Learning Organisations: A practical approach in a lean manufacturing organisation

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ABSTRACT *This paper examines the application of learning organisation theory in a lean Australian manufacturing organisation. The paper aims to bridge the gap between current theory and actual practice by using an action research methodology in a workplace environment. To do this two case studies are investigated to show how learning organisation and knowledge management concepts can be used to create sustainable business improvement. The study of both practice and theory is then used to develop a list of criteria that can facilitate the implementation of the learning organisation concept in such an environment.*

Introduction

Many top executives and CEO's claim that "People are their greatest asset". What does this really mean? If we analyse this, we ask the question, why are people the greatest asset? Is it the physical capability of people? Is it the market orientation of the quality movement?

Both a market oriented (value adding) and a learning orientation have a significant positive impact on the performance of an organisation, however, a learning orientation has a stronger positive relationship with business performance, than does a market orientation. Supporting the arguments that organisational learning may be the only source of sustainable competitive advantage and that organisational learning may be the key to future organisational success.[1]

Many academics and practitioners have asserted that the greatest business value in an organisation now lies not in physical assets, but in the various elements of intellectual capital that has been developed.[2 3] It is the knowledge that the people in the organisation possess and how they utilise that knowledge for the benefit of the organisation. Learning is the process by which knowledge is created in the organization.

"A learning organization is one which facilitates learning and development of its employees, whilst continually transforming itself."[4] Senge extended this to include teams; "…teams, not individuals, (who) are the fundamental learning unit in modern organisations"[5]. Organisational learning occurs with an organisation skilled at creating, acquiring, and transferring knowledge, and at modifying its behaviour to reflect new knowledge and insights.[6]

Learning is critical to a modern organization in order for it to cope with the many critical issues of today. These includes[7]:

- Reorganisation, restructuring, and reengineering for success, if not just survival.
- Increased skills shortage with schools unable to adequately prepare for work in the 21st century.
- Doubling of knowledge every 2-3 years.

- Global competition from the world's most powerful companies.
- Overwhelming breakthroughs of new and advanced technologies.
- Spiralling need for organisations to adapt to change.

Hence companies that do not become learning organisations will no longer survive because they will not be able to adjust fast enough to cope with the critical issues of today. Simply put this is why a company must be a learning organisation but what is an learning organisation, what are the characteristics of a learning organization? Peter Senge in Fifth Discipline[8] explains that in a learning organisation:

1. People feel they're doing something that matters – to them personally and to the larger world.
2. Every individual in the organisation is somehow stretching, growing or enhancing his capacity to create.
3. People are more intelligent together than they are apart. If you want something really creative done, you ask a team to do it – instead of sending one person off to do it on his or her own.
4. The organisation continually becomes more aware of its underlying knowledge base – particularly the store of tacit, unarticulated knowledge in the hearts and minds of employees.
5. Visions of the direction of the enterprise emerge from all levels. The responsibility of top management is to manage the process whereby new emerging visions become shared visions.
6. Employees are invited to learn what is going on at every level of the organisation, so they can understand how their actions influence others.
7. People feel free to inquire about each others' (and their own) assumptions and biases. There are few (if any) sacred cows or undiscussable subjects.
8. People treat each other as colleagues. There's a mutual respect and trust in the way they talk to each other, and work together, no matter what their positions may be.
9. People feel free to try experiments, take risks, and openly assess the results. No one is punished for making a mistake.

These are the characteristics that should be developed and engendered into the organization. A general consensus is that organizations need to find better ways to learn[9] [10] but confusion surrounds as to what organizations should be learning and how effective learning takes place and is translated into action.[11] Watkins and Marsick have identified seven action imperatives for building learning organisations[12]:

1 To create continuous learning opportunities
2 Promote dialogue and inquiry
3 Encourage collaboration and team learning
4 Establish systems to capture and share learning
5 Empower people to a collective vision
6 Connect the organisation to it's environment
7 Leaders who model and support learning at individual, team and organisational level

In an attempt to add to the body of literature in this area, this paper describes two projects undertaken by a large manufacturing organization that involved significant change. The aim was to identify the key concepts that were critical in the completion of the two projects and discuss how these relate to a learning organization. The first author, an employee of the organization, was heavily involved in both projects. Hence, action research is the approach

adopted in this study. The remainder of this paper is structured as follows: The next section describes the company and the two case study projects undertaken recently. This is followed by the discussion section that highlights the key concepts of a learning organization as identified from the two projects and finds support for each from the literature. The paper ends with a brief conclusion.

Company Background

Pilkington Building Products Australasia. (BPAA) is a subsidiary of Pilkington Inc. which is a global float glass manufacturer based in the U.K.. Pilkington Inc. has 26,500 employees globally with an annual turnover of 2.8 billion pounds. BPAA consists of three main production sites that supply to 35 downstream processing and retail sites with 1950 people across Australia and New Zealand. Of the three core sites, Dandenong is the largest site employing 310 employees. BPAA is the market leader and holds over 70% of the Australia and New Zealand float glass market with revenues of about $400 million and is the only company that manufactures glass in Australia, the rest in made up of imports by competitors.

The Dandenong plant was built in 1967 to cater for the growing demand of float glass in the region. The operations are very capital intensive with over $140 million invested in capital equipment on the site. The main float process is highly automated employing 56 people with the rest being in processing operations. The plant runs 24 hours a day, 7 days a week. Major restructuring has taken place in recent years to lift the company to profitability from increasing losses in the past. The site has gone from 610 employees 10 years ago to the 310 employees currently with investment in automation, moving operations downstream and outsourcing of non-core activities. The workforce is multicultural of moderate intelligence with many years of experience in the operations as identified by an average service of 12 years. A strong industrial culture exists at the three major production sites.

Case Study 1

Heavy manufacturing produces a large amount of waste and Pilkington is no exception. Each year thousands of tonnes of waste go to landfill and waste recycling facilities. By far the most environmentally damaging of these wastes is ‘prescribed waste’, as identified by the Environment Protection Authority who determines the list of prescribed wastes. Prescribed waste is of particular concern to the government not just because of the damage to the environment but also because the Victorian state has insufficient sites to handle such waste and the availability of suitable sites is diminishing, hence the costs of disposing of such waste is dramatically increasing. During 2002 the Dandenong site produced over 660 tonnes of prescribed waste costing over $112,000 (not including transport costs). As a consequence Pilkington was on the EPA Focus 30 list of worst polluters in the state.

On the site the waste comes from two main sources; waste batch and mirror cullet. Waste batch is the mixture of raw materials that go into making the glass that have been mixed wrong due to many process issues. Mirror cullet is broken up mirror glass as a result of process rejects and faults. Pilkington is always looking for ways of reducing this waste and there have been process opportunities to reduce the source of this waste. The greatest opportunity came when an employee attended a local conference on the environment. One of the segments was on recycling and alerted to a list of waste recyclers that could be used to recycle industry waste that was available on the internet through the Sustainable Energy Authority site. On returning to the site the employee saw an opportunity to recycle some of the prescribed waste through a recycler. A project team was set up consisting of Purchasing,

Environment and Production employees. The team organised for four recyclers to come out and view the waste to see if there were any opportunities to recycle some of the waste.

The company that offered the best way of recycling the most amount of waste was Alex Fraser Group (AFG), a supplier of materials to the construction industry. AFG identified that the waste batch could be used as a road base material or in concrete and that the waste mirror could be crushed up and also used in another layer of the road base.

To allow the waste to be recycled it required approval from the Environmental Protection Authority (EPA) to ensure that the waste was not harmful to the environment in it's end use. This involved extensive testing and reports of the processes and uses which the project team organised with Alex Fraser. Once the approval was received all of the waste batch and mirror cullet could be recycled. There were some issues with respect to transport and storage that the team overcome. This initiative reduced the prescribed waste from the site by 98%, amounting to a saving of over $150,000 per year that was expected to be much greater in the years to follow.

The project team efforts were recognised by the EPA and Pilkington in that Pilkington was no longer on the top 30 list of worst polluters and the company was presented an award by the state minister on behalf of the EPA.

Case Study 2

The manufacture of glass requires high temperatures for which specialised insulating material is required. In order to maintain the thermal properties, these materials are usually carcinogenic and hazardous. The insulating material is applied around the seals to the furnace used to manufacture the glass. In the past, materials such as asbestos were used and these have long been replaced by lessor carcinogenic materials. The current material used is Fibrefrax that is a level 2b carcinogen. Due to it's hazardous nature many controls and procedures have been put in place. Every time the material has to be replaced or access gained in the vicinity of the material, complete coveralls and masks need to be worn. However sometimes due to the emergency of the situation in the process access needs to be gained quickly and complete sets of clothing need to be replaced to ensure the carcinogen is not transferred to an uncontrolled environment. The hazardous nature of the material and administrative controls have also caused many industrial and downtime issues. This amounts to a very costly and time consuming part of the process with many associated safety issues.

Pilkington is always trying to find ways to improve safety by reducing hazardous materials wherever possible. However, in this case it was thought that less hazardous were not available. Some employees believed that there might be some materials that that could be developed for this particular application and should be researched. A project team was set up consisting of operators, safety professionals and process experts to try and come up with a better solution to the carcinogenic material.

The project team searched extensively throughout Pilkington, it's suppliers base and similar industries. Extensive Internet search was also conducted to see what materials were available. Three different materials were considered based on an analysis of their chemical properties and applications. However, one material stood out because it was not carcinogenic at all and was also not hazardous. Hence there was no need to wear protective outfits and other controls associated with a carcinogen. Although there were concerns about whether the material would be suitable for the process and the specific insolation requirements. A

comprehensive testing and trial period began involving a laboratory analysis of the material to ensure it maintained its properties during application and to monitor the process parameters.

The initial trials were successful and more material was ordered and more tests were carried out to ensure full confidence in the replacement product. At all times extensive notes and communication took place with all parties concerned to assist in adoption and acceptance. The project was a great success and not only greatly improved safety and communication but also a saving of over $40,000 per year. The team was then recognised and rewarded for their efforts in the form of gift vouchers and presentations.

Discussion

In this section we identify ten key concepts that were critical to developing and completing the two projects described in the previous section. These are the core principles of a learning organization and we provide support for these from the literature. The ten concepts/principles are:

1. Expand capabilities of the workplace
2. Utilising resources internal and external
3. Create entrepreneurial activity in the workplace
4. Gain enthusiasm and drive support
5. Time for reflection and learning as part of regular work
6. Set up horizontal teams in the organisation
7. Risk taking for new ideas
8. Problem solving skills and expertise
9. Focus on value adding activities but consider the 'big picture'
10. Recognition and reward

In the remainder of this section we discuss these concepts/principles in detail. Under each one we provide evidence from the two case study projects and then present support from the literature.

1. Expand capabilities of the workplace

In case study 1 capabilities were expanded by having employees attend conferences whilst in case study 2 capabilities were expanded by allowing research into Pilkington world-wide, it's suppliers and other companies.

A key part of a learning organisation is the creation of knowledge by expanding the capabilities of the employees within the workplace. The concept of knowledge and it's continuous creation is vital to the survival of the organisation.[13] [14] However companies such as 3M recognises the limits of formal training programs to achieve this, and has built a major part of its knowledge development into the day to day operations of the organisation.[15] Important to the development of capabilities is the support and motivation of management. In leading organisations senior managers spent a substantial amount of time and energy developing the individual members of their organisations and in supporting their ideas and initiatives and middle managers playing a key role in facilitating the process of organisational knowledge creation.[16] [17] "They (business leaders) want not only to increase their own capabilities, but improve the capabilities of the other people around them. They recognise that an organisation develops along with its people."[18] Dr. Yoshiro Maruta, CEO of Kao

Corperation, puts it, describing his organisation as "an educational institution" rather than a corporation, Maruta insists that "learning is a frame of mind, a daily matter." Thanks largely to its institutionalised knowledge-building capability to develop individuals, Kao has become universally recognised as one of the most consistently innovative companies in Japan.[19] Anderson Consulting strives to have at least three staff attend seminars and conferences identified as valuable by the firm.[20] Companies must recognise that in a learning organisation, diversity of perspectives, experiences, and capabilities can become an important organisational asset and must be expanded and developed.[21]

2. Utilising resources internal and external

In case study 1, the resources available from the Environmental Protection Authority and, the Sustainable Energy Authority were utilized. In addition, the internet was used extensively. In case study 2 suppliers were used develop alternatives and the operators from the line were involved rather than external consultants.

Lean manufacturing organisations, such as Pilkington, realise they cannot maintain all the resources internally and remain competitive and hence must utilise external resources whilst maximising the knowledge of internal resources. The use of partnership and joint ventures as organisational actions that would increase the amount and quality of new information that was available to the organisation.[22] Business leaders can help support this by creating a climate for maximising resources by; developing community partnerships; improving business representation and networking structures.[23] And then to quickly diffuse the information and knowledge gained so it can be leveraged by the entire organisation.[24] Where possible the sharing of ideas should be done on a face to face basis creating a higher openness/trust and information sharing.[25]

3. Create entrepreneurial activity in the workplace

In case study 1, entrepreneurial activity was generated in the skills and knowledge of the supply and HSE departments and their ability to apply it to a workplace application. This forms part of the Management Development Programs (MDP). In case study 2, entrepreneurial activity was created by allowing the operators to take ownership of the projects through the allocation of time and resources.

Today, there is an almost universal recognition that the vast majority of the world's largest and most powerful organisations have lost much of the entrepreneurial spark and individual initiative that made them successful in the first place.[26] This is not the case for leading organisation such as 3M and ABB whose most striking set of activities and achievements common to their frontline entrepreneurs were those related to their willingness and ability to create and pursue new opportunities.[27] Nurturing Innovation and entrepreneurial activity in order to foster an environment that inspires others to deal creatively with business and people problems thus ensuring continuous renewal of the learning organisation.[28] [29]

4. Gain enthusiasm and drive support

In case study 1, enthusiasm and support was gained through identification of the improvements that can be made in the workplace and having those with the correct knowledge and ability involved in the project. In case study 2, employee enthusiasm was created by involving only those individuals who had a particular interest in the area and had relevant experience. Management, support was gained by ensuring that only those managers with sufficient authority in the company were involved. Their involvement ensured allocation of adequate resources to the project.

In order for any initiative to eventuate in an organisation it must gain the support and enthusiasm of the leaders which is cascaded through the organisation. It is the liberating and energizing element … that raises individual aspiration levels and encourages people to lift their expectations of themselves and others.[30]

5. Time for reflection and learning as part of regular work

In both cases the reflection and learning was a part of the whole process as there were regular reviews and meetings towards a defined target and changes made as the projects progressed. For the recycling program evidence of this was in the way in which the process for capturing the waste was modified to enable easier transport.

Organizations need to stimulate employees to reengage in learning, bringing with them their prior knowledge. Reflecting on the learning, evaluating, and giving and receiving feedback on what they are doing and learning is also important. This ensures a greater depth of learning enabling learners to think strategically, plan and monitor their activities in ways that promotes further learning.[31] [32]

6. Set up horizontal teams in the organisation

In case study 1, the horizontal team consisted of; Supply, HSE, Engineering and Waste Recyclers bringing all the skills required to solve and disperse the learning. In case study 2, the horizontal team consisted of; Production, HSE, Engineering and Material Suppliers which was more focused on internal learning, problem solving and dissemination of knowledge.

To maximise the knowledge and benefits of learning in an organization, horizontal linkages amongst peers are strengthened through a variety of mechanisms, including industry and functional specialist networks, as well as strong firm-wide norms.[33] That in turn requires people to voluntarily seek and provide assistance to colleagues. Unless people talk and share it with peers, knowledge remains untapped.[34] This is another way for organizations to expand capabilities by forming partnerships and linking the information from each individual into a common information system that can be used by all the partners.[35] As it is through social networks within manufacturing operations that engineering/technical staff and operational employees engage in learning within their communities of practice.[36] This allows individuals to learn through exposure to experts in their environment, an interactive system within which people work collectively on a problem in an effective manner.[37] Hence the set up of horizontal teams in the organisation allows the linking of dispersed knowledge, skills, and best practices across units.[38]

7. Risk taking for new ideas

In case study 1, risks included: contaminated waste, non approval by authorities, unable to transport and high set-up costs. All these had to be appropriately considered or addressed by the team. In case study 2, risks identified included: no better material available, new material introducing a higher risk, process problems introduced and excessive cost of the new material. However, the process proved successful despite the risk involved.

The learning organisation is where people are excited in trying out new ideas by taking risks and recognising that failure is an important part of success.[39] In this environment managers support staff development, encourage risk taking and share insights and innovations.[40] Thus providing the resources and credibility to take risks and make the investments that stimulate the learning process.[41]

8. Problem solving skills and expertise

In case study 1, problem solving skills were needed to resolve the risks identified in point 7 above. It was the skills and expertise of the cross-functional team that came up with answers. In case study 2, problem solving skills and expertise were introduced into the project through involvement of engineering and HSE.

Problem solving skills and expertise are required in order to make success of difficult situations and risks that may arise. This is emphasised in the action learning philosophy which is a dynamic process that involves a small group of people solving real problems while at the same time focusing on what they are learning and how their learning can benefit each group member and the organisation as a whole. It is built on the application of new questions to existing knowledge, as well as a reflection on actions taken during and after the problem-solving sessions.[42]

9. Focus on value adding activities but consider the 'big picture'

In case study 1, the value adding was rather apparent from the start. The amount of waste and the associated dispose costs were identified. The 'big picture' is introduced by also considering the waste to the community as a whole as the manufactured wastes are from non-renewable resources. In case study 2, the value adding was not as obvious, consideration had to be given to the "big picture" of total costs and potential long term health effects rather than just direct savings.

The objective of a company is to capture as much as possible of the value that is embedded in its products and services.[43] This is achieved by ensuring that the learning and knowledge proves itself in action.[44] However focus needs to remain on the "big picture" of the organisation. Royal Dutch Shell (RDS) was identified as a learning organisation in the 1980's and recognised during the first half of 1990's as the world's leading oil company. However, in 1998, RDS posted a great loss. This was because the impact of learning in RDS could only become beneficial for the organisation when both management and employees combine not only for a shared vision but also organisational commitment and community.[45] Simply put each employee must understand that the whole purpose of the organisation is to create superior value for customers. Further, a learning orientation can lead an organisation astray … if a strong market orientation is not present to provide grounding.[46]

10. Recognition and reward

In case study 1, the recognition was in the form of an award from the EPA presented to those involved in a formal setting. In case study 2, the recognition and reward was a presentation to key internal and external people and a gift given to all those in the team by the manager of the area.

The purpose of recognition and reward is to "Get as many people inside (the organisation) who are as enthusiastic about the idea (learning organisation) as can be.[47] Recognition and rewards can drive and stimulate the learning organisation ethic that further drives improvements.

Conclusion

A learning organisation is one that can harness the power of its greatest asset, that is, the knowledge of its people. Not only using that knowledge but also developing and enriching it for the benefit of the whole organization. This paper introduced the concept and theory of a learning organisation and then provided real life practical examples of how the theory can be applied in practice in a lean manufacturing environment. The key concepts identified can be applied in other situations and organisations to enhance knowledge management and develop a learning organisation.

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