Lean Projects and Sustainability in the Swedish Agricultural Sector

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Introduction

The Lean philosophy is increasingly being implemented, both in industry and the public sector. Examples of this include *Produktionslyftet* (The Production Leap) and *Verksamhetslyftet* (an educational project helping hospitals and municipalities in their work to implement lean principles in their organizations), two larger programmes that have been researched by academia. For more information about the programmes, please see: www.produktionslyftet.se and www.verksamhetslyftet.se. The Swedish agricultural sector has been subjected to international competition, which farmers have found hard to keep up with. Hushållningssällskapet in Halland (Swedish Rural Economy and Agricultural Societies in Halland) has therefore initiated a project, *Lantbruket lär av industrin* (Agriculture adopts lessons learned from manufacturing), to implement the Lean philosophy in microenterprises with a similar methodology to Produktionslyftet.

The Lean philosophy promotes a vision of continuous improvements which aims to achieve a better and sustainable future (Liker, 2009). To look for yourself and determine the actual root cause of a problem, always with respect for individuals involved, are some of the aspects from Liker´s 14 principals. Toyota's Lean philosophy creates a learning environment and through continuous improvement strives to reach a sustainable future state at all levels of the organization.

Interactive research and sustainability

How to create sustainability and positive long-term effects in projects and development programmes has become more and more a focus in social research (Svensson *et al.*, 2013). An interactive research methodology can be applied to support development towards a sustainable state (Svensson and Brulin, 2012). Interactive research can focus both on institutional level and operational levels. A project is not only about goal fulfilment but also to a greater extent evaluating unpredictable/predictable and unexpected/expected effects (Svensson *et al.*, 2013). One reason that projects do not achieve sustainable effects is because they are usually run separate to the day-to-day operation and when the project ends the results tends to tail off. The research on which variables make a contribution to the creation of unexpected effects that lead to sustainability is still vague. However, Svensson *et al.* (2013) argue that active ownership, development learning and collaboration between internal and external stakeholders are three success factors to achieve expected effects that will lead to sustainability. Active ownership is defined by how the resources are provided, such as leadership, to the project and how the ownership aims to interpret the project results in daily operation. Involving stakeholders, both internal and external, increases the mandate for groups to influence their environment. The greater ability to influence the environment the greater commitment. The involvement of stakeholders gives legitimacy to the project and its activities. The third factor, development learning, refers to an environment where stakeholders collaborate in a strategic way, in different official and unofficial groupings, to jointly establish the development of knowledge.

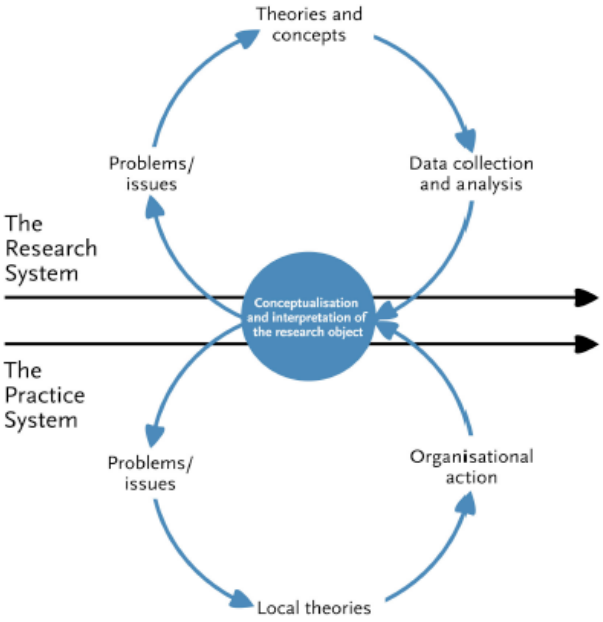

Figure 1. A Model of Knowledge Creation through Interactive Research (Ellström,

Ellström (2007) provided a model that described the interactive research process (Figure 1). The model depicts how developmental learning consists of inputs from both practitioners and academia. The processes run separately until a certain point where conceptualizations and interpretations are made from practitioners' experience and from academia's results. New knowledge is built during this collaboration and through different types of seminars.

Eklund and Karltun (2012) assessed effects and sustainability in seven interactive ergonomics projects using a four-factor model. The model included: active ownership, professional management, competent project managers and involved participants. This model is derived from the model by Svensson *et al.* (2013), where both models include the same factors. Svensson et al. (2013) focused more on a higher level of abstraction than Eklund and Karltun. The assessment of the seven interactive ergonomics projects established a relationship between the assessment model and the three variables needed for creating sustainability.

Produktionslyftet´s interactive research methodology
Produktionslyftet was evaluated by two external organizations (Brännmark, 2010a). The first series of evaluations was made by the consultant company Ramböll, while the second was formed as a research project using an interactive methodology as a foundation. The interactive research project aimed to evaluate Produktionslyftet's capability to create an environment where sustainable development work could be initiated and maintained (Svensson *et al.*, 2007).

The methodology Produktionslyftet used started with a common discussion about the research questions (Brännmark, 2010a). Both the researchers and the project management contributed in the discussions that aimed to establish research questions that added important and usable data for academia and practitioners. The research study was then developed and carried out. More detailed information of how Produktionslyftet's executed their methodology could be found in Brännmark (2010b). The collected research data were then fed back to the project and its management through analysis seminars. The analysis seminars had two target groups in *Produktionslyftet* (Brännmark and Halvarsson, 2011).The first target group was on a programme level, while the second target group was represented by the operational level. The greatest differences of the analysis seminars among these two groups were the participant composition, but also how and to what extent the analysis seminars analysed theory and/or empirical data. In the first target group involved participants were programme management, coaches, financiers, educators and researchers. This target group focused more on theory development and interpretation of the empirical results from existing theories. The operational level focused more on practical and empirical issues where a joint analysis and reflections of the empirical data were made. This practice created a learning process among the participants. After the seminars had been completed, the research group compiled the data from the seminars and analysed it using applicable models of how to reach sustainable change. This step also provided an environment where theory could be developed.

Lantbruket lär av industrin is a project partly financed by ESF (European Social Fund) and partly by the farm organizations. The project aims to implement the lean production philosophy within 35 agricultural farms with *Produktionslyftet's* methodology as a model. The farms are located around Halland and Västra Götaland in Sweden, have a range of employees from two to 20 employees with an average of five employees. The farms were chosen through a process of selection interviews. The farm owners needed to express an understanding and enthusiasm for change, development and learning to be included in the project. The project planned for an 18 month long implementation period of lean production during which each farm would be visited by its lean coach every third week. There are eight coaches in total, and each coach is allocated three to five farms. Suitable coaches were educated by Chalmers University of Technology (the same educator was contracted in Produktionslyftet). When complex situations arise, advice, help and knowledge will be obtained from more experienced coaches. The coaches and the project managers educate the participated farms.

Aim

This paper presents how the adaption of the methodology of *Produktionslyftet* could fit into an agricultural context. The modifications concern primarily the process of interactive research and how the process is affected by the agricultural context. The aim of the paper is to describe and discuss how an interactive research approach could be applied in two

new combined settings: lean implementation in an agricultural context and the microenterprises in scope.

Methodology

The methodology rests on the theories of how to create sustainable change. The first theory emphasizes how sustainable development is established through the interaction of three elements: collaboration, active ownership and development learning (Svensson and Brulin, 2013). The second theory stresses the importance of a balance between owners, customers and employees (Eklund, 1998). Ongoing evaluation can be a way to reach developmental learning. It uses the concept of analysis seminars as a method of spreading knowledge and creating support for the project, both for the ongoing process and for future projects (Brännmark and Halvarsson, 2011). Ellström (2007) depicts the interactive research process where joint events with practitioners and academia create joint knowledge, which supports a more sustainable environment. Further on, the applied methodology design in *Lantbruket lär av industrin* will be described.

Data collection
Preliminary research data will be derived from longitudinal questionnaires, distributed during the spring. The same questionnaire will also be sent out to two reference groups. One group is represented by farmers who joined earlier pilot studies exploring the possibility of implementing the lean production philosophy in the agricultural sector. The other reference group is represented by farmers who have not implemented lean production but are keen to work on the development and improvement of their farm.

The questionnaire will be sent to 53 farms and 409 individuals. The project *Lantbruket lär av industrin* consists of 35 farms which involve 238 individuals. The individuals include owners, managers and employees. The questionnaire will not be translated into foreign languages and therefore an unknown number of foreign employees will be excluded from the survey. The reference group, farmers who earlier were included in the pilot studies, consists of nine farms and 76 individuals (owners, managers and employees). This group did not have any foreign workers. The last reference group consists of nine farms with a total number of 95 individuals involved. This group also does not have any foreign workers employed.

Research data will also be collected through semi-structured deep interviews. Interview participants and areas will be chosen from an elementary analysis of the questionnaire data. The semi-structured deep interviews will validate the elementary questionnaire data. The analysis of the interview data will in its turn be validated in the analysis seminar. Validation trough triangulation is then established.

Because of data uncertainty, immigrant workers have been excluded from the questionnaire. According to the coaches the immigrant workers within *Lantbruket lär av industrin* usually remain in Sweden for a period of three months before travelling back to their families for the same amount of time. In contrast to the exclusion of immigrant workers in the questionnaire, their perspectives must be captured through an event where the underlying reasons for their perspectives can be determined. Therefore a proportionate number of semi-structured deep interviews are allocated to immigrant workers. An interpreter is involved in the process of semi-structured deep interviews. Just as Swedish

workers, immigrant workers are also invited to the analysis seminars, and an interpreter is provided in these circumstances.

Analysis seminars
The *Lantbruket lär av industrin* project will deliver experience sharing seminars which aim to let the farm owners and their foremen meet other farm owners and foremen in smaller groups to discuss problems and share experiences. The analysis seminars will be communicated to those involved as structured, experience sharing seminars. The analysis seminars are set to last for 3- hours including two shorter breaks. Within these 3 hour, three sessions are held, each one lasting for 45 minutes.

The first question is how to group the analysis seminar attendees. In the earlier experience sharing seminars, the participants themselves decided the group constitutions. In the main, the groups were formed because of practical geographical conditions except for one group in which the farmers wanted to have the experience sharing seminar with farms with the same business type (farms with automatic milking systems). “Geographical conditions” refers to the closeness of proximity of the farms in Halland and Västra Götaland.

The main difference between the structure of the experience sharing seminars and the analysis seminars is how the sub groups are composed, and which roles are included. An aspect to take into consideration is the involvement of project owners, project managers, coaches, financier representation and stakeholders. Both Eklund (1998) and Svensson and Brulin (2013) promote their involvement to be able to achieve sustainability. Because of the low number of coaches, farm owners and employees, it is preferable to involve as many relevant stakeholders as possible. The analysis seminars invite and include farm owners, foremen, employees and the steering committee, in contrast to the experience sharing seminars which include only owners and foremen. Immigrant workers are included in the employees (including an interpreter). This area of research - the physical and psychological work environment in combination with business development involves problematic and sensitive questions. Therefore it would be an advantage to separate owners and foremen from their own employees. This separation could support individuals speaking openly and providing frank answers. Analysis seminars are created to generate knowledge and learning and not as a forum for blame. *Produktionslyftet* was able to separate the operational level from the programme level since the businesses in *Produktionslyftet* had between 50 and– 250 employees.

The first session of the analysis seminar starts with a general feedback of the questionnaire results and from the semi-constructed deep interviews with individuals. The feedback follows the same structure and headings as much as possible as both the questionnaire and semi-constructed deep interviews have ‘The Physical Work Environment’, ‘Problems with Locomotive Organs and Eyes’, ‘The Psychological Work Environment’, and ‘Improvement work’. This is an opportunity to validate the result with the respondents. The session continues to give a small background, theory and earlier project experience of how to create engagement among project participants. It is relevant to bring up the challenges the different roles possess, especially between coaches, farm owners, foremen and employees. One particular dilemma is what role the coach is supposed to take on in the implementation of Lean production among the farms. Two examples of questions are: to what extent should the coach engage in the process on the farm, and to what extent are the coaches supposed to use rewards or punishment? During the implementation process at one of the farms, it was recognized by the coach how the

participants who were least engaged at the beginning of the project became one of the most engaged after some involvement had occurred.

The second session continues with background, theory and earlier project experience within the area of learning. The project managers in *Lantbruket lär av industrin* have stressed that the question should be asked whether or not the project's processes create conditions for the participants to learn. The focus of the common analysis is the understanding of the actions carried out in the farms. What results and effects have the actions contributed to? Have the actions contributed to results within or outside the target area or have the actions influenced other areas in a positive or negative way? Why has the daily level of physical tiredness increased or decreased since the Lean philosophy started its implementation process?

An exercise is presented in the second half of session two. The exercise is a case from an agriculture context including the empirical area of challenges. Troublesome areas and issues are identified from the questionnaires and the interviews are then condensed into four analysis questions. The analyses questions are given from the case perspective, which the participants answer or discuss in smaller groups of five people. A farm owner is not placed in the same group as his own employees. Project owner, project managers, coaches and other stakeholders are mixed in these discussion groups.

Session three starts with an exercise which is focused on how learning and engagement could contribute to a better and more sustainable psycho-social and physical work environment together with the Lean production philosophy. The groups´ inputs will be summarized and sent back to the farms.

The same interactive research methodology will be applied in the two other reference groups. Each farm in the reference groups will have individual analysis seminars conducted at their farm.

Discussion

The discussion will focus on the differences in the structure and design of *Lantbruket lär av industrin* compared to *Produktionslyftet*. The differences of the two project's methodologies contribute to a slightly different approach of the analysis seminar in *Lantbruket lär av industrin*. The question is whether the adjusted approach contributes to an improved interactive process in *Lantbruket lär av industrin*. Will the adjusted approach contribute to developmental learning and a preferred state of sustainability?

One of the biggest differences between the two projects is the size of organizations participating. The size of an organization has an effect on several of the sub-processes and how the sub-processes could be structured during an analysis seminar. The organizational size has an effect on processes including: immigrant workers, the structure of organizational hierarchy, management versus operative levels, and direct decision making.

Produktionslyftet consisted of organizations categorized as SMEs (small and medium enterprises), while *Lantbruket lär av industrin* consisted of microenterprises. SMEs have between 50 to 250 employees that contribute to a more hierarchal structure than micro enterprises with between 0 and 10 employees. Microenterprises have greater interactions

between employers and employees and the boundaries between professional and private life could get diminished.

Moreover, *Produktionslyftet* separated the analysis seminars between governing and operating departments, which is impracticable for microenterprises that only have a few employees. The purpose of separate the management from the operational levels was the aim of the analysis seminars. The management's analysis seminar aimed to build theory while the analysis seminar for the employees aimed at validation of the results. Is there an advantage or disadvantage to separate management from the operational level? An event where both Swedish and immigrant workers, employers, coaches, project managers, project owners and financiers representatives share experience, discuss and analyse research data and creates joint knowledge creates a complex situation. The situation also gets more complex with a higher level of divergent goals at the same time that bridges are built with knowledge, understanding and opinion from different angles of the project. One more advantage of the merged structure of the analysis seminar is how management and stakeholders can directly use inputs from the analysis seminar to develop the project and its structure during the duration of the project. A disadvantage of the joint analysis seminars is if the participants from the farms are inhibited by the presence of project owners and financiers. An employee could also be inhibited by the presence of their boss in the same discussion group in an analysis seminar. This threat is removed through mixing up participants in the discussion groups. To create several analysis seminars with different aims might be even better. In such cases, a theory building analysis seminar could be executed with involvement of the management, the operational level could be involved in analysis seminars aimed for validation, and one analysis seminar could be executed with the aim of bringing together the perspectives of the two different analysis seminars.

One other difference between *Produktionslyftet's* structure and *Lantbruket lär av industrin* is that some of the farms, characterized as microenterprises, employ foreign workers who do not speak Swedish. This language barrier makes the sharing of knowledge and the possibility of creating joint knowledge, more problematic. From an equality perspective, it becomes very important that immigrant workers*'* opinions are also considered and that they have opportunities to contribute to joint learning. Unfortunately, accurate data of the nationality and number of immigrant workers is missing. To what extent immigrant workers and Swedish workers will participate depends on the extent that the employers' possibility will release them from their duties on the farm. Immigrant workers could contribute with more unexpected views and thoughts since *Lantbruket lär av industrin* possess less knowledge of these individuals, their personalities and their perspectives of the work environment. Foreign workers' perspectives and references could also differ from Swedish employees. Situations like this where immigrant workers can make 'their voice heard' contribute to higher complexity and a higher level of nuanced knowledge.

The analysis seminars are communicated using the same structure as the experience sharing seminars. The farm owners are grouped according to geographical proximity. The choice of structure makes the involved participants more comfortable. They recognize the structure which makes it legitimate.

The project *Lantbruket lär av industrin* acts in an environment that is more condensed in several matters. As mentioned above, farms do not have 50 to 250 employees in Sweden. The project is also more condensed in the number of farms, and as a result the number of

coaches is fewer. *Produktionslyftet* had two coaches per organization, one coach was primary and the other was secondary. This provides a training opportunity for the secondary coach. Furthermore, the project *Produktionslyftet* had coaches who specialized in specific topics. These specialized coaches could be called on whenever an organization had trouble with a specific area. *Lantbruket lär av industrin*'*s* Lean coaches are also uniquely placed because their Lean education has not been based on experience from an agricultural context since this is the first larger scale project in the industry. The Lean production philosophy has been used in the international industry for several decades and has been applied slightly differently depending on the country, culture and context. Knowledge from research within the Lean production philosophy is still disputed in several ways and some research is ongoing. This gives incentives to develop and deepen the interactive approach in the *Lantbruket lär av industrin.*

Conclusion

The methodology of *Lantbruket lär av industrin* had its spinn of in *Produktionslyftet's* methodology, but in some processes it becomes impossible or impractical to apply the same methodology. From a perspective where analysis seminars are established to ensure sustainable results and effects within the project, the size of the organizations involved is one of the larger structural differences between the two projects. This difference creates a slightly changed methodology, particularly during the analysis seminar. The farms are microenterprises and do not have the same amount of employees and middle management hierarchy. This structural difference could affect either positively or negatively the process of creating joint knowledge through continual learning evaluation. The opportunity of mixing both operational and management level people in the analysis seminars could achieve a positive exchange between participants. This mix could also create a situation where undesired results and effects are highlighted at an early stage of the project. In this case, individuals with the authority to change or even develop the undesired but (positive) results should do so during the ongoing project process.

Immigrant workers' contributions are another big difference. There is an opportunity for immigrant workers, through an interpreter, to contribute their opinions, experiences and views to enhance sustainability and the working environment during an analysis seminar. Immigrant workers are a common and debated involvement in Swedish agriculture and there is a lack of research about their situation as immigrant workers in Swedish agriculture.

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