the companies and are aimed at engaging the companies in collaborative improvement projects, involving processes of diagnosing, fact-finding, implementation and evaluation of improvement actions in the areas of delivery, quality, change-order management, and cost reductions. The participants themselves carry out the improvement activities, facilitated by the academic researcher, the action researcher. The results of the improvement projects are the presented and discussed in plenum by the representatives of the companies to evaluate and reflect on the process and progress of the collaborative improvement project. During the reflection and discussion at the workshops the researcher stimulates and facilitates the identification of experiences, observations and learning moments. In this way, explicit attention is being paid to learning and how this can contribute to their own knowledge and that of the whole EME. This collaborative learning helps to build collaborative knowledge, collaborative improvement processes and collaborative learning capabilities. Through this collaborative learning we are trying to build upon the knowledge of the members with regard to the object/subject of improvement, knowledge on improvement processes and improvement tools and techniques, knowledge on each other's companies, processes and goals.
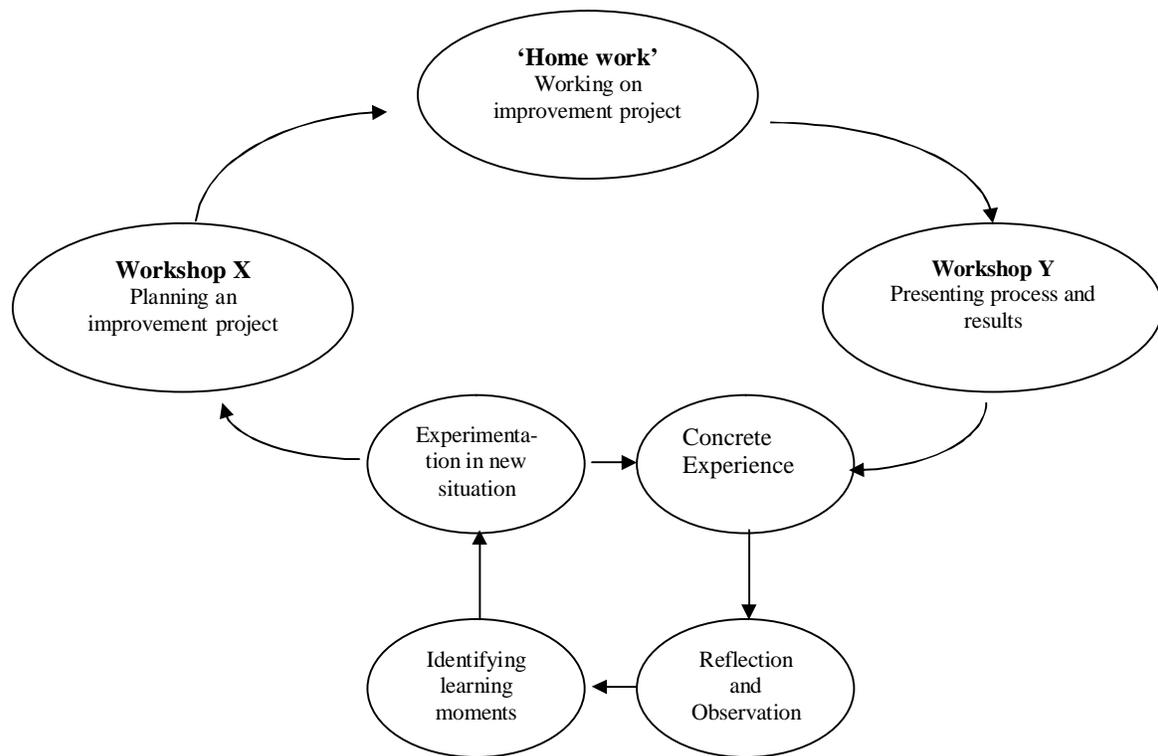
Figure 2: Learning process through adopted Action Research approach

Research base

This section reports on the context in which research is taken place by introducing the Dutch EME: one system integrator and three of its suppliers. Furthermore a description is given how the action research approach is put in place within the Dutch EME.

The System Integrator (SI) is a company, which is specialised in 'Motion Control'-systems for different markets, such as the automotive, truck, marine, medical and agriculture market. The company sees itself in a niche market, dominantly automotive and truck. The competition is known, heavy and mainly on price. The company observes a shift towards a commodity market. In this new market the order-winning criterion is price, whereas quality and technology are qualifiers. For a company in the automotive industry nowadays it is a main challenge to constantly monitor the cost-structure in order to remain profitable as a result of the price pressure from the OEM's, the increase of prices of raw materials and contracts on long-term delivery schedules. Therefore the company has as a strategic objective to produce zero-defect products against the lowest total cost from world-class suppliers to satisfy PPE requirements on quality, cost and delivery.

The suppliers that have been selected by the system integrator to participate in the project all represent different kinds of relationships and deliver different kind of products. This means that information and communication can pass freely throughout the whole group without running the risk of giving or loosing sensitive information to competitors. The underlying

reason for the SI for selecting these suppliers has been the fact that the suppliers are perceived as highly involved in collaboration and are dedicated partners that fully support the SI in assembling and delivering the systems of the SI. The companies within the Dutch EME and a short description are listed in Table 1.

Table 1: Companies in the Dutch EME

Company	#employees	Geography	Products
System Integrator	425	The Netherlands (East)	Electro-hydraulic systems for operating soft tops and retractable hard tops on convertible cars as well as opening/closing car trunks
Supplier 1	200	The Netherlands (South)	Plastic precision parts and assembled products for the automotive, medical and pharmaceutical industry. The company supplies the SI with plastic moulding products
Supplier 2	55	The Netherlands (East)	Fine-mechanical parts for high-tech industry. The company supplies parts for the pump for opening the roof
Supplier 3	160	Germany (West)	Cylinder-tubes for the automotive industry.

Empirical results

In the Dutch EME improvement projects in collaborative operations were started based on improvement areas, which were identified through interviews by the researchers with representatives of the companies and the results of assessments with regard to the level of operational integration and collaborative improvement maturity. The result was a list of possible improvement projects between the SI and the suppliers from which the companies selected specific improvement projects at the workshops. After the companies have selected a project, they start working on the collaborative improvement activity, whereby the researcher would act as a facilitator for all the companies in the project. A series of workshops was organised in which actually a learning cycle was planned:

- Choose a collaborative improvement project by and between the companies and work on it between the workshops;
- Present and discuss the improvement activities and results in plenum at the workshop;
- Reflect on the process and progress of the project in order to learn;
- Diffuse the learning moments, experience and knowledge throughout the entire EME.

The initial approach within the Dutch case can be described as an approach in which the companies in the network together initiate improvement projects. Within this approach a high degree of consensus between the companies within the EME was striven at. The SI has deliberately chosen not to be directive or prescribe improvement projects, since it was felt that collaboration and collaborative improvement is about shared goals and vision, mutual dependence and joint work and activities. Furthermore it was believed that a directive role of the SI would not facilitate the participation of the suppliers and the development of collaborative improvement in the EME.

However, after three months, hardly any improvement project was started between the companies in the EME. Main reasons were a lack of activity at company level and no sense of urgency in general. Although all the companies supported the adopted approach, it did not lead to the results with regard to collaborative improvement. The SI and the suppliers were

not able to hold on to the enthusiasm, shown during the workshops, and translate this enthusiasm into activities within the companies.

Discussing and analyzing this situation, the SI and the researcher decided to change the approach towards a more active and directive role of the SI. Within this role the SI should start activities, generate discussion and encourage participation of all companies within the EME. Besides the change in role the frequency of the workshops was increased from a half day every two months to a full day every month in order to increase efficiency and effectiveness of the meetings. The monthly workshops should trigger and stimulate the process and progress of the collaborative improvement projects. This stimulus and trigger is needed since the companies perceived the projects to be additional to their daily activities and in practice a higher priority was given to daily operational activities. The representatives of the companies had not realized that the improvement projects could include current problems that were integral part of the day-to-day operational activities between the companies. A second reason for increasing the frequency of the workshops was that energy and attention increased shortly before and shortly after a workshop. The sense of urgency increased in the period around the workshops as people received an incentive to start working on the collaborative improvement activities, but after some time attention and energy decreased causing the lack of activity within the EME. By scheduling a workshop every month the researcher and the SI are trying to keep momentum and speed within the process and progress of the improvement projects. A third reason is that the participants themselves underline the importance of face-to-face contact for learning collaboratively.

After the change in the approach the companies started to work energetically on 5 collaborative improvement projects of which at date two have been finished successfully. An overview of the initiated projects is given in Table 2:

Table 2: Improvement activities performed

Relationship	Improvement activity	Results
SI – Supplier 1	Redesign of a product, which causes severe problems during malfunction in system of Power Packer	New design and new material has been chosen, which should eliminate the problem
SI – Supplier 1	Proposal to produce an existing product of the SI of aluminium in plastic	Expected outcomes are 50% cost reduction for the SI and increase in Sale for the supplier
SI – Supplier 2	Information and communication on specifications of products	Increased information exchange and awareness of need for improving communication
SI – Supplier 2	Analyse and evaluate a change in tooling concept by the supplier	Increased insight in organisational structure and communication flows on both sides
SI – Supplier 3	Cleanliness of products	Expected results are better communication about the process of cleanliness of the products (impact for the whole EME)

Agenda of workshops

Each workshop is scheduled according to a fixed format of the agenda. Within the agenda, which is scheduled for the whole day, a distinction is made between the CO-IMPROVE project, incentive for joining meetings, the EME and the one-to-one relationship between the companies.

In the morning the companies receive a project update about the process and progress of the other EMEs (Denmark and Italy) in order to stimulate the identification and selection of possible improvement projects in the Dutch EME and try to learn from the experiences of the other EMEs.

After the project update time is available on the agenda for a topic on request. In the discussion with the companies a suggestion was made that a incentive for joining the meetings would trigger and stimulate the companies to attend at the meeting. In this slot of the agenda, issues are presented and discussed on the request of the companies within the EME. A relevant topic for example which was discussed in this slot of the agenda has been the re-organisation of the Purchase department of the SI and the consequences for the suppliers in general.

In the afternoon time is available for the companies to work on and discuss the improvement projects on a one-to-one relationship. During this session a representative of the SI and a representative of the supplier are discussing and reflecting upon the last month(s) in which they have been working on a specific improvement project. Information is exchanged and project management related issues are discussed and updated if necessary.

After the one-to-one discussion, the companies present their progress and process in the improvement projects and what they have observed, experienced and learned so far to the whole EME. These results are discussed in order to synthesize learning moments, which are applicable for all the participants.

Roles within the Action Research approach

Within the Action Research approach the companies in the EME and the researcher play different roles. The researcher has the role to facilitate the collaborative improvement process between the companies, whereas the role of the SI has changed towards a more directive role. Within the CO-IMRPOVE project an overview of the main roles within the Action Research process and a short description is the following:

- Instigator: Start activities, generate discussion and encourage participation;
- Methodologist: Give structure, organize activities, propose methodologies and provide training;
- Facilitator: Facilitate communication, moderate discussion, encourage interaction, encourage reflection
- Observer: Monitor progress, reports on events;
- Expert: Provide information, evaluate feasibility, anticipate constraints
- Gatekeeper: Provide contacts, identify and liase with key sources of information
- Actor: Does the work, participate in activities and discussion, reflect on experience and progress

When mapping the different roles within the collaborative improvement projects for the Dutch EME, a distinction has to be made in roles at the EME-level, one-to-one level and the interim meetings. When we map the roles of the researcher, SI and the suppliers the following Table can be drawn:

Table 3: Roles within adopted Action Research approach

	Researcher	**SI**	**Suppliers**
Roles during workshop at EME level	Instigator, Methodologist, Facilitator	Instigator, Actor	Actor
Roles during workshops at one-to-one level	Instigator, Methodologist, Facilitator, Observer	Expert, Actor, Gatekeeper	Expert, Actor, Gatekeeper
Roles during interim meetings	Methodologist, Facilitator, Observer	Instigator, Actor, Expert, Gatekeeper	Instigator, Actor, Expert, Gatekeeper

Results

The adopted Action Research process allowed insight into the process of collaborative improvement and to develop a better understanding of how companies can learn to collaborate on improvement issues and jointly improve both their operations. The main findings can be synthesized as follows:

1. Throughout the process of Action Research the companies learned that collaborative improvement is not additional to daily activities, but is integral part of daily operational activities in and between the companies.

2. Due to operational priorities within the EME reflection and evaluation of an improvement process is not performed. This means that mistakes can happen and have happened again. One of the projects already started 2 years ago, but still has not finished due to a lack of communication and information exchange. By applying a the Action Research approach as a problem solving tool, companies were able to start solving the problem structurally and allowed the researcher to be part of the improvement project and get insight into the history and current situation of the project with access to detailed information.

3. The improvement activities performed took place at the level of customer-supplier relationships, but the progress and the results were constantly shared with the entire EME in the monthly workshops. This allowed to acquire an EME perspective and to share learning and ideas across the network. One of the results of sharing experiences within the EME has been the exchange of a document on specifications, which was needed by one of the suppliers and was used by a different supplier on the basis of earlier experiences.

4. Regular face-to-face meetings have been experienced as a "fuel" for the efficiency and effectiveness of collaborative improvement activities. In these meetings the companies are able to align the process of improvement with regard to the progress and expected outcomes. Regular meetings keep the momentum and speed within the improvement projects, since attention is increased in the time before, during and after the workshops.

5. The companies within the Dutch EME tend to focus the collaborative improvement projects on problems, which have been encountered within the relationship on the areas of cost, quality and delivery. However, collaborative improvement activities can also concentrate on "creative" improvements, which are not related to problems but provide the companies with the same results and benefits. After the explicit attention

by the researcher on the distinction between the two kind of improvement projects, a "creative" improvement initiative was started between the SI and supplier1 (see Table 2).

6. The role of the independent observer within the Action Research approach has provided the Dutch EME with great benefits in terms of the identification of experiences, observations and learning moments. Reflection and evaluation of the process of improvement was not a common behavior within the Dutch EME due to high priorities on operational activities. The researcher facilitated and stimulated this process and, consequently, contributed to build collaborative knowledge, collaborative improvement processes and collaborative learning capabilities.

7. Within the Dutch EME 5 the companies have initiated improvement projects. The improvement projects are all concerned with changing and improving existing inter-organisational work practices. As stated earlier in the paper, these kind of projects refer to single-loop learning at the EME level. Single-loop learning is already difficult enough for most of the companies within an inter-organisational setting, since learning is not a natural behaviour of network of organisations. Double-loop learning at the EME level has not occurred, yet, in the Dutch EME, since this is much more difficult to achieve.

Conclusions

It is clear that collaborative improvement and inter-organisational learning will be key requirements for coping with the dynamic environment and building competitive advantage. Therefore the process of collaborative improvement should be supported and facilitated adequately in order to stimulate the development of a capability for learning and improvement. Action Research challenges and supports this inter-organisational improvement process and the EME through a structured cyclical process. The approach has been efficient and effective for both the researchers and companies. The former, since it allowed in-depth insight into the process of collaborative improvement and how it can be facilitated and stimulated through a cycle of workshop. The latter, because it allowed the companies to experience the relevance of reflecting and evaluating upon activities performed as part of inter-organisational work practices.

Since collaborative improvement is not a natural behaviour improvement activities have only been performed as part of the single-loop learning. Since companies and their representatives were not used to step back and re-frame the focus of the initial improvement activities has been on the re-considaration of current work practices and daily activities on a one-to-one level.

Companies have to be triggered to participate in collaborative improvement processes due to priorities on operational activities, lack of understanding of the concept and possible benefits. By applying the Action research approach the researcher, as part of the improvement project, is able to provide information, moderate discussion, encourage interaction and facilitate communication in order to develop a common understanding of the concept and its benefits. Slowly, the companies seemed to agree that participating can offer significant benefits in terms of their improvement projects, relationship and learning. We can conclude that through the adopted approach the improvement projects have been moving away from problem-driven initiatives towards improvement activities as opportunities.

However, many issues need to be addressed and require more detailed analysis and development:

1. The roles played by different actors within the Action Research approach and their impact on the learning network.

2. The development of enabling tools and methods through which learning can be shared and developed within a network of organisations.
3. The impact of collaborative improvement projects and collaborative learning on the operational performance of the companies and their relationship.

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