

Intellectual Outputs 1-3: Informal Learning, Problem Based Learning and the use of ICT for Learning in European SMEs

Report for the Archimedes project



The Archimedes project is funded under the 2014 Erasmus Plus programme



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Acknowledgements

The Archimedes team would like to thank the European commission for providing us with the funding to make this research possible and all 340 SMEs that participated in this research.

1. Introduction

1.1 Overview

The Archimedes project is a Erasmus plus project aimed at investigating the use of problem based learning (PBL) in SMEs. It realises that SMEs require an immediate impact from learning with minimum time spent away from the workplace. Traditionally learning in SMEs has been weighted more favourably towards informal approaches. Archimedes is examining how to leverage off of these informal learning approaches using PBL to provide SMEs with a learning approach that produces a significant impact for small businesses.

The purpose of Intellectual Outputs 1- 3 is to develop a report outlining the approaches to and the problems faced by SMEs in their learning practices, specifically concerning Informal Learning, Problem Based Learning(PBL) and ICT in learning. It will detail these practices in SMEs throughout Europe.

This activity will be used to obtain an understanding of Informal Learning (including mentoring), Problem Based Learning(PBL) and ICT in learning in SMEs and how it is used. It will provide an in depth examination of these practices in partner countries through surveys, focus groups and case studies.

The research was conducted between February and May 2015.

1.2 Background of the region

In 2012 over 99% of European companies were SMEs, 90% of companies were micro enterprises with less than 10 employees (European Commission, 2013). Currently the largest SME business sector is Wholesale and Retail (28%), followed by Professional Science and Technology (17.5%), Construction (15.5%), Manufacturing (10%) and Accommodation and Food (8.5%). (European Commission 2013)

In terms of employment in SMEs, the figures are similar. Accommodation and Food is the largest employment sector in SMEs (46%), followed by Manufacturing (44%), Admin and Support (17.5%) and Construction (14%). SMEs have a greater turnover of jobs than large companies, creating and destroying jobs at a higher rate. (Central Bank 2012)

In 2008, Europe entered a period of financial crisis with a deep recession, a sharp rise in unemployment and stringent austerity measures. Subsequently banks imposed strict financial regulations; this affected small businesses who are largely reliant on short term credit to enable them to survive. This resulted in a decrease of 0.7% in the number of SMEs in Europe (European Commission 2013); however this figure varies significantly between countries. For example, in Ireland in 2009, SME deaths exceeded births by 56%. While the survival rate decreased and rate of job destruction of firms increased in this period. (Central Bank, 2012) As can be seen in the literature review training has the ability to improve SME survival rate by providing them with the skills to adapt to changing situations.

1.3 Objectives of Intellectual Outputs 1 - 3

The main objectives of the work package for IO1 are to identify:

- Current Informal Learning approaches in SMEs .
- How Informal Learning is used in SMEs
- Benefits and problems with these approaches in SMEs.
- How ICT is used to support Informal Learning.
- An ideal scenario for Informal Learning in SME

Those of the work package for IO2 are

- A review of the literature of PBL models
- A review of current and previous projects on PBL
- A study of how problems are identified and addressed in SMEs and how they are successful and if any learning occurs
- Outline a successful scenario for PBL in SMEs
- Report on PBL and recommendations of how the above can be applied to PBL

And the objectives of the work package for IO3 are to:

- Review past projects concerned with the use of ICT to support Informal Learning
- Review past projects concerned with the use of ICT to support PBL
- Identify what tools are used in SMEs for Informal Learning and collaboration
- Identify are they successful and why/why not
- Explore and evaluate the emerging tools that could be used to support Informal Learning and PBL in SMEs
- Recommend a suite of tools for the ICT platform
- Produce a requirements specification for the ICT platform

A number of research questions have been outlined to enable the project to achieve the above research objectives

- Identify current Informal Learning approaches in SMEs
 - What methods of Informal Learning are used in SMEs?
 - How is Informal Learning implemented in SMEs?
- How is Informal Learning used
 - For what purposes is Informal Learning used in SMEs?
 - Is it successful in satisfying these requirements in SMEs?
 - What skills does Informal Learning develop?
 - Does Informal Learning develop the required skills for SMEs to succeed?
- Identify benefits and problems with these approaches
 - What benefits does Informal Learning offer SMEs?
 - What are the limitations in adopting Informal Learning in SMEs
- What are the common problems SMEs face?
- How are these problems addressed in companies?
- Are the methods of problem solving successful?
- What learning occurs during the problem solving process?
- How can PBL be aligned to the SME requirements?
- What past projects are concerned with the use of ICT to support Informal Learning?

- The year and the main objectives of the project and the partners
- A summary of the ICT tools used in partner countries to support Informal Learning
- What past projects are concerned with the use of ICT to support PBL?
 - The year and the main objectives of the project and the partners
 - A summary of the ICT tools used in partner countries to support PBL
- What tools are used in SMEs for Informal Learning and collaboration?
 - Which tools are already in use in SMEs?
 - What do the SMEs want to use and what are the technical and qualification requirements?
- Are the used tools are successful and why/why not?
 - Which tools have turned out to be successful in the frame of informal- and problem-based learning?
 - Which aspects do the ICT Tools particularly support in the Informal Learning process?
- What are the emerging tools that could be used to support Informal Learning and PBL in SMEs?
 - What are the emerging tools suitable for SMEs?
 - How can these tools be measured to be suitable?
- What are the most suitable suite of tools for the ICT platform?
 - Collecting of the most suitable tools, which can be provided by the ICT platform
- What is the requirements specification for the ICT platform?

2. Literature review

Many observers from the research community, business and government organisations have stressed the importance of employee training in improved productivity and thus competitive advantage.

Much research has been conducted into how training can achieve a competitive advantage through measurable forms such as increasing productivity, quality and financial results. (Ashton and Felstead, 1995;Holzer et al, 1993;Barron et al, 1999;Conti, 2004, Konrad and Mangell ; Stainer, 1997;Filiatrault et al., 1996; Black and Lynch, 1996) Management literature suggests that competitive advantage built on knowledge and skills is less visible to competitors and is therefore more difficult to imitate, thus providing a base for a more robust advantage. (European Commission, 2003a)

However, in many cases, SMEs are slow to undertake formal training despite the fact that it has been proven to maintain employee productivity, improving a company's competitive advantage (Ashton and Felstead, 1995). Stone (2010) reported that, on average, 36% of SMEs do not have any formal training activities. Amongst the main reasons for this are:

- Lack of Time.
- Lack of Funding (Costs).
- Lack of Planning.
- Lack of Relevant Courses.

(European Commission, 2003a; Nottingham Trent University, Barriers to Training in Small and Medium Sized Enterprises, 2002;Storey and Westhead, 1996; Hankinson):

2.1 Training in SMEs

Training can be classified in terms of formal or informal methods. Both methods of training can be of benefit to a learner if used appropriately.

Formal Learning involves “acquisitional and individual learning, vertical or propositional knowledge within educational institutions”(Malcolm, Hodkinson and Cooley, 2003). Formal learning is appropriately named as it is a ‘planned’ method of training and the learning process is carefully constructed. It traditionally consists of a tutor teaching a set curriculum in a classroom. Formal training methods include: (Garavan, 1995;Wynn, 1992)

1.In-house Training Programmes – This involves teaching in a classroom, a group of employees about a particular skill they may require to work in the organisation. Material can be tailored to individual departments.

2.External Training Programmes – This involves teaching employees from different companies a particular skill they may require to work in their individual organisations. Material is generic and does not differ depending on the individual, it is not contextualised to the company. However it allows the organisations to acquire new skills

3.Computer Based Training/e-learning – This is training material presented on a

computer or via a network using educationally sound theories. Usually a generic course is developed for a large audience.

Traditionally training and development in SMEs has been limited to informal approaches such as mentoring, coaching, self-directed learning and on the job training. Informal Learning accounts for over 75% of individuals' and companies' learning processes. (Hamburg, 2012)

Employees in SMEs are expected to be flexible in nature, adopting new roles and tasks as the company changes direction; the company, and hence skills development, is often reactive. Little formal training is provided. Informal Learning is more attractive to SMEs because it is low cost, it can be easily integrated into the company and can be tailored to the needs of the organisation (Hill and Steward 2000; Curren et al 1997). Furthermore, often SMEs focus on the short term as they operate in an uncertain business environment. Formal training does not yield a return immediately, thus it is unattractive to small businesses. In addition, it is of a generic nature and often companies find it difficult to integrate the skills acquired into their work environment.

From an employer perspective, Stone highlighted that "Informal training is preferred by smaller employers because it can be tailored to their needs and conducted at suitable times". Furthermore, Euaert et al(2000) highlighted that informal training is more relevant when developing professional skills than formal training as often formal training often does not offer opportunities to put theory into practice. (Kok, 2011;Admiraal, 2009)

2.2 Informal Learning

Informal Learning has been around for many years, many skilled trades were developed through Informal Learning from trade 'Masters'.

Informal Learning refers to situations in which some combination of the process, location, purpose, and content of instruction are determined by the worker, who may or may not be conscious that an instructional event occurred. Furthermore, the extent to which the worker determines the process, location, purpose, and content of instruction, and is aware that instruction occurred, can vary widely among situations that are labelled as "Informal Learning." (Carliner, 2012, p. 5)

Informal Learning involves "Learning through everyday embodied practices, horizontal knowledge, non-educational settings"(Malcolm, Hodgkinson and Cooley, 2003). It is implicit, unintended and unstructured. (Eratut, 2004) Doyle et al conducted research into the approaches of Informal Learning in SMEs and found that many employees highlighted the role of trial and error and learning by mistakes. Armstrong (1992) examined prevalent learning media used in companies (at the employee level) and found that past experience was used by 95% of respondents. From the literature the main methods of Informal Learning are (Garavan, 1995;Moorby, 1992;Bell, 1992, carliner, 2012;Doyle 2004)

1. Coaching – This involves one to one guidance by a superior to assist an employee to develop the appropriate skills they require to conduct their job.
2. Mentoring – This involves an experienced employee acting as an advisor to those less experienced to assist them to become proficient in carrying out skills to conduct their job.

3. On-the-job training – This is the predominant form of training in SMEs (Kotey 2007) which involves first demonstrating new skills to employees and then allowing them to practice these skills under the supervision of a superior.
4. Job Aids/Instructional Manuals – The purpose of this material is to assist employees in recalling information that was presented during the training process.
5. Brown bag lunches or lunch and learns.

According to several studies, on the job training is by far the most favoured by SMEs (Koty and Folker 2007;Kotey and Slade, 2005) . In addition, structured training activity increases in correlation with the company size.

Informal Learning offers many advantages and disadvantages. (Dale and Bell, 1999; Clough 2010; Ravenscroft, 2012)

Advantages	Disadvantages
<ul style="list-style-type: none"> • Learner empowerment – the learner is responsible for their own learning and can make their own choices about what to learn • Relevant – the content is relevant to the company and the individual • Problem based – the content is applicable and will provide an immediate return to the company • Immediate application – what is learned is applied immediately 	<ul style="list-style-type: none"> • Lack of quality and poor practices can be developed – often individuals that have developed bad habits or behaviours will pass this on to other employees. Also because there is no accreditation the quality of the training can be questionable • Not transferable – As it is very contextualised • Often not distinguishable as a learning or instructional event – as it is so well integrated with work. • Poorly defined • Without direction can reduce learner confidence and morale • Does not develop new skills it is used to disseminate existing skills.

Table 1: Advantages and disadvantages of Informal Learning

Both informal and formal learning provide an effective method of training staff. However, Informal Learning needs to be supported by formal education or have clear goals (Ellstrom, 2001). It improves the ability to assimilate Informal Learning at the workplace (Svensson, Ellstrom and Aberg, 2004). Formal learning provides the learner with basic skills to enable them to conduct Informal Learning, therefore they complement each other. In addition, Conlon (2004) highlighted that over reliance on Informal Learning alone can lead to an employee feeling abandoned and lost, reducing learner confidence. As a result Brooks 1989 identified the need for Informal Learning to be supportive and to have clear goals.

Admiraal (2009) has argued for “more attention for Informal Learning processes in organisations aimed at learning problems that really matter....the learning outcomes seem to take more root....Workers learn when they feel the need to (so called just in time training)”.

2.3. Conclusions and recommendations - Informal Learning

The literature highlights the benefits Informal Learning can provide to companies. There is a significant amount of research into Informal Learning in an organisational context. It particularly identifies the reasons why SMEs choose Informal Learning as a method of training, the benefits and disadvantages of such and the different Informal Learning adopted into companies. Some empirical studies have been conducted into the methods and approaches to learning in companies. However, there is little research on what purposes SMEs use Informal Learning for and what skills Informal Learning is used to develop. Few empirical studies have focused on the approaches to Informal Learning and for what purposes these are used.

Research needs to be conducted into these areas to determine the skills that are key to the success of SMEs and how Informal Learning can help deliver these skills. In addition, further research needs to be conducted into what SMEs require from a learning solution. This research will allow the project to ensure the framework, courseware and platform align to the requirements of European SMEs.

Furthermore, the research highlighted the importance of aligning Informal Learning to goals or outcomes and providing learners with the basic skills to learn informally. Thus it is important to identify if SMEs align Informal Learning to the organisations strategy and measure and reward it and if so how this is done. This will allow the project to leverage best practices.

As a result there is a need to develop a framework to leverage the benefits of current training and educational practices to overcome the disadvantages of informal training, developing a framework that is transferable, recognisable as a learning event and improves learning quality while at the same time being cost effective, timely and relevant to the companies' needs.

2.4. Common problems in SMEs

There has been limited research into the common problems faced by SMEs. Much research has been conducted into organisational problems that occur, categorising them as strategic or operational, technical or personnel. (Blake and Mouton , 1964; Drucker, 1954).

Problems often depend on the person's knowledge, skills and experience as well as their motivation. (Jones-Evans, 1996)

Huang (1999) conducted a study into the common problems SMEs face with 973 companies. He used a framework that classified problems based on functional areas in a company used by Terptra and Olson (1993). The main areas were internal and external finance, marketing, operations management, product development, general management, HR management, organisational structure and design and legal aspects (such as copyright etc.).

He found that the most common problems faced by SMEs are in Sales and Marketing (market research and promotion), HR Management (training and development) and General Management (planning and management skills).

The study however was conducted in 1999 and it is expected that things have moved on significantly since then. In addition, the research was based on quantitative research and gave no insight into why SMEs had these problems Dodge et al (1994) used an interesting approach which determined a decision an employee/company made and traced it back to the source of the reason why the decision had to be made.

SMEs are particularly vulnerable to the impact of environmental changes as they do not have the resources to absorb these impacts. Problems can often mean 'make or break' for the company. (Carter, 1990)

Dodge(1994) classified the problems SMEs have based on their life cycle stage and the intensity of the competition in their environment derived from quantitative research conducted with 645 companies.

The main areas where they had problems were with contacting customers and marketing. Again this research was conducted in the 1990's and was quantitative. Twenty years on there has been no in-depth quantitative and qualitative research done on the problems SMEs face. It is necessary to obtain an up to date understanding of current problems SMEs are challenged with and how they can be leveraged for learning purposes.

2.5. Problem Based Learning

Problem Based Learning (PBL) is a constructivist approach to learning that has been widely used and advocated in higher education. It is used particularly in medical and nursing education. It is based on experiential learning advocated by Dewey (1916). Experiential learning is widely used in SMEs (Armstrong, 1992).

Jonassen (2011) stated that the traditional method of education is to master content and then present a problem to the learner. However, with PBL, the learner encounters a problem and then constructs the relevant knowledge to address the problem.

Problem Based Learning (PBL) is a learner centered approach to learning in which a teacher facilitates the activity by guiding the learner in a process of inquiry. Thus the teacher plays the role of a mentor. It is known to positively affect learning outcomes and develop the skills that are critical in today's workplace, namely problem solving, logical thinking, creative thinking. (Sendag 2009)

Within an organisational context, the learner identifies a problem in the organisation and formalises a project to identify a solution (or a number of solutions) to that problem (Bell, 2010). It provides a number of benefits to SMEs (Bell, 2010; Walters and Sirotak, 2011):

- Immediate return on investment.
- Low cost.
- On the job training, thus the learning is highly contextualised and situated.
- Practical and related to the SME's needs and sustaining the organisation's competitive advantages.
- Encourages innovation and independent thinking.
- A greater understanding of a topic due to active learning, engaging in the material

- Increased motivation to learn thus developing a learning culture
- Develops skills in critical thinking, leadership, communication, problem solving

To date, no research has been conducted into the adoption of Problem Based Learning in SMEs. Facilitated work based learning is a Danish project which examined the use of PBL in teacher training. (Rokkjær et al, 2009) Saatci (2008) explored the use of PBL in an intercultural business communication course, however it was limited to introducing SMEs into the formal education curriculum by partnering with SMEs on real world projects which were predefined. A research group at the Institute of Future Studies in Austria examined more the problems SMEs face with e-learning rather than Problem Based Learning. The ENSel project conducted by Henley Management College highlighted the fact that “Social interaction allows for co-construction of knowledge, which promotes engagement of learners in Work Based and Problem-Based Learning” (Stewart and Alexander 2006) in SMEs but did not examine the concept of PBL in SMEs and a model or framework for implementing it.

The Learning Layers project (Atwell, 2013) is currently focusing on technologies to support Informal Learning in SMEs, of which PBL is one strand. Similar to Saatci (2008) They are using PBL” to engage with learner groups, who in computing or business ICT are often required to undertake a one semester programme undertaking a real project in conjunction with companies”.

2.6. Goals and characteristics

There is a significant gap in the research in the use of PBL in an organisational context (initiated by an SME and conducted within a work based environment). This is despite the fact that the goals of PBL largely meet the requirements of an SME as identified in IO 1. Hmelo Silver 2004 stated the goals of PBL were to:

- Develop a flexible knowledge base – a wide variety of skills were deemed important by the SMEs in IO1. PBL has the ability to allow the learner to identify the skills they require and the ability to develop these skills themselves
- Develop effective problem solving skills - effective problem solving was identified as a key skill in SMEs; PBL assists in developing these skills
- Develop self directed, lifelong learning skills – Encouraging initiative in employees in SMEs was seen as a learning requirement in IO1. In addition, drop off and maintaining enthusiasm post learning was identified as a key issue. PBL has the ability to develop initiative and continuous approaches to learn by encouraging self directedness and reflecting on how learning can be applied in future situations.
- Become effective collaborators – Team skills and customer centric skills were identified as being important in IO1. Due to the collaborative nature of PBL these skills are developed through the course of the learning process
- Become intrinsically motivated to learn – This goal will reduce the drop off and resistance to learning experienced by SMEs (particularly associated with longer serving staff) and encourage continuous learning

Hoffman and Ritchie (1997) consider PBL as ‘a learner-centered strategy that has significant, contextualized, real-world, ill-structured situations while providing resources, guidance, instruction and opportunities for reflection to learners as they develop content

knowledge and problem solving skills' (p. 97).

The main characteristics are: (Hung et al 2003; Woods 2003)

- Problems are ill structured but authentic—Jonassen, 2011 has identified a number of problem types
- Knowledge is constructed rather than retained
- It is collaborative.
- It is conducted in small groups
- It self directed, the learner is responsible for their own learning and reflecting on the adequacy of what they have learned
- Learner centered- the learner takes the lead role and the tutor acts as a mentor
- There is no one solution.

Furthermore there are a number of approaches developed to guide the PBL process.

2.7. PBL Approaches

There are several approaches to Problem Based Learning. Barrow has developed a PBL taxonomy (1986), Jonassen (1997) developed a number of steps to PBL, the Mastricht 7 Jump method, which is often used as a guide for facilitators and learners. All of these approaches consist of similar steps:

Step 1 – Identify and clarify unfamiliar terms presented in the problem scenario. This ensures that the problem is well understood

Step 2 – Define the problem in terms of what needs to be understood

Step 3 – “Brainstorming” here the learners identify possible solutions or hypothesis on basis of prior knowledge; learners draw on each others knowledge and identify areas of incomplete knowledge.

Step 4 – Review steps 2 and 3 and arrange feasible explanations

Step 5 – Formulate learning objectives; group reaches consensus on the learning objectives; tutor ensures learning objectives are focused, achievable, comprehensive, and appropriate.

Step 6 – Private study (all learners gather information related to each learning objective).

Step 7 – Group shares results of private study (learners identify their learning resources and share their results); tutor checks learning and may assess the group.

Within the above process there are a number of roles (Woods, 2003)

- **The tutor or facilitator** – whose role is to guide and scaffold the learning process and ensure the group remains focus and achieves their learning objectives
- **The scribe** – whose role is to record the group perspectives and maintain up to date records
- **The chair** – whose role is the lead the PBL process, encouraging all members to participate and maintaining constructive group dynamics
- **The group member** – whose role is to actively participate in the PBL process, suggest solutions, conduct self study and share findings with the group.

2.8. PBL: The role of the facilitator

As mentioned previously, the PBL process is guided by a facilitator. The role of the facilitator is that of a mentor who encourages the learner to justify their thinking and verbalize their reflection through appropriate questioning (Hmelo Silver 2003). In line with Vygotsky's socio-constructivism, the tutor in PBL scaffolds the process and withdraws the scaffold over time.

Jonassen (2011) identified different scaffolding approaches to PBL depending on the types of PBL problems. He argued that the PBL process depends on the problem type and that different scaffolding approaches should be used depending on the problem. Jonassen stated that there were eight problem types:

- **Story problems** – this is a problem where a scenario is presented and the learner has to apply content to solve the problem. Often the end result is known. These are common at the end of text books
- **Rule using/Rule inducing** – this is where there are a number of different ways to solve a problem, it has a known outcome. For example, creating a set of accounts.
- **Decision making** – these require learners to decide on which solution to pursue out of a number of different alternatives. For example, to increase customers whether a company should export to a different country, increase marketing activities or reduce prices. It is complex and depends on a number of factors.
- **Troubleshooting** – this highlights faults with a system or an approach and identify a solution.
- **Strategic performance** – this is a complex problem which may require a number of approaches to solve an overall problem. For example, to improve cash flow a company may need to use forecasting methods to reduce over ordering stock, collaborate with customers to improve forecasting accuracy and negotiate with suppliers regarding credit terms.
- **Policy problems** – these are largely on a national or international level and consist of many different opinions
- **Design problems** – associated with how to design a product, business or a process within a company.
- **Dilemmas** – these are problems in which there is no solution to satisfy all parties involved. A 'damned if you do and damned if you don't' scenario. There are a number of different parties involved and perspectives.

Jonassen (2011) suggests a number of scaffolding approaches depending on the type of problems used for PBL these are

- **Analogical encoding** – Identifying 'structural similarities' between problems. To do this provides the facilitator provides learner with one or more similar or dissimilar problems and asks the learner to draw comparisons between the two to form a basis for the PBL process
- **Casual reasoning** – Understanding the causes of the problem and the relationships between these components. This can be done by encouraging the learner to map diagrams of the problems they are solving.
- **Questioning** – Questions the learner to encourage them to think alternatively. This encourages learner to articulate how they did a task, what tasks are next, how they

- will be conducted and why. (Jonassen 2011)
- **Argumentation** – Requires the learner to construct arguments to justify decisions. This allows the learner to reflect on why they made decisions and enables them to support these decisions in a robust manner.
- **Modeling** – Encourages the learner to identify the components of the problem and the relationship between these assisting the identification of a solution.

In addition he suggests the following instructional schema to support scaffolding

- **Worked examples** – of how to solve the problems
- **Case studies** – of a problem that was experienced and how it was addressed
- **Prior experiences** – stories of how similar problem were solved from a library
- **Alternative perspectives** – stories of different perspectives of a problem
- **Simulations** – 'PBL is practice based and learners must practice solving problems not learning about problem solving' Simulations are environments which allow learners to manipulate components of a problem.

Figure 1: Problem types and scaffolding approaches

Problem type	Case Components	Cognitive Scaffolds
Story	Problems, Examples, Analogues	Analogical, causal, questioning, argumentation, modeling
Rule-using/induction	Examples, problems, analogues	Analogical, causal, questioning
Decision making	Problem, case studies, prior experiences, alternative perspectives	Causal, argumentation, modeling (scenario construction)
Troubleshooting	Problems, prior experiences	Causal, argumentation, modeling
Policy analysis	Case studies, problems, prior experiences, alternative perspectives	Analogical, questioning, argumentation, modeling
Design	Problems, prior experiences, alternative perspectives	Causal, argumentation, modeling
Dilemmas	Case studies, alternative perspectives	Argumentation

Jonassen (2011) specified the following scaffolding approaches for the different problem types. In addition many of these scaffolding approaches encourage the learner to reflect on their learning and decisions and why they applied them. Hmelo identified that reflection was key throughout the PBL process in order to adequately achieve the learning goals.

In order to design a PBL environment for SMEs it is important to identify the common problems that exist in order to support the learning process adequately. IO2 aims to identify this.

2.9. Challenges of PBL

Despite the reported benefits of PBL, it does not come without its limitations. Hmelo Silver (2004) highlighted that PBL might be difficult for learners who cannot grasp the concept of meta cognition and reflection and that scaffolding is key in assisting learners to overcome this issue.

Hung et al (2003) highlighted that the transitioning period from traditional education to PBL is particularly difficult for learners in the initial stages. Jost et al (1997) found that this was due to uncertainty about their roles, what was expected of them and the absence of a predefined framework (Fiddler and Knoll, 1995) . However, many studies have found that these issues ease as the learners adjust to PBL.

Hung et al (2003) suggest to ease this transition that educators should inform learners of the PBL process and provide excerpts of learners PBL experiences. Thus, Archimedes aims to develop learning material to inform learners of each stage of the PBL process and what is required of them. In addition, it will provide the learner with a library of similar PBL projects undertaken to scaffold the learner through the process this will be done in the form of case studies, solved problems and similar problems solved in alternative ways.

Barrows (2002) explored the concept of distributed PBL (dPBL) arguing that it could provide huge benefit allowing learners from different cultures contexts and backgrounds to collaborate similarly to the real world. However, he found the lack of technology a barrier to dPBL. Archimedes aims to address this gap by developing a PBL ICT platform.

As you can see from the research a significant amount of work has been conducted into PBL, the PBL process, the different categories of problems and how to scaffold them.

In a work place environment the approach to PBL will vary from the academic environment as the problem will not be predefined for the learner. It will be the responsibility of the learner to define a relevant problem in their company and identify the relevant learning material to address it. Thus the learning is highly self-directed and company driven.

The success of PBL is largely reliant on sufficient guidance from a mentor. Facilitators need to be educated on the PBL process and their role. Furthermore, for SMEs technical expertise may not always be in-house and they may need to leverage from external experts through networks and communities.

2.10. ICT for learning

Advances in information and communication technologies have dramatically altered the way educators do their jobs and the way learners are engaged in learning activities and processes. Web 2.0 technologies support a new paradigm of teaching and learning in a way that both educators and learners take a role as co-constructors of learning in these environments (Baran, 2013). The rapid growth of research on technologies such as social media tools has aroused an interest in the area of education; some examples of specific areas of research are learners' educational use, teachers' pedagogic practice, and related concern regarding trust and privacy factors (Mage, Wellens, & Hooloey, 2009).

In connection with the the internet, social media as a term, is often interchangeable with Web 2.0 and social software (Dabbagh & Kitsantas, 2012). Social media enable users to share information and collaborate with each other to create web content and utilize it. It refers to users' activities, practices, and behaviours occurring through media via sharing information, knowledge, and opinions (Safko & Brake, 2009). These technologies facilitate creativity, information sharing, and collaboration among users (Clough, 2010. Social media puts great emphasis on sharing, participating, and collaborating processes and activities (Lucas & Moreira, 2009). Social media, social networks and social communities provide a new form of collaboration and communication for users (Ebner, Lienhardt, Rohs, & Meyer, 2010).

The use of these tools both facilitate and support the development of communities and networks where incidental or self-directed learning may occur resulting in established connections and interactions of their members (Lucas & Moreira, 2009). In general, collaboration, social interaction, and participation generate main constructions of the social software tools (Lucas & Moreira, 2009). Researchers have offered many typical technologies and applications that stand for the term Web 2.0. Clough (2010, p.1) asserts that "Web 2.0 is not any single collection of applications or technologies". More specifically, social media involve social networking sites, video sharing sites, wikis, blogs, subscription services, and folksonomies (Madge et al., 2009).

Referring to SMEs they can use many free and low cost ICT tools, which could support the learning in companies at different levels, i.e. software for mind mapping to explore the requirements, ideas and steps of the practical implementation or to plan the projects.
<http://www.mindjet.com>

Moodle is a popular open source software solution for advanced learning.
<http://www.moodle.org>

Moodle is easy to install on a company server, but it is also possible to use a Moodle provider for low tax. Moodle can be extended with social media services like forums, wikis, databases and glossaries for collaborative knowledge management, quizzes to test knowledge. Moodle can also be used to develop a community of practice for a company or a professional network.

Desktop conferences are open for everyone and can save time and money, for example by using internet telephone services like Skype.

In the literature, ICT, Web 2.0 and social software are often linked to Informal Learning (Kahnwald, 2009). Social media allows participants to connect in a diverse range of places and social environments, provides support of different types of learning and can be used to promote Informal Learning processes and experiences and collective PBL.

The following table shows social media tools, which can be used in a company:

Categories	Social Media Tools
Social Networks	Facebook, Bebo, LinkedIn, Friendster, MySpace, MOLI, Plaxo, Ning, Orkut
Publish	Blogger, Constant Contact, Joomla, Knol, SlideShare, Wikia, Wikipedia, WordPress
Audio	iTunes, PodBean, Podcast.net, Rhapsody

Video	Google Video, YouTube, Metacafe, Brightcove, Hulu, Viddler
Microblogging	Twitter, Twitxr, Plurk
Live casting	BlogTalkRadio, Live 365, TalkShoe, Justin.tv, SHOUTcast
Virtual Worlds	Active Worlds, Kaneva, Second Life, There, ViOS
Gaming	EverQuest, 4x4 Evolution, Entropia Universe, World of Warcraft
Productivity Applications	Survey Monkey, Yahoo!, Google Docs, Google Gmail, AOL, Acteva, etc.
Aggregators	FriendFeed, iGoogle, My Yahoo!, Reddit, Yelp, Digg, etc.
RSS	RSS 2.0, PingShot, FeedBurner, Atom
Search	Google Search, Yahoo! Search, EveryZing, Ice Rocket, MetaTube, etc.
Mobile	airG, AOL Mobile, CallWave, Jumbuck, etc.
Interpersonal	Acrobat Connect, AOL Instant Messenger, Skype, Go To Meeting, etc.

Table 1: Categorization of Social Media ToolsSource: Mevlana International Journal of Education (MIJE), 3(4): 109, Dez. 2013.

As you can see there are a significant amount of ICT tools available for learning purposes. SMEs find it difficult to navigate through all of the information available on these tools. Also they often do not have a significant amount of ICT expertise internally and so are not likely to use ICT tools dedicated to learning they often use general ICT tools for learning purposes.

3. Research Methodology

The research conducted will aim to focus on SMEs representative of Europe, in particular micro companies based in the services, distribution, construction and financial sectors and how learning is conducted in these companies. It will examine best practices in these companies, the learning challenges they face and examine how to overcome these.

Furthermore PBL has traditionally been delivered in a subject domain. To determine how to deliver PBL in an area which is not focused on one specific discipline the project needs to determine if SMEs face similar problem. It will examine the common problems SMEs face to identify if PBL can be delivered in a subject oriented manner. In addition it will identify the barriers they face in addressing such challenges. It will determine how ICT is used in these companies and how it can be used to support a problem based learning environment. The research will provide a major input in informing how to construct a learning environment for SMEs and the main elements it should contain to ensure it is successful by leveraging off of best practices and SME requirements.

Mixed methods research approach will be used to acquire quantitative and qualitative data regarding Informal Learning in SMEs, PBL in SMEs and the use of ICT in learning in SMEs. It will use three approaches:

- **Questionnaire.** This will capture the general practices of a wide range of SMEs representative of the business sectors and sizes throughout Europe and will aim to identify:
 1. Common learning approaches in SMEs, the purposes of these learning approaches, the skills needs in these companies and how learning can address these.
 2. Common challenges SMEs face, the reasons for these challenges, how these challenges are currently addressed and the knowledge required to overcome them.
 3. ICT accessibility in SMEs, the uses of ICT and the ICT used for learning purposes. This will allow the project to determine how feasible it is to implement an ICT platform for organisational PBL. It will identify if ICT is currently used for learning purposes so that the project can leverage existing practices.
- **Focus groups**

While the survey will gather an overview of the common learning approaches in SMEs including the benefits and challenges faced. The focus group will use the results to gain an in-depth understanding of the findings of the survey regarding best practices in learning, challenges faced by SMEs, the elements of an ideal learning solution for SMEs, how ICT is used for learning purposes and the requirements of an ICT learning solution for SMEs. A focus group was chosen over interviews as the project team wanted to gain an consensus of SME opinions rather than individual opinions.
- **Case study analysis**

This will aim to gain an in-depth observation of how Informal Learning is conducted in practice in SMEs. It will observe an employee within an organisation and the

learning path undertaken. A case study was chosen to allow us to examine if the findings of the survey and focus groups were applied in the real world and how they were applied. The case study will also examine typical problems faced by the employee and the measures undertaken to address the problem including the barriers they faced.

- **Project analysis**

This will aim to gain understanding of what research has been conducted to date regarding how ICT is used in SMEs for learning, the research conducted in the area of PBL and how ICT has been used to date to implement PBL.

By using multiple sources of data it will increase the reliability of the findings. In addition, a number of measures were taken to ensure data reliability and validity:

Questionnaire –The questions were based on similar studies and findings in the literature. Furthermore, every attempt was made to ensure the survey questions aligned with the research questions identified in the research methodology. In addition a pilot was conducted with 6 SMEs prior to the dissemination of the survey.

Focus groups - A preliminary analysis of the questionnaire was conducted prior to the focus groups. This allowed the researcher to gain an understanding of the common learning approaches and challenges faced by SMEs so the group could focus on these. Prior to the focus group specific themes were identified for discussion these were:

- What Informal Learning works
- What doesn't work (why/why not)
- What elements you would like your ideal learning solution to contain
- What are the common problems SMEs face
- What knowledge do you need to address these
- What issues do you have in overcoming these
- The use of ICT for learning

This allowed the researcher to gain an in-depth understanding of the benefits and challenges of Informal Learning in SMEs and the common challenges and how to design a learning solution to overcome these. Reliability was established by ensuring the facilitator did not influence the discussion in any way, they were responsible for ensuring that each participant gave their opinion on the different discussion items. The observer recorded notes of the focus group only asking for confirmation of particular points made by the participants.

Case studies – Sources of evidence were analysed under themes associated with the work package research question. In addition, information was gathered from multiple sources of evidence including training documentation, company documentation and interviews.

4. Findings

4.1 Surveys

4.1.1. Introduction

A survey was conducted to identify the common approaches to training in SMEs, how Informal Learning is used, what are the benefits of these approaches, identify common challenges SMEs face, the reasons for these challenges, how these challenges are currently addressed, the knowledge required to overcome them and how ICT is used to support these. An electronic survey was disseminated to over 3,000 SMEs via email. The survey was administered using survey monkey others followed up with a telephone call directly to achieve a response rate of 10%. SMEs representative of the industrial profile of Europe were targeted those in the manufacturing construction, retail sectors. 380 responses were received representing a sample of 9.65%. Of these responses 330 were usable representing a sample of 10%..

Questions structured around the literature were constructed and organised according to the research questions. (see appendix 1)

The responses were mainly from companies in the Manufacturing(13%), Construction (11%), Business Support and Logistics (10%), Healthcare (8%), Retail (8%) Financial Services (6%) and Transport (5%) sectors. Over half of the respondents were from companies with less than ten employees.

4.1.2 Approaches to Informal Learning

The literature highlighted that the main approaches to learning in companies were mentoring, coaching, internal/external courses, on the job training and job aids . Kotey conducted empirical research in this area and found that on the job training was by far the most prevalent. In line with Kotey's (2007) findings on the job was by far the most common form of training in European SMEs with 84% of respondents using it regularly. Job aids are the second most popular form of training (50%).

The most important skills to SMEs are problem solving (73%), technical (68%), teamwork (66%) and communication (64%); similar to those reported by the PUII project in 2007. The majority of companies felt current methods of training allowed the organisation achieve these skills.

Areas where the companies learning approaches did not develop skills were in innovation, change management and critical thinking.

Where companies found it difficult to develop these skills internally, 77% of companies used external training courses

4.1.3 Uses of Informal Learning

Little empirical research has been conducted in the uses of informal training. Much

research has proved the benefit of formal training in increasing firm productivity and competitiveness. In our survey, the most common uses of Informal Learning for inducting new employees and developing new skills in employees was OTJ training and mentoring. To retrain staff OTJ is the most favoured approach and to improve productivity mentoring is most commonly used.

When new skills are required by staff these are generally acquired by working alongside a colleague (63%), approaching management (56%) or on the job (49%).

80% of companies align training to their strategy. Only half of companies measure their training. In those that do, the majority use performance development reviews. The main reason cited for not measuring training was lack of time (57%). A quarter of SMEs were unsure how to measure their training.

4.1.4. Advantages of Informal Learning and use of IT tools

Companies cite that the main advantages of Informal Learning are that it exploits internal skills (53%), it is cost effective (46%) and tailored to the companies needs (33%). This is similar to the findings in previous projects such as readisme and studies conducted by Dale and Bell and Clough.

48% of companies are satisfied with their learning approaches. However, 16% felt that their learning approaches were not successful at problem solving or developing managerial skills.

4.1.5 Problems with implementing Informal Learning.

There has been no empirical research conducted in the problems SMEs face in terms of Informal Learning. Most research has been conducted in the area of formal learning approaches.

In the survey the main reasons why they felt that they were not successful were that it was not obvious that the employee had acquired the skills (23%), learning was unstructured (24%) and lack of staff to implement the training (20%). Within the focus groups it emerged that immediately after training there was significant enthusiasm however this lead to drop off after a period of time.

Companies felt that these problems could be alleviated by aligning the learning to company challenges (48%), developing a learning culture (33%) and aligning the learning to company strategy (34%).

Culture was also an issue that was discussed at length in the focus groups.

4.1.6. Main problems that arise in companies

The first section of the questionnaire was aimed at identifying the common problems faced by SMEs in order to categorise them into the schema identified by Jonassen. The main problems that arise in companies are in the following areas:

Sales and marketing 89%
Management 80%
HR 78%
Finance 75%

Exports, product development, production and regulation were not seen as problematic areas for companies. This was similar to the findings made by Huang in 1999.

Sales and marketing was the aspect where companies faced the most challenges. On examination, the types of problems faced in this area were increased competition and promotion of the companies products.

Within finance the main areas that were problematic were controlling profits/margins /expenses and cash flow.

In general management time was one of the major challenges faced by companies followed by managerial resources and controlling growth
Within HR employee development and skills development were key issues

37% of companies used strategic reviews to identify challenges followed by performance indicators (31%).

4.1.7. Why these problems occur and how they are overcome

Companies (51%) felt that the problems occur due to external reasons. This reinforces Carters (1990) findings in which he stated that SMEs are vulnerable to environmental changes. 73% of companies felt that these problems could have been prevented. Of those respondents, 41% felt that they could have been avoided by structured problem solving and 46% through new skills. (See figure 5)

Of those that felt that the problems could not be prevented ,55% said that they were problems that just had to be dealt with and 41% felt that they had no control over these problems.

In terms of addressing problems 36% of companies used trial and error, 34% leveraged past experience and 35% spoke to other companies. (See figure 6)

80% of companies had instances where they found it difficult to solve a problem. Of these 58% found a work around, 28% asked a colleague in another company and 30% searched the internet.

This illustrates that companies feel many of these problems are due to circumstances beyond their control (in line with Carter's, 1990 findings) and if they had structured approaches to problem solving that these could be overcome. It also shows that companies are prepared to seek advice from external sources in order to address problems. Thus it would appear that PBL is a suitable approach to allow companies to use their challenges to allow employees to learn, external expertise can be sought from a SME PBL network which the Archimedes project proposes to establish.

4.1.8. ICT in SMEs

The majority of companies have greater than 6 PCs in their company (96.6%). With most employees having internet access on a daily basis (97%.) This coincides with the OECD findings. Mobile devices were used in some SMEs but were prohibited in others due to regulatory issues depending on the sector in which the SME operates

4.1.9. Use of ICT in SMEs

Internet is the most widely used form of ICT (91%) followed by word-processing (89%) and email (82%). Please see Figure 2

What kinds of ICT do you use for your daily work?		
Answer Options	Response Percent	Response Count
Word processing\Ms Office	88.3%	317
Databases	58.2%	209
ERP systems	23.4%	84
Intranet	35.9%	129
Internet	91.4%	328
Accounting packages	63.0%	226
CAD\CAM	17.8%	64
Customer Relationship Management	24.0%	86
Email	82.3%	191

Figure 2: ICT applications used in SMEs

Over 85% of SMEs would like to implement some new technology such as Customer relationship management or a new web site. The challenges preventing them from doing so are cost (36%), time (26%) and lack of skills (22%).

5.5. How ICT is used for Learning

The internet is the most widely used technology for learning (87%), followed by videos (40%) and open educational resources(35%). These are similar to the study conducted by the Future Lab project. Please see Figure 3. The focus groups confirmed this with many SMEs stating that they use video for learning. You Tube in particular was used a lot by most participants and they would be open to using ICT as a training tool and video learning material. In some focus groups it was felt that video and social media were widely used on a personal basis and learners could be encouraged to use these on a professional basis

It was felt that mobile access to tools and learning material would be useful.

Answer Options	Response Percent	Response Count
Internet search	86.6%	303
Online Books	34.9%	122
Video	40.6%	142
Mobile applications	28.9%	101
Social media	38.3%	134
Open educational resources/Free resources	35.7%	125
Cloud computing	20.0%	70
Content management systems	22.0%	77
Discussion forums	31.7%	111
Wikis	20.0%	70
Blogs	20.0%	70
Acrobat Connect, AOL Instant Messenger, Skype, Go To Meeting, etc.	30.3%	106
RSS 2.0, PingShot, FeedBurner, Atom	5.7%	20
Live casting - BlogTalkRadio, Live 365, TalkShoe, Justin.tv, SHOUTcast	7.7%	27

Figure 3: ICT applications used for learning in SMEs

4.2. Focus Group

4.2.1. Introduction

Focus groups were conducted in each of the participating countries one month following dissemination of the survey to gain an in-depth understanding of the Informal Learning that takes place within companies and the challenges associated with these. Time constraints were a major issue preventing SMEs from participating.

Five focus groups were held with 66 participants. Time constraints were a major issue preventing SMEs from participating.

The industry sectors of the companies were

- Distribution
- Construction
- Service based
- Financial services

Manufacturing
Technology
Transportation
Automotive
Food and beverage
Textile

In Ireland, twelve SMEs were contacted and, of those, 6 agreed to participate. This resulted in a 50% response rate. Two additional SMEs which could not participate in the focus group sessions were interviewed at a later date using the same format.

The industry sectors of the companies were

- Distribution
- Construction
- Service Based
- Financial Services
- Manufacturing
- Textile
- Craft
- ICT

The focus group was homogeneous as all participants were owner managers or managers within a small company.

The focus group was facilitated around a number of themes with each participant engaging in discussion about the Informal Learning approaches in their company, what works and what doesn't work and what elements they would like their ideal learning solution to contain.

The focus group was transcribed by a researcher while a facilitator encouraged discussion and contribution from the members. This is available in Appendix 2.

4.2.2. Approaches of Informal Learning

Informal Learning is used in all companies. On the job is the most widely used and companies find it is useful to receive immediate training in a cost effective manner. Informal Learning is seen as a quick method of learning and the personalised and tailoring benefits of Informal Learning were discussed widely in various focus groups.

Mentoring is valued as a way of transmitting contextualised, on-demand technical knowledge but also the culture of the organisation and information of "how we do things around here".

Informal Learning is largely spontaneous. A wide variety of approaches are used. All participants realise the benefits of Informal Learning and feel that it is a successful approach in their organisations.

In one focus group, companies spoke about the fact that there were two sides of their business. Firstly a technical side, which contained very structured training through internal

trainers, standardised procedures or regulatory training. For example, for the financial sector insurance brokers have to sit a technical exam to practice; training here is done by reading books and passing an exam. However the transfer of this into a work based context can be difficult. The second side is the management and administration side. Three companies in the focus group are trying to structure this and are unaware of how to approach this and others have just completed structuring in this. Companies shared their practices in this area. Those that have placed a structure on this area actively encourage individuals to undertake training, particularly external training. After the training course the individual is required to present what they have learned to others in the company.

The main problem here is getting longer serving members of staff to participate in training as they are often resistant to change. Motivation to participate in training is a key issue.

In terms of ICT the internet and videos were seen as the main technological methods use to support Informal Learning.

4.2.3. What works well?

Most companies use internal training. Internal trainers are managers and are used to induct new employees or retrain individuals into a new job role. Companies stated that consistency in internal training is difficult to maintain. Having a champion for training is key. Most companies felt that all forms of Informal Learning work well in different circumstances. However when participants were asked to discuss the problems with Informal Learning several generic issues were identified.

4.2.4 Problems with implementing Informal Learning

There was a long discussion about the problems SMEs face in terms of Informal Learning. The group consensus was that the main issues were:

- Validating training resources such as video and online content and how to ensure they are of a high quality. This was identified as an issue in three focus group sessions.
- “Drop off”, when an individual undertakes learning there is a lot of enthusiasm at the start which starts to wane as the time progresses. This was identified as an issue in two focus group sessions.
- Motivating people to participate in training. Furthermore getting people to take self initiative towards learning. In addition for longer serving members there is a resistance to training. This was identified as an issue in three focus group sessions.
- In addition, the word 'culture' was mentioned in several focus groups. They expressed concern in how to develop a culture in terms of getting employees to take initiative, developing a culture of trust and knowledge sharing that motivated employees to learn. They were interested in getting training on how to foster this culture. This was identified as an issue as three focus groups.

4.2.5 What elements would an SME ideal learning solution contain

SMEs were asked what their ideal learning solution would be. From the discussion the companies determined that an ideal learning solution in SMEs would:

- Standardise work and teach best practice
- Encourage the learner to apply what they are learning on an ongoing basis
- Reduce drift or drop off after taking training
- Have context – They felt that learning lacks context, it teaches you an ideal situation. Typically there is no training on what happens when things go wrong/deviate from the norm, thus training should also deal with non conformance
- Develop a learning culture

4.2.6. Common problems in SMEs

In each of the focus groups, the problems varied significantly for different companies. Marketing was one issue that cropped up in three focus groups.

In others the group had difficulty in determining what type of problems the project was looking at. They were looking for examples and spoke about small problems such as when their phone system went down that the employees do not have the initiative to ring the phone company.

In another group rather than specific problems the general problem of obtaining and updating relevant information and knowledge was seen as the major issue.

This emphasizes the need to educate the facilitator and the learner on the types of problems that can be used for Problem Based Learning and to provide a method of evaluating the suitability of a problem for PBL and teaching the skills to allow the learners to acquire the relevant knowledge to address a variety of problems.

A main problem discussed in three focus groups is that often staff do not think for themselves or show initiative; they approach the owner/manager on an ongoing basis looking for solutions. Often the owner manager has to repeat the same solution several times which takes up management time or the manager has to solve the problem themselves, which is a major challenge identified in the survey. SMEs need employees to take ownership. However the group were unaware if this was due to

- Personality
- Management style
- Culture
- or
- Attitude of the individual.

In one focus group the question was raised “what if the employee shows initiative and fails”. The group emphasized the need for a no blame culture. However, if an employee made a very bad decision they should be able to justify why this was made (their rationale for making this decision). Thus reflection and corrective action in PBL framework is key to illustrate why a learner made specific decisions.

4.2.7. Challenges and knowledge required to overcome these problems

In three focus groups knowledge gaps were a major issue. “How to find this knowledge and act in specific situations” was considered a challenge to solving problems. Furthermore, one focus group discussed the issues that SMEs have with clearly defining

and recognizing a problem. In the Irish focus group, SMEs specified that employees in their companies were slow to admit problems. For example, one company had a non-conformance book and no employees used it until it was explained why it was needed, to address problems not blame people. Also, unless customers specified they wished to make a complaint this issue was not resolved. The solution was that if a customer made a complaint the section/department in which the issue originated were involved in fixing or resolving the issue thus making staff aware of the problem and an approach to resolve it.

In an educational setting the tutor provides a library of resources to complete the PBL process; this is possible as the problem is dependent on the subject being taught and the tutor has extensive expertise in this area. However in an organisational setting there is a wide range of problems from different disciplines, the facilitator or manager will not have in depth expertise in all areas and so it is up to the employee to source this knowledge and use the most appropriate knowledge required.

4.2.8. ICT for learning in SMEs

It can be seen from the survey that technology accessibility is not an issue within SMEs. In the focus groups it emerged that even if employees do not have their own PC they can access one. The majority of SMEs already use technology to learn and would be open to doing so. Internet and video were the most prevalent forms of technology used. In some companies mobile devices were permitted and in others it was prohibited due to regulation. Thus a platform that can be used on multiple devices is required.

A draft of the ICT platform was shown to 66 companies in 5 focus groups. All were very enthusiastic about the platform and could see multiple uses. Several companies have registered to explore the ICT platform further and have started entering in problems on the platform

In some of the focus groups it emerged that a few companies are doing PBL but not in a structured process and it is not recorded on ICT. Managers often are approached to solve a problem and they solve it individually and give the employee a solution. The tool would shift responsibility to an employee and free up management time.

General comments about the new requirements for the tool:

- Private company area necessary
- Search facility to search for problems
- Allow the learner to update the documents in the self study area in the event that they are changed
- Ability to delete problems which were not entered correctly

They see several uses for the tool

- Knowledge management: Putting up already resolved problems
- Training systems: training manuals and documents concerning particular issues could be stored.
- As well as a learning tool

4.2.9. Summary

The subject types of problems are not seen as important within companies. Motivating employees to take responsibility for challenges within companies is often seen as a problem in itself. Knowledge gaps and the acquisition of knowledge is seen as a key issue in addressing company problems. It is more important to instill a culture of employees being self directed and undertaking responsibility for addressing problems themselves.

4.3 Case studies

Five case studies were conducted in five European countries about the Informal Learning pathways within a company. The case study looked at an individual employee within the selected company and the training undertaken throughout their career in the organisation.

Data was gathered from semi structured interviews with the employee and training documentation and was analysed under the following themes:

- Background to the company
- Profile of the research participants
- The learning path of the individual in the company
- The learning problems that individual faced
- How these learning problems could be addressed
- The future learning requirements of the individual.

4.3.1 Case study of an employee in a Portuguese company

Introduction

This case study aims to report the experience of an employee of a textile company, with regard to their professional development in the company, based on the widespread use of Informal Learning.

To this end, issues were identified that should be explored so that the employee's testimony was as complete as possible:

- What Informal Learning methods are used?
- How are they used?
- What are the problems with these approaches?
- Common problems faced
- How these problems are addressed

The choice of AIP, CCI, for the preparation of this case study was because the company responded to the survey on Questionnaire on Informal Learning in SMEs and also participated in the Focus Group.

In the discussion forum, the participant gave an example of an employee's development, based on different forms of Informal Learning, which were acquired in a self-taught way and on their own initiative.

AIP visited the company on May 15, 2015, in order to meet in person, the employee whose testimony is the basis for this case study.

Company Background and History

No of Employees: 234

Activity Sector: Textile

Markets: Germany, Austria, France, England, Spain, Russia, Poland, Mexico, South Africa, Angola, Japan, USA and China.

“Quality, availability to the client and service are some of key features present in the DNA of our company, which helped us to achieve over four decades the prominent position in the international market.

We have come a long way since our foundation on August 24, 1972. The dynamism and the will to overcome challenges, along with a planned idea and attention to detail, has brought us to being a company with nearly 250 employees.

We chose to be different in the supply of our products and the way we function, focusing on quality and diversity of products, as our customers and agents demand. We decided to be original in design, in colours, raw -materials, service and also the in the price. We invest in a youthful style, maintaining the tradition of a traditional production, which may satisfy the taste of a young 20 year old as well as a young gentleman of 60 years.

We build a fashion culture, supported by the production of our quality products in a consistent manner. We bring together skills, people, processes and organization that we believe to be suitable, such as our history has shown.

Over the years, our challenge is to maintain the excellence of execution through time; it is the secret of our values that make our manufacturing exemplary.”

Employee Profile

The employee is a Senior Technician of the company. Businesses need training and this should be ongoing, but we already notice there is a chain of companies that begin, increasingly, step-by-step, to work another kind of learning that is not the more typical way of getting a certificate through very traditional and formatted training, but through other ways of acquiring knowledge.

In the case of this company, its experienced production workers pass their knowledge to new junior workers. It is the same with commercial staff; they know the customers and they will present them to commercial juniors.

The company has forms of learning and transfer of knowledge through which employees do not have to go to a training room, watch a preformatted program and follow a rigid schedule.

In the company, this type of traditional training is actually the least important, the interviewee highlighted.

On the other hand, the company gives special attention to customer satisfaction and considers pleasure in what they are creating as a crucial motivation of all employees. The

entrepreneur believes that the creation process must always be enjoyable and achieving results. If it failed, that is, if the customer is not satisfied or does not purchase the company's products again, something must be changed in order to get back that pleasant feeling of a healthy commercial relationship with the customer. As a complement, the business stresses that quality is friendliness, cleanliness and, of course, service. It's in the voice, it's in the face, it's in service. Again, the satisfaction of employees must be obvious to clients.

As an example, it is reported that when the company is visited by foreigners, they are pleasantly surprised by the facilities. Because although they are visiting a factory, the facilities are the staff's home for 12 hours a day, so it must be clean, must be tidy, must be organized. All employees must have clean clothes and be kind to each other. The company is very demanding on these points and about everything that happens during the company visit.

Interviewee

This case study builds on the experience of Paulo Camacho, an employee that has held different functions in the company, having been recruited in 1993 to the area of design because of his higher education course in Industrial Design/Styling Industrial at the Magestil Professional School.

The Magestil is a school aimed at all young people seeking an alternative to the formal education system in health, childhood education, management, information management, communication and marketing, photography, textile and clothing industry.

This school offers an innovative approach to education and investment in vocational training and in connection with Portuguese businesses. It prepares learners for the technical and human challenges of the working world. Paulo Camacho began his duties at the company within the area for which he had obtained training.

However, over the 20 years in the company he has evolved into other areas of work, achieving a very interesting career, largely due to the expertise that has been acquired through the use of Informal Learning and based on collaboration and contact with other employees.

His first experience as mentioned earlier was in design. The stay in this area lasted 10 years, which included the design and collections, preparation of technical drawings, design of the collections and assistance in collections.

Then he switched to the commercial area, where he currently manages the image consultant function and the showroom (thus still keeping some contact with the area of the design). He also is a trainer/mentor for new employees.

His attitude, greatly pro-activity, allows him to have a very holistic view of the company and he believes that is how it should be. He also argues that it is for this reason that today young people choose to have different forms of training (bachelor, masters, MBA, ...) that will complement and prepare them for new career opportunities.

Interview

How did the opportunity for change from Design area to the commercial area happen? It was by invitation. When I was still working in Design, I knew the company's suppliers. I had already interacted with them, since the time I had the textiles buying process and, on the other hand, also had some connection with customers. Thus, the opportunity to begin a new professional stage in the commercial area arose, where he coordinates about 5 people and reports into the Commercial Director.

How important was Informal Learning in your career?

Paulo Camacho believes that when he entered the company was prepared theoretically and even technically to perform the duties for which he was hired. I knew the textiles, knew the machines and had an idea of what a textile factory was. Indeed, later training had a large technical component and not only theoretical, as with most courses, even in the same design area. However, already at this stage, the importance of Informal Learning had been noted, as much of the hands-on learning was done in the business environment through direct contact with the entrepreneur and other older employees.

On the other hand, this employee has always been very curious to learn, especially observing colleagues and asking them questions. No doubt that this kind of attitude leveraged his progress within the company.

We also questioned Paulo Camacho to find out if the company provides formal training to employees, notwithstanding the strong focus on Informal Learning, as mentioned above.

The answer was affirmative; Diniz e Cruz, also provides training sessions based on traditional training models, particularly with regard to technical training, but not on a large scale, for example they would know the textiles, how they are made, their composition, etc..

In most cases, it is the management that identifies the need for such training, but there are also situations where employees do suggest training provision. There is a great openness on the part of management to receive this feedback from employees.

Paulo Camacho said that he never felt the need to suggest doing some specific training. It is he himself that decides his self-taught way, going in search of information he needs.

On the other hand, recognizing that Informal Learning has been essential on your own career path, also promotes the idea that new employees can take advantage of this person's knowledge, allowing him to play the role of mentor to new employees, for example, of those who are doing internships in the company.

Indeed, Paulo Camacho states that people come into the company having completed courses, for example Management, but their technical knowledge is largely undeveloped. This is a problem. In other countries, this problem does not happen in the technical part the same way because companies seem to invest in the technical component, e.g. Italy and Spain.

But in Portugal the theoretical component is still prevalent. We are not saying people do not come in prepared, competent, but it's noticeable that they really need more practical experience.

Motivation is seen as important. Beyond the issue of the career development of an employee through different forms of learning, with clear predominance of the informal, this business is like an art: those who are in it have to like it, otherwise it will not have the same level of motivation.

It's different working in a company or a factory. The atmosphere is totally different. Factory is factory. Be automotive, textile or other art. The atmosphere is always very informal and based on teamwork, where everyone has the same importance, and leadership plays a major role, combined with respect for others.

What skills have been gained from Informal Learning?

Many. technical skills; commercial; logistics (eg.: inventory management); how to deal with people. It is a very responsive learning.

At the commercial level, knowing how to deal with the client is critical. Today customers have much information; they go to the web and make a number of searches and are much more easily aware and informed. Those working with customers have to be sensitive to capture what they do not say, but want. This can only be achieved with much practical experience of dealing with customers, speaking directly with them and really liking the work that is done. It is not only selling; it is to make the customer a friend.

For the company, at first, what really matters and is the priority is to sell, but what is more important is to have a future in the relationship with the customer.

Were you aware that you were acquiring these skills?

Yes, on my part I was.

If you believe that the training received was not enough to acquire skills necessary for carrying out its work, would you apply for new training programme?

Yes.

How is the issue of time for teaching new employees through the use of mentoring managed?

This is indeed a major problem. It is the availability of older employees to teach the others. At a staff reduction phase, employees are often obliged to accumulate functions, so it is not easy to have availability to teach new employees, especially in terms of stages.

Do you use technological means to teach? Do you organize the information that results from informal training? For instance on the intranet?

No. As already mentioned above, this is a very specific learning and must be done in real time. It is with hands on working with textiles that learning takes place.

Imagine that tomorrow you were leaving. Is there any way to retain your knowledge in the company?

A part yes, another part no.

But how could your knowledge be retained? What kind of instruments might you suggest?

I like to teach, I am not afraid to share my knowledge so at any time, I'm facilitating the

learning of another colleague. There is no record of this transfer of knowledge.

What skills still think you are missing?

Financial management and languages (Mandarin). To improve performance in sales and purchases.

How you think you could learn more?

Doing a Masters, even for career advancement. I love to learn and be updated. Previously we didn't notice this development. In regard to the technology evolution, in 10 years it was enormous. I go to events, I maintain contacts in the fashion world. I talk to those who work in this area.

Summary

Also the commercial director the company, who has been the mentor of Paulo Camacho, could be an interesting case study due the fact he was hired by the company when he was only 14 years for administrative functions, and thanks the ambition and willpower, at 51 years old holds the position of Commercial Director, which includes the international market, representing 90% of the company's market. His whole career was based on Informal Learning. He came to bring the newspaper to the owner of the company, at 14, and never stopped its course. In all departments where he went he learned lessons from colleagues.

His ambition was to learn more. He started visiting the providers to see the textiles first hand; he learnt languages, all very practice-based. A self-taught individual.

Several questions were posed to the employee on, (work package IO 2):

1. Problems that occur, why they occur, if they could be prevented, how they could be prevented
2. General procedure for defining a problem
3. Scenario of a typical problem in the company and how it is solved, barriers to solving the problem.
4. Scenario of a typical problem in the company that is difficult or impossible to solve and why this is so.
5. Description of the learning that occurred as a result of the problem solving process and how learning could be encouraged.

About the problems that happen in SMEs, it became clear the fact that this company being industrial, brings a number of issues that do not happen, for example, in a service company.

For example, in terms of human resources, there are some specific conditions we are facing because we are in an industrial company, that is, there is an assembly line, and for this reason, all employees have equal importance in carrying out their functions. If at the beginning, middle or end of the line one fails, the entire collective work can be placed in question.

Also hiring staff, in particular seamstresses, has been a difficulty. It is not a very attractive activity in the labor market, which requires a high degree of specialization, and for which there is not much training provision.

The question of obtaining external financing, in particular as regards the Portuguese state incentives or support, it is effectively also a concern of this company.

The economic crisis is another problem that was focused on. Though, the Diniz e Cruz, LDA has always bet on the foreign market, and so it has managed to extend its geographic deployment in order to try to mitigate as much as possible, the problematic effects of the crisis.

The survey shows up that in most cases problems occur by the very characteristics of this field of activity, or by external issues of the business. Indeed, after a guided tour within the company, in which several employees were interviewed, it was noted a strong commitment by all, and motivation for its success. This cooperation promotes the attitude that problems inside the company's are resolved swiftly and without significant consequences. So when a problem arises at this level it is quickly identified, either by the head or by another employee that communicates to the respective manager, and the solution is presented.

Thus, since the problems more difficult to solve and have to do with external factors to the company, its resolution is also more complex. For example, identified the problem of the crisis, the answer was to extend the export to new markets. Studying new markets, examining ways of implementation and making proposals was the priority.

There are problems that really cannot be avoided, but its thoughtful analysis creates a favorable environment for them to be overcome.

Sometimes the Diniz e Cruz, LDA is visited by customers who want to place an order, or simply know their products. Domestic and foreign customers. This first impression of a customer of the company is very important. So Paulo Camacho created a showroom space, demonstrating what is produced at the factory and that changes depending on the season. This need was confirmed by Paulo himself, because he is commercially focused and is in contact with customers, but also by their own leadership.

It is a space that is constantly evolving and currently represents a great business card for those who want the Cruz e Diniz LDA products.

The profile of Paulo Camacho and also his long-standing experience in the company allows him to have some autonomy in solving problems. Indeed, the closeness he has with other employees, the knowledge acquired by having gone through two major areas of activity (design and commercial) and the empathy created with the top management, means he has some autonomy to suggest improvements in the company or in the respective processes.

So what really makes a difference in a company is to have people motivated and like what they do. The problems can always be solved, sometimes by searching the web, reading specialized articles, asking for support from management or a colleague, but the solution ends up being found.

And of course in this learning process there is always skills acquired which will necessarily contribute to the resolution of other future problems.

4.3.2 Case study of an employee in a German company

The company itself was founded in 2000 and has been steadily growing ever since. Its headquarters is located in Austria. The German subsidiary can be found near Hannover. Further subsidiaries can be found in Austria, and also in Prague (Czech Republic), Warsaw (Poland) and Moscow (Russia).

The company is one of the leading providers of products and solutions in E-learning and the implementation of social software to support and facilitate Informal Learning. It is a cooperation partner of the IAT. Both are members of the WisNet, a network of SMEs and education institutions.

IAT interviewed the marketing coordinator and an individual with responsibility for IT in the company.

In the context of Archimedes, the company is interesting for two reasons: first, the company itself deals with different forms of IT supported learning including Informal Learning offering courses to its own staff and therefore has hands-on expertise regarding difficulties and advantages of the use of such tools. Second, the company is a provider of e-Learning services and tools has been able to gather lots of experiences with regard to other companies' successes and failures in the area, their challenges and solutions and can therefore provide information on a number of companies from the expert's point of view without having to ask each of them individually.

These advantages led to the selection of the company as our research object for the following portrait.

According to the head of marketing at the company, the motivation of employees to improve their skills is mostly a professional one, since a company, with as few as 55 employees in all subsidiaries, cannot offer raises or promotions in the same way a bigger company could. However, the atmosphere and working conditions attract young employees who are eager to learn and improve their skills with regard to their respective working field, leaving team motivation at a very high level. Also, the careful recruitment process ensures that this motivated environment remains stable. The programmers have to be "multi-talented" in order to create e-Learning environments that are customer-tailored, whatever the field of the particular customer may be. The infrastructure within the company is very high, since their own equipment frequently serves as advertisement for their services and needs to be up-to-date in order to offer the latest state of the art when it comes to their products and services.

Due to the small number of employees, there is very little time for the individual to self-educate through formal learning measures since time used on it is "time lost" for fellow employees and other processes cannot easily be handled by other employees. From the company experience, SMEs are also harder to reach when it comes to offering e-Learning – partly because of their mere number, but also because of the lack of personnel dealing with e-Learning or even HR. Other problems mentioned were technical barriers, organizational ones and cultural reasons for rejecting e Learning.

With regard to reaching SMEs, the company has started to co-operate with intermediary institutions. All the above reasons contribute to the rather small amount of SME customers. The company focuses rather on bigger companies since their chances of

engagement and profits are much higher. This might show that it is not only the SMEs themselves that need change and guidance, but also the providers in order to make supply and demand meet. Often, intermediary institutions like the ones mentioned above contact e-Learning providers and then offer their products to the institution's clients.

4.3.3 Case study of an employee in a Romanian company

No of Employees: 6

Activity Sector: Business support, research and innovation

Function: Employee

Number of years in the company: 2

Previous job roles: Engineer, employee

Number of years in current job role: 1

The company is a micro private company that is in the field of business support services, research and innovation. The company started the activity within the business incubator – IPA CIFATT SA.

The company deals with business support consultancy in the areas of market research, business plan development and the company innovation.

Currently, the company is coordinator in a research project on automotive maintenance, involving partners such as the University of Craiova, Automation Research Institute(IPA), County School Authority and Romanian Association for Technological Transfer . The project is funded by the Ministry of European Funds.

When the company began the activity, some external training needed to be followed. 2 employees were trained in developing business plans, entrepreneurship, project management, cost-benefit analysis, market research and innovation. After the training, the employees transmitted the knowledge to the other employees and in this way they make a team with precisely defined tasks.

In order to find out details about Informal Learning developed in the company, an interview was organized with an employee that entered in the company 2 years ago.

How important was Informal Learning in your career?

The Informal Learning is very important because it is tailored to her consultancy activity. She said the information gained from more experienced colleagues and from electronic materials and guides cannot be learned during the external training. Also, she learned how the customers and projects partners can be approached.

Are you interested to learn more about Informal Learning and Problem Based Learning?

The response was positive, she is very interested to learn more for personal development.

Are you interested to involve in ARCHIMEDES project?

The answer was positive, she is very interested to deepen the Problem Based Learning

Mrs. Mihaela Simion have worked in projects funded by National Ministries, in the past, so, when she entered in URANUS team she knew about projects implementation and application submitting. However, she needed more information and knowledge about other kind of projects, namely European projects funded by European Commission and European Fund Ministry . All European projects funded by Structural Funds need a Cost – Benefit Analysis , Market research, calculation of business profitability indicators, etc. Also, Mrs. Mihaela Simion needed to improve her English language in order to work easily in European projects.

Case

The company implements national research projects and there is a very bad communication between company and Project Management Authorities. Also, there is a high bureaucracy from reports point of view. All the reports must be submitted on paper and electronic support.

This kind of problem cannot be prevented, for the present. Maybe, in the future, beneficiaries of projects send common petition to Ministries for reducing the bureaucracy.

On the other hand, the experts of the company implement partnership projects that necessitate communication with a lot of partners. Sometimes delays happen because the partners do not submit their documents in time and do not follow the reporting directions. This issue can be solved organising frequently meeting with partners and explain the necessity of a good reporting because all mistakes could mean budget reducing.

The company studied implements many projects in the same time. The employees consider it is very difficult to manage the time so that all the reports be ready for submitting in time. They do not know to prioritise the activities so that all the requests be covered.

This issue can be solved using Informal Learning referring to time management.

An employee has to perform a cost-benefit analysis for a infrastructure European project.

Up to now, the employee performed a simple financial analysis for research projects. So, the employee gain knowledge from the other employees that carried–out these types of analysis and search similar documents posted as case studies on the specialized sites. The employee downloads a lot of documents necessary to achieve the financial analysis, for example, a good site for learning is www.levier.ro (levier means leverage).

Scenario of a typical problem in the company that is difficult or impossible to solve and why this is so.

A difficult problem to solve is the communication with Management Authorities that change the implementation rules during the implementation period.

This problem is impossible to solve because the company suggestions are not taken into consideration.

Description of the learning that occurred as a result of the problem solving process and how learning could be encouraged

Mrs. Mihaela Simion is satisfied related to Informal Learning because all information are completed and ready to apply. However, there is a problem concerning the employee that should give information to a fellow employee, because the time of the first employee cannot be paid and their basic activity can be affected.

On the other hand, the employees attended external training on cost-benefit analysis but they did not get complete information and “all secrets” which can be applied in order to achieve a complete and correct analysis.

Conclusions and recommendations

The conclusion is URANUS is interested in deepening Informal Learning because this kind of learning can save time and money and the results are directly applied in the work process.

4.3.4 Case study of an employee in a Lithuanian company

What year the employee started working in the company - the year 2010

How long the employee is with the company - 5 years

The role the employee started in within the organisation - Social worker

The number of years in that role - 2 years

Current role within the company - Director, trainer

Number of years in that role - 3 years as director and 4 years as a trainer

Why did you move job roles? - My basic position and competencies I have, and the situation in the organization, made it possible for me to start to work in these positions.

Who made the decision for you to move job roles? - Employer

Informal Learning on starting in the company

Explain when you joined the company what kind of informal and formal training you received.

Train the trainer	Vsi Zmogiskuju istekliu stebesenos ir pletros biuras	7-9/12/2010
„Group leaders supervision“	Closed joint - stock company „Economic Consulting and Research“	13,20,28/04/2010 4,11/04/2010 03/06/2010

Describe each of these forms of training and how it was implemented and used?

Formal training was approved by Ministry of Social Security and Labour and provides more theoretical knowledge. Informal training was held by the organization’s trainers. They provided innovative and practical techniques for the conducting training. Training was organized by official announcement on the internet. The gained information was used for preparation and provision of training.

What skills did this training develop

The training developed communication skills, team management skills, soft skills (time management, planning, flexibility etc.) and professional skills in the social area.

Were you aware at the time that you acquired these skills?

I have the basic skills and training to help to develop skills of communication within an auditorium and to extend professional knowledge.

Are there any cases when you felt you required new skills to do this role?

Yes.

What kinds of skills were these?

Communication in an auditorium, public speaking, management of critical situations.

Describe how you developed those skills?

During formal and informal training, studying theory and performing practically.

Do you feel these methods developed those skills adequately?

Yes

Why\Why not?

Because my skills were developed and I gained more professional knowledge.

How do you feel this training you received could be improved within the company?

Informal training was provided by company staff.

What problems do you feel there are with the current forms of training in your company and how could these be addressed?

I am satisfied with the training forms in the company

Informal Learning moving job role\being promoted\progressing

When you progressed in the organisation what kind of informal and formal training did you receive?

Practical Implementation of Gender Equality in the Field of Employment	Socialinių inovacijų fondas	2014/2015
Development of the emotional resistance of social workers	VšĮ EDUKACINIAI PROJEKTAI	24-25/09/2014
Psychological aspects of the work with young disabled people and conflicts' prevention	VšĮ EDUKACINIAI PROJEKTAI	22-23/09/2014
"Work with children who have been victims of violence and violent parents"	Vytautas Magnus University	14/06/2014
Contract law and legal-administrative language	VšĮ „Taikomosios politikos institutas“	07/05/2014
Training "Business and Development Plans' Preparation"	VšĮ „Taikomosios politikos institutas“	25/02/2014
Training "Methods of the Theatre of the Oppressed in the NGO Employees' Activity"	VšĮ „Menų ir mokymo namai“	24-23/01/2014
"Public communication, effective discussion and creativity"	VšĮ „Taikomosios politikos institutas“	21/01/2014
SET4 Work "Training for Trainers and the Inclusion of the Target Group into Learning and Work"	NGO Social Innovations Centre	21, 31/08/2013

“Practical Aspects of Public Procurement Procedure”	Association of Administrative Staff	19/03/2013
“Work with Youth“	The Department of Youth Affairs under under the Ministry of Social Security and Labour	16-18/03/2012
Changes of the Law of Public Procurement Procedure and Related Legal Acts with A. Vaznelis (simplified procedure, electronic public procurement procedure)	Association of Administrative Staff	23/02/2012

Describe each of these forms of training and how it was implemented and used?
 These were formal and informal training on the office management, staff management, social work issues. The training provided theoretical and practical knowledge. The knowledge was used in the everyday management of the company and preparing and providing training programmes for social workers.

What skills did this training develop?
 The training developed the professional skills and improved professional knowledge.

Were you aware at the time that you acquired these skills?
 Yes

Are there any cases when you felt you required new skills to do this role?
 Yes

What kinds of skills were these?
 Management skills

Describe how you developed those skills?
 In various training ways, managing the office work, conducting training for the social workers.

Do you feel these methods developed those skills adequately? Why\Why not?
 Yes, skills were developed adequately, because the company works well and social workers are satisfied with the training received.

How do you feel the training you received to date could be improved within the company?
 I am satisfied with the training in which I participated.

What problems do you feel there are with the current forms of training in your company and how could these be addressed?
 We have no problems with the training in company.

What skills do you feel you require to do your job in the future
 Team building, management of team, management of time, management of conflicts.

How could training be designed to ensure that you develop these skills

The training could use more practical methods and case studies.

What are the common problems you face in your organisation?

The main common problem in the organization is that sometimes there is a misunderstanding between workers: when one member of staff gives information and another takes it up slightly differently to what was intended.

How do you define these problems?

These problems was seen when the final result is different from the initial request.

Do you look at a number of solutions for addressing the problems

Yes

If yes how do you formulate these solutions? How do you evaluate the potential effectiveness of these solutions?

Give tasks to the staff in written form. If the information is presented in oral, ask questions to clarify if the information is properly understood.

To discuss the task implementation during work process several times to ensure that all is going the right way.

The solutions were effective and now the cases of misunderstanding are very rare.

Describe why you feel these problems occur

Because staff has a freedom to act independently.

Could these problems be prevented?

Yes

If yes describe how?

Control from the manager is necessary.

If no describe why not?

-

You mentioned the problem of (a problem outlined in the first point). Explain the process of how you addressed this problem.

Firstly I talked to the employee directly trying to clarify the situation. Then we started to discuss all questions during the staff meeting once a week, on Mondays. During this meeting all staff members present their implemented and planned for the week works, discussed what means are necessary to complete the work. And all tasks are distributed to staff by intranet.

How long did it take to address this problem

About 1 month

Explain if the problem was completely solved. Why? Why not?

Problem is completely solved. Better communication, both orally and written, helps to better manage the work.

How do you feel you could have been supported or assisted in solving the problem more adequately in a shorter time?

-

Describe a problem within your organisation that was difficult or impossible to solve. Why do you feel it was difficult to solve the problem?

We have no problems which we cannot solve.

Do you feel you learn anything in the process of solving company problems? Why\Why not

Yes, because each situation requires some knowledge and teaches new things.

What did you learn?

I learn that each person is different and perceptual process depends on the each person

individual characteristic.

What could you learn?

-

What could be done to help you learn more?

To attend training for team management and communication.

Problems that occur, why they occur, if they could be prevented, how they could be prevented?

Recruitment of staff.

The organization is looking for a psychologist to work with clients from a social risk group. They chose the person who met all the qualification requirements of the company. But when he started to work it became obvious that person does not meet the expectations of the company: the attitude to the work was completely different from the organization expectations, he overstepped the professional boundaries in the communication with the clients and did not respect the policy of organization.

This problem occurs because the official presentation of the person and real work in the office is completely different.

In this situation the problem could be prevented if the candidate could do voluntary work for 1 or 2 months in the organization. This way there is a possibility to understand if the person, who applies to the job position fits the organization's policy.

General procedure for defining a problem?

We have no special procedure to define problems.

Scenario of a typical problem in the company and how it is solved, barriers to solving the problem.

Misunderstanding between manager and staff members delivering work tasks.

When the manager gives the task or information to the worker of company orally, sometimes happens that worker understands the information incorrectly and the final result of the work is not as expected by manager.

The solution in this situation is to present the tasks and information in written form, to check periodically the process of task implementation by manager, communicate more with the staff members in weekly meetings.

The barriers for solving this problem could be the lack of the time for regular communication, bad relationship between manager and employee.

Scenario of a typical problem in the company that is difficult or impossible to solve and why this is so.

We do not face the problems which could not be solved.

Description of the learning that occurred as a result of the problem solving process and how learning could be encouraged.

We have no such learning.

4.3.5 Case study of an employee in an Irish company

Introduction

The Irish case study is of a building services company. The aim of the case study is to identify how an employee identifies and solves problems within an SME, the learning that takes place and the barriers they face. The company completed the survey and participated in the focus group. ISME is very familiar with this company as they have done a significant amount of training with ISME over the last few years and have participated in a number of management development programmes as part of this. The person selected for the case study is a building services engineer and joined the company in 2012.

Company Background

The company was established in 1968 and provides building services including mechanical services installation, maintenance, inspection and repair services within industrial and commercial establishments nationwide. They are leaders in their field with a wealth of experience and expertise and a highly skilled and motivated workforce. They have worked on a number of high profile projects, e.g. faithful restoration of the Palm House Botanic Gardens, Farmleigh, TV3 Television Network, Google Block E, etc. The current MD is the son of one of the original founders.

Their Mission Statement is "EXCELLENCE IN EVERYTHING WE DO" and their prime objective is complete customer satisfaction and growth through repeat business, with many clients with them since 1968.

They are specialist engineers and contractors in the following:

- Clean Rooms
- Combined Heat and Power
- Industrial and Process Plant Piping
- Compressed Air Installations
- Fuel Transfer and Storage Installations
- Medical Gases
 - Vacuum Systems
- Purified Water Systems
 - W.F.I. Systems
- Steam Boiler and Plant Installation
- Air Conditioning Installations
- Ventilation Installations
- Electrical Installations
- Building Management Systems
- Low Pressure Hot Water Heating Systems
- Medium Pressure Installations
- Water Service Installations
- Fire-Fighting and External Mains

The principles upon which the company's operating procedures are based include the following:

- The development of a sense of commercial awareness throughout the organisation.
- The promotion of a genuine quality health, safety and environmentally aware culture.
- The development of a collaborative and enjoyable work environment for all employees.
- To foster excellent relationships with customers, suppliers and sub-contractors and further develop out reputation as a great company to do business with.
- Do every job right, do right by others and enjoy it.

The management of the company is committed to the creation of a continuous improvement culture via the development of an overall business strategy based on the

present and future needs and expectations of the organisation. They have consistently achieved this objective via the following:

- Building a customer focused organisation with a reputation for completing projects on time, within budget and to their clients' satisfaction.
- Employing people with a positive, can do, flexible attitude and developing such individuals into a collaborative and competent team through formal, non-formal and Informal Learning.
- Committing to what they do and approaching each project with a professionalism that will allow them to guarantee client satisfaction.
- Regarding health and safety as a priority in the overall planning of a project and aggressively pursuing this policy with continuous investment in their accredited safety system.
- Continuously improving through commitment to their accredited quality assured systems of working.

Employee Profile

The employee is a Building Services Engineer (H.Dip). He spent almost 20 years in a consultant engineering company which provided services in a number of areas: industrial, retail, prisons, hospitals etc.. He started as a Junior Engineer and progressed to Associate Engineer. There was then the demolition of the construction industry in Ireland and the company downsized, leaving the employee without work.

In 2012, the employee started work with the company. The company had gone through a similar reduction in staff, going from a staff of over 100 and subcontractors of a similar number to a full time staff of 6 in 2009. While the company he previously worked with was on the design side, this company is on the implementation side. The company would have been one of ten companies regularly used by the employee's previous employer for the delivery of their designs. This meant that the employee was familiar with culture and most of the staff by the time he started with the company.

Interview

Informal Learning

With such few staff in 2012, it meant that the employee was doing a bit of everything. He was familiar with the business from the design end but not so familiar with what happened on site. "The 1st year was a learning curve. It still is." He learnt by doing and looking to the MD for feedback when he wasn't sure of what to do. "While I'm more focused on the technical end, the MD has one eye on the wallet in his back pocket at all times. He is more business focused. I see it more now but I'd still be more focused on the technical end." So gradually now others have been taken on to do "properly" much of what the employee had been doing. He is now Senior Contracts Manager ("and general doer of all"). And he has had to upskill the new comers to their roles. This would be done in a similar way to his own experience. They would learn by doing and bouncing plans off him; checking in to see if they were doing things right and getting feedback from him.

The company invests heavily in formal training too and since he has joined The company the employee has completed Health and Safety courses (PSCS 2015 March), Energy Management courses(2012. Certified Energy Manager) and ISME's Advance Business Programme (a Management Development Programme.) Informally he has learned how to estimate, use the company IT systems, including the accounting package, Exchequer. The skills that this training developed were as follows:

PSCS – allows him to prepare safety documentation for construction. From the Energy

Management Course he can assess current energy usage of installations and identify possible savings to be made. The Advance Business Programme is broad and covers areas such as strategic planning and implantation, finance, employment law, marketing, operations management and people management. The skills developed were not individually identified. But it was felt that he used what was relevant to the company and his role on an ongoing basis. Informally he has learned estimating skills, more of Excel functions and the in house IT systems.

In both the formal and informal situation the employee felt he was aware of acquiring the skills as he was learning. He also doesn't think that he requires new skills to do the role as what he has already learned is currently adequate but that if the requirement arose the new skills would be learned as needed, either informally or formally. This is because there is a regular gap analysis done for all staff regarding their training needs. He believes that the methods used developed the skills adequately as he is using them all the time. How do you feel this training you received could be improved within the company? "No need. There is a good effort put into it across the board. There is a good focus on training and as long as it is maintained should be no issue. "

The employee didn't believe there were any problems with the current forms of training in the as they keep track of everyone's training (gap analysis carried out regularly).

When asked about what skills he felt he would require to do his job in the future, the answer was to just maintain awareness of technology changes and keep up to date. This could be done by both research for yourself and through courses and presentations. He is a member of IEI (Institute of Engineers of Ireland) and they have CPD modules. "Some of this is on line stuff. And once done the learning is shared in the office".

When discussing how could training be designed to ensure that you develop the skills needed, the employee stated that their quality systems identified the needs and then talked about the informal which goes on and why it works. He said that they are all supporting each other – it's an open plan office and when there is a need there is usually someone there who can help. "Mentoring goes on".

As regards the formal training he said that using it on the job is how you ensure you develop the skills needed. Basically it's a use it or lose it situation.

Problem Solving

An example of early problem solving for the employee was in Health & Safety where he had no experience. He had to write up method statements for processes on site. "I'd to do them almost from scratch. I had no idea. So, I got one that was done before. Developed it. Went out to site. Met the lads, grilled them to see what they were doing. Then wrote it up. That has all changed now with the Safety Cert. It's more formal with Karen." (Karen is a relatively new employee with responsibility for QA and Health and Safety and who is qualified in the area.)

When asked how problems were solved in general, he took the example of a customer complaint where something needs to be fixed. "What we would do is look at the background. What was the design spec? What has actually been put in? Is it different? Why is it different? How has it changed from the spec? (This shouldn't happen because of the QA system.) Is it McGrattan and Kenny's fault or was the equipment faulty or not a suitable design? So for example, you would identify the problem, e.g. noise problem with fan and someone sitting under it. Where is the noise coming from? Is it the fan? The duct? Or just the person being awkward? Look at the design. Have a look at the commissioning

figures – (when a project is commissioned the performance statistics are all recorded). Is the fan doing what it should be doing? Then talk to the designer and supplier to find some other way to reduce the noise. It is important to take ownership of the problem but not to take on full responsibility – we put in what we are told to put in. But we will do our bit to resolve the problem.”

Success of Problem Solving and Learning

When asked were there any unresolved problems the answer was no. But it may have cost the company money to resolve it and “that’s another thing”. Now there is a full QA system to make sure something won’t happen again. “If it’s a site thing then do a tool box talk for the next job. Tool box talks are Health & Safety or technical talks so everyone on site learns. There are never any huge problems. Problems are often suppliers or clashes with other contractors.”

Barriers to Problem Solving

When asked what barriers there were to solving problems the answer was: “Working relationships with builders or suppliers. Depending on others to be involved. If people are not paid they won’t solve it. If they have been paid then they won’t come back to solve problem”. McGrattan and Kenny’s policy is to do their part in resolving problems for customers. If the problem was caused by McGrattan and Kenny then they will fix it and take the hit on the cost. If it wasn’t caused by them they will assist in the solution but will charge for their part in the resolution.

4.3.6 Summary

Learners recognise the importance of Informal Learning and see it is key to professional development as it provides them with practical skills that formal learning does not. They see it as evolutionary.

Those employees that succeeded had a motivation and thirst for learning. They realised the importance of using formal training content.

A culture of knowledge sharing and trust are key to successful Informal Learning within a company.

4.4 Previous Related Projects

A search was conducted for projects in the area of Informal Learning, Problem Based Learning and ICT for learning in companies. Eleven projects were identified.

4.4.1. Projects on Informal Learning

There are several projects on Informal Learning in companies and the use of ICT. Many of the projects are around the recognition of Informal Learning and pathways to facilitate this. In particular building learning societies developed videos and e-content to allow different countries to validate Informal Learning. The Archimedes project will provide a method to recognise Informal Learning and measure that it has taken place through the use of PBL which facilitates reflection on the learning that has taken place.

Other projects such as Learning Layers, MATURE and TRAILER examine the use of ICT to facilitate Informal Learning. The FP7 project learning layers is currently developing a platform to allow companies to create, contextualise and share individual and collaborative learning content.

The predecessor FP7 project Mature (2008-2012) developed a platform to allow learners to progress from individual to collaborative Informal Learning. It created tools to allow learners to collaboratively tag content and create semantic networks. Trailer, a project under the LLL programme that spanned 2011 - 2013 developed technology with similar functionality however its tagging facility was targeted at Informal Learning and building a database of evidence of skills rather than tagging content. It included the capability for the learner to create an Informal Learning portfolio to share with educational institutes and the workplace to facilitate recognition.

SMEs do not have the resources to create their own digital content, there is a significant amount of resources available on the web and the purpose of the Archimedes project is to guide the learner on how to find and use these resources for learning purposes. The learner will be able to upload and share digital content and use social media to tag content as required.

Net Knowing took an approach that focused on educating owner managers on the use of Web 2.0 tools for Informal Learning in their companies and exploiting these tools. It also put in place a CoP to support companies in their endeavours. It was a successful approach and Archimedes will provide SME managers with learning material to allow them to use PBL.

Future Lab conducted an extensive study of the Informal Learning practices of over 1900 adult learners in the UK. Learning was focused on 'intentional learning that was conducted outside the workplace'. It found that 94% of adults engage in Informal Learning and 74% of these use technology to do so. Of those that engage in Informal Learning 48% do so because they enjoy learning. Of those informal learners that use technology 79% use any relevant technology. Others use the internet (58%), DVDs and videos (53%) and search engines (50%).

37% use technology because it is quicker, 34% feel it gives them access to more information and 31% enjoy the flexibility technology affords them. The report made a number of recommendations two of which are relevant to the Archimedes project:

- Embed measures to increase digital literacy and digital participation: Digital inclusion is about more than access to technology and the development of functional ICT skills, however. It also requires that learners are equipped with the skills, knowledge and motivation that will enable them to be active citizens, effectively participating in the use of digital technologies for a wide range of purposes, including for adult Informal Learning. This means ensuring that digital literacy is embedded in all forms of learning so that people have the competencies which will allow them to use technologies to communicate and interact with others as well as to create, critique and evaluate a wide range of digital texts and digital media
- Support and provide guidance for diverse and sustained learning journeys: Digital

technologies have an important role to play in providing access to information about a wide range of opportunities for learning and in enriching and diversifying adult learning journeys. However, research identifies a need for interconnectedness and signposting between different learning episodes, different locations for learning and between different sorts of technologies which enhance learning.

The Archimedes project will provide learners with the skills to search for and evaluate digital content and also provide them with a scaffold to use digital content for learning purpose.

4.4.2 Problem Based Learning

There are very few formal research projects in the area of Problem Based Learning. Research in PBL is being conducted in several universities within centres for teaching and learning or on an individual basis. One project currently in operation is looking at the use of PBL in training veterinary nurses (PBL-VET - <http://vet-pbl.eu/>). The project is currently involved in developing a facilitators guide and a learner guide. The Archimedes project has requested this from the project co-ordinator when it is available.

Haaga Helia university in Finland is one of the main advocates of PBL and has developed a tutor handbook to guide them through the PBL process. It is envisaged that this content could be useful in developing learning material for the PBL mentors in the Archimedes project, although it will need to be adapted to an organisational context.

UCD conducted a pilot study using Blackboard as an ICT tool to support PBL. Learners had to log into two synchronous PBL tutorials which were recorded and had a agenda pre posted to blackboard. Learners used discussion forums to collaborate outside PBL tutorials. On evaluation the use of the tool was successful and facilitated a deep approach to learning. Some of these features may be implemented into the Archimedes ICT tool such as discussion forums and synchronous PBL tutorials if collaboration is required from HEA institutes.

Facilitate is a PBL network funded by the HEA in Ireland. Higher Education Institutes collaborate together to share PBL experiences, provide training on PBL and inform national curriculum development for PBL. The Facilitate network can provide a platform to allow the Archimedes project to disseminate to HE institutes and collaborate at a national level.

4.4.3 ICT learning in SMEs

Alot of work has been done on the use of ICT in SMEs. The European commission are advocating this through Horizon 2020 initiatives. The majority of SMEs in Europe have access to technology (OECD 2004). SMEs adopt ICT at different levels basic, substantial and sophisticated (Matthews 2007). It is mainly used for marketing, communication, networking and resource planning (Tarute and Gratautis, 2013). Learning is not widely recognised as one of the main uses of ICT in SMEs.

In addition to the earlier project some others have looked at ICT in SME for learning purposes. The Nemsi project developed a best practices database for upskilling employees in the ICT sector. They also created an open conference space for academics and companies to share their approaches to upskilling.

Innoskills ,a large scale research project conducted between 2008 and 2010, developed a learning assessment tool and online learning material to develop innovation skills in individuals in SMEs.

The fact that the majority of SMEs have access to ICT and internet makes it feasible for the Archimedes project to exploit digital content and ICT to deliver a PBL framework. Further research needs to be conducted on what types of technology SMEs have access to and how ICT is currently used for learning purposes. The next section will detail how this data was gathered in the Archimedes project.

4.4.4. Project review: Impact on Archimedes

The survey demonstrated that SMEs readily use ICT and several use the internet for learning purposes.

From the study conducted by Future Lab and confirmed in the study Informal Learning is embraced by the majority of adult learners on a personal level. This needs to be transferred to the workplace and make employees aware that these approaches used in recreational time can be applied in other contexts. Technology is widely adopted for Informal Learning particularly internet searches and video. This point was reinforced in the focus groups

Several research projects have developed Informal Learning tools for tagging content for Informal Learning and the recognition of learning. However there is no evidence that these are widely adopted. From the survey and projects such as that conducted by Future Lab learners seem to have preference for the 'generic tools' such as internet, search engines, social media and blogs.

To date no work been done on developing a PBL ICT platform. Blackboard was successfully used in one pilot which indicates that ICT can potentially be used to deliver PBL. Furthermore Jonassen 2011 identified the need for collaboration and communication tools.

It is important that the Archimedes provides a platform to guide the learner through the PBL process. Rather than redeveloping existing tools that tag and recreate content Archimedes should develop tools so that the learner is provided with the skills that allow them to leverage off of existing content (such as video, OER) and tools that companies are familiar with (such as discussion forums) to facilitate the PBL process. Perhaps integrating social media tools and providing relevant learning material to enable the learner to 'search for and evaluate' the existing material in view of its ability to satisfy the learning requirements is key.

There are several PBL guides and best practices that can be leveraged to develop content for a PBL course. In particular Haga Helia's tracing the tutor guide and the You Tube

videos developed by Maastricht University. This will need to be adapted for an organisational context. Based on the findings it is recommended that

- A platform that is operable on multiple devices
- A platform that leverages off of the electronic resources SMEs are familiar with. From the survey these are video content, discussion forums and the use of internet resources for learning purposes.
- Privacy was a major issue identified in the focus groups so the option for the company to keep their Problem Based Learning solutions public or private.

4.5. Conclusions and recommendations

As can be seen the findings from the survey confirm findings from empirical studies such as Kotey that on the job training is the most popular choice for SMEs. It is largely used for inducting new employees and new skills development. The training methods adopted by SMEs are largely successful however SMEs find that training used in some cases does not work in others. The areas where SMEs' approaches to training are successful in acquiring skills are teamwork, customer centric skills and problem solving. This may be due to the use of collaborative approaches to learning such as mentoring and on the job training in which individuals work with existing staff members to develop skills. Areas where SMEs feel that their approaches to training are unsuccessful are innovation, change management and critical thinking. These skills are largely dependent on external factors thus internal informal training approaches such as on the job training may not be successful. In the focus groups the SMEs cited the lack of self direction and initiative as a problem with their staff thus the development of critical thinking skills could address this as it involves "reasonable and reflective thinking [concerned with what to do or believe]" (Norris & Ennis, 1989, p. 3). These skills encourages individuals to take initiative.

Where informal training was not seen as successful, this was often because it was not obvious the skills were acquired. This could be alleviated by aligning the learning to problems the company has. By doing this it would be immediately clear if skills were required if the problem was addressed. However if the problem was not solved, the learner may still have acquired skills. As a result, it is important to allow the learner to reflect on what they learned through PBL, why their approach did not work and also potential corrective actions that can be undertaken to reach a solution.

From the research conducted it is recommended a that a learning approach should be developed for SMEs that is centred around:

- A culture of learning
- Encourages the learner to take initiative
- Contextualised continual learning.

The companies in the study felt that issues could be addressed by aligning learning to company problems. Thus PBL could be a suitable approach.

The main categories of problems in SMEs are in Marketing, Finance, HR and General Management. The types of problems that occur are either

- 1) Strategic problems such as increased competition, controlling profits
- 2) Decision making problems such as how to manage employee performance or how to promote the company.

Thus the appropriate scaffolding approaches should be used including worked examples, case studies, alternative perspectives and causal. This can be done by providing a library of PBL projects, PBL case studies, discussion forums to allow alternative discussion and expertise outside of the organisation. Encouraging the learner to identify problem components and relationships between those at problem definition stage of the PBL process (this may be done through integrating mind map software into the PBL tool) would provide causal scaffolding. Providing the relevant learning material and questioning to encourage the learner to do this would allow the learner to make the PBL process transparent.

SMEs are unclear of what a problem for PBL consists of and need to be given guidance on choosing a problem for PBL. Learning material needs to be developed for facilitators and learners prior to the PBL process to clarify what types of problems to use.

Reflection is key to making the decision making process in PBL transparent. For companies this will reduce the potential for a blame culture, thus questioning and encouraging the learner to verbalize why they are using particular approaches to address a problem are also key. Questioning and argumentation should be encouraged by the facilitator at each stage of the PBL process and a reflection, corrective action and further application stage will be included at the final stage of the PBL process. This can be done by educating the facilitator on the types of questioning to include in the discussions, providing a template for each stage of the PBL process and asking the learner to enter in their reason for taking particular actions (Jonassen's questioning approach discussed earlier could be applied). At the final stage a reflection or learning diary could be included in the PBL ICT tool requiring the learner to identify what they learned, where it could be improved and how their learning could be applied in other situations.

The survey demonstrated that SMEs readily use ICT and several use the internet for learning purposes.

From the study conducted by Future Lab, and confirmed in the study, Informal Learning is embraced by the majority of adult learners on a personal level. This needs to be transferred to the workplace and make employees aware that these approaches used in recreational time can be applied in other contexts. Technology is widely adopted for Informal Learning, particularly internet searches and video. This point was reinforced in the focus groups.

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tools.

It is important that the Archimedes provides a platform to guide the learner through the PBL process. Rather than redeveloping existing tools that tag and recreate content Archimedes should develop tools so that the learner is provided with the skills that allow them to leverage off of existing content (such as video, OER- put in full) and tools that companies are familiar with (such as discussion forums) to facilitate the PBL process. Perhaps integrating social media tools and providing relevant learning material to enable the learner to 'search for and evaluate' the existing material in view of its ability to satisfy the learning requirements is key.

There are several PBL guides and best practices that can be leveraged to develop content for a PBL course. In particular Haga Helia's tracing the tutor guide and the You Tube videos developed by Maastricht University. This will need to be adapted for an organisational context. Based on the findings it is recommended that

1. A platform that is operable on multiple devices
2. A platform that leverages the electronic resources SMEs are familiar with. From the survey these are video content, discussion forums and the use of internet resources for learning purposes.
3. Privacy was a major issue identified in the focus groups so the option for the company to keep their Problem Based Learning solutions public or private.

5. Problem based learning for SMEs

5.1. A learning solution for SMEs

The proposed solution for SMEs is Problem Based Learning. It is proposed that Problem Based Learning can encourage a learning culture in line with the principles of a learning organisation as

- It is facilitated by a tutor
- It encourages the learner to see a problem as a whole and de-construct it into parts and identify their relationships.
- IT is based on the constructivist approach to learning
- Learning is collaborative
- During the last step of the process the learner is required to reflect on what they have learned

Furthermore it has been proven to develop self-directed learning and is highly contextualised promoting a 'learn to learn' approach.

5.1.1. Building a learning culture

Several companies in the study highlighted the importance of developing a learning culture. A learning culture is one which supports the creation, sharing and utilisation of knowledge (Gill; Gaile). There are a different number of areas this research spans including learning organisations and organisational learning. The main theories in this area are that of Garvin, Senge and Agyris and Schon.

Garvin (1993) suggests that there are three foundations to a learning culture which consists of support, leadership and concrete learning processes and opportunities for practice. He suggested that organisations learn through "systematic problem solving, experimentation with new approaches, learning from their own experience and past history, learning from the experiences and best practices of others, and transferring knowledge quickly and efficiently throughout the organization" -

<https://hbr.org/1993/07/building-a-learning-organization>

Senge defined a learning organisation as a place "where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together"

Again he argued that organisations learn through five principles systems thinking, personal mastery mental models, shared vision and team learning. This involves the ability "to comprehend as a whole" and the relationship between parts, mastering information personally, reflecting on what action that needs to be taken, working together to clarify that action and implementing that action collaboratively. He highlighted the importance of creating an environment conducive to reflection to enable people to learn.

<http://infed.org/mobi/peter-senge-and-the-learning-organization/>

Agyris and Schon argued that organisational learning involves an interplay between individual learning and organisational learning. They highlighted the need for a closed process in which there is reflection on what action they took and how it can be corrected or improved. It is similar to an action research cycle in which the learner reflects on current practice and takes the actions (based on the corporate strategy) to make the necessary changes to correct any issues.

In addition many authors have highlighted the importance of trust, communication, leadership and reward in encouraging a learning organisation. (Duden;Gill;Gaile;Garvin) Duden also spoke about the importance of making information about decisions transparent in order to encourage its use.

Thus the main principles of a learning culture are

- Communication and support (Duden;Gill;Gaile)
- Systems thinking – a holistic view of learning and the organisation (Senge)
- Mental models and transparency of information for decision making (Senge;Garvin;Duden)
- Construction of knowledge (Senge;Garvin)
- Collaborative learning (Senge;Garvin)
- Opportunities for reflection and corrective (Argyis and Schon)

There are a number of issues that need to be considered when exploiting PBL to build a learning culture. Traditionally PBL takes place within formal education. In order to address the SME requirements it is suggested to transfer this form of learning to the workplace. However this means that the tutor is no longer available to facilitate the learning. Thus support and facilitation must be fostered inside in the organisation owners and managers must be educated on how to facilitate and lead this form of learning.

In the initial stages due to the uncertainty of the process learners cite PBL as being challenging. (Helela and Fagerholm) Within a formal education institute the facilitator is available to reduce these anxieties and support the learner. As a result the process should be better defined for learners in companies and the learners should be provided with the process and the learning material to guide them through the PBL process to reduce these feelings.

Furthermore corrective action is not a stage in the PBL process and may need to be developed as a stage in a PBL process within a workplace environment. If a problem has not been addressed this may be seen as a failure, it is important to ensure that through reflection and corrective action the learner is made aware of what they have learned and how they can apply it to other situations. This stage will be key.

5.1.2 Encouraging learner to take initiative

In order to develop a learning culture employees must be encouraged to take initiative. Encouraging the learner to take initiative involves developing a self-directed learning approach. Self-directed learning (SDL) research has been in existence for many years, some take the stance that all adults are self-directed (Tough, 1971) and others that it

needs to be fostered and encouraged. (Knowles 1985).

Knowles (1975) defined SDL as one in which ' individuals take the initiative with or without the help of others in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes"

Candy emphasises that in contrast to Tough and Houle self directed learning is a social process. He describes SDL as having four main principles that of "personal autonomy, the managing of ones own learning, the independent pursuit of learning, and the learner control of instruction".

Guglielmino argued that a learner must be ready for self directed learning and developed a self directed learning readiness assessment to evaluate this. He argued that some learning approaches foster self direction better than others. Furthermore Guglielmo emphasised that to reduce problems and interruptions occurring there must be 'focused planning and reflection' which will improve the effectiveness of the SDL process.

Problem Based Learning naturally lends itself to self directed learning. Several studies have been conducted to assess the ability of PBL to foster self directed learners many using Candy's principles of SDL. (Lyones et al;Blumberg 2000)

Furthermore one of the main objectives of PBL is to develop self directed and lifelong learners (Barrows, 1994)

This makes it an ideal approach to learning for SMEs as it is collaborative,it encourages the learner to identify what they need to learn (with the help of others). The learner must define their own learning objectives, it encourages self study and reflection on the learning process corresponding to Knowles and Candy's self directed learning processes.

With PBL in an educational setting the problem is defined by the facilitator and they often provide the learners with a library of resources to assist them in the self study stage of the learning process. Within a workplace setting, the problems used for PBL will vary widely; they will be identified by both the learner and the facilitator. The facilitator, which will probably be an owner or a manager will not have the time to provide a library of resources therefore learners will need to be provided with the skills to guide them to search for, identify and utilise the correct information to address the problem.

Although self study and reflection may be widely practised in SMEs informally, it does not have any structure (as highlighted in the studies) thus a guided process and learning material may be required to provide them with the tools assist learners to search for, access and gather the information they require for study purposes and synthesise it into a solution. Learners will also need guidance on how to reflect on the learning approach that was undertaken throughout the PBL process and if it was successful which encourages meta cognition.

5.1.3 Contextualised continual learning

Within our study SMEs highlighted the need for training to be contextualised and teach

how to deal with incidences occurring outside the 'norm'.

They also identified the need for learning to be integrated into the organisation, the attractiveness of Informal Learning is that it is immediate and applied. The experience companies had with formal training was the application of what they learned on the course to the company. Thus learning needs to be applied. The other problems they experienced was the 'drop off' in the use of skills and knowledge on courses over a period of time.

Problem Based Learning is a contextual form of learning. (Maurer and Neuhold, 2012) In addition the problems are ill structured and are outside the 'norm'. In the initial stages of PBL the learner has to discover why the problem has occurred, the different parts, their inter relationships and proposed solutions to these.

Drop off is something which is not addressed, the final stage of the PBL process is one of synthesis and reflection of the learning undertaken. However to facilitate the requirements of SMEs reflection could be separated into an eighth stage which can comprise of reflection of the learning process and its application to other instances in the workplace. This could form the basis for new PBL projects in the company.

5.2 Problem Based Learning in the workplace

It can be seen that Problem Based Learning can address many of the requirements of a learning solution identified by SMEs. However this type of learning has never been implemented in a workplace context before. The major issues that will need to be addressed in order to integrate PBL into a workplace environment are that there is no tutor or educator skilled on PBL, the problem can vary significantly in different instances thus the learning material is not defined and self study will need to encompass the identification of learning resources, furthermore the lack of a dedicated tutor and structured sessions will require the learner to be guided through the stages in the PBL process so they are clear of the requirements at each stage. It is proposed that these issues be overcome in the following manner

- 1) Educate owner managers on the PBL process and the importance of communication and support.
- 2) Train owners and managers in SMEs as PBL facilitators.
- 3) Provide learning material to support both the facilitator and the learner through the process.
- 4) Provide guidance on the sourcing of material for self study.
- 5) Include a separate stage for reflection, corrective action and further application of learning.

The Archimedes project is currently working on a method of overcoming these issues by:

- Developing a PBL facilitator course for owners and managers in SMEs
- Creating a PBL mentor network for PBL learners in SMEs
- Developing an ICT tool which will consist of a template to guide learners in SMEs through the PBL process. This will be supported by discussion forums and social media
- Developing learning material which will be integrated into the template to inform the learner to complete each stage of the PBL process.

This approach will allow SMEs to develop self directed learners within their company with an ability to apply their learning to company challenges.

The reflection and corrective action stages will illustrate what skills the learner has acquired and how they can be applied to other work issues facilitating continual learning and reducing drop off as it will encourage the learner to continually think how to apply their learning to new instances.

By including the SME owners and/or managers in the process it facilitates leadership and open communication and a supportive learning environment. The structured process and learning material will alleviate some of the issues associated with the ambiguity surrounding the application of PBL in a work environment.

The companies in the study felt that many of their learning issues could be addressed by aligning learning to company problems. Thus PBL was a suitable approach.

The main categories of problems in SMEs are in marketing, finance, HR and general management. In categorising these with Jonassens classification (2011). The types of problems that occur are either

- Strategic problems such as increased competition, controlling profits
- Decision making problems such as how to manage employee performance or how to promote the company.

Thus the appropriate scaffolding approaches should be used including worked examples, case studies, alternative perspectives and causal. This can be done by providing a library of PBL projects, PBL case studies, discussion forums to allow alternative discussion and expertise outside of the organisation. Encouraging the learner to identify problem components and relationships between these at problem definition stage of the PBL process (this may be done through integrating mind map software into the PBL tool) would provide causal scaffolding. Providing the relevant learning material and questioning to encourage the learner to do this would allow the learner to make the PBL process transparent.

SMEs are unclear of what problems are suitable for PBL and need to be given guidance on choosing a problem for PBL. Learning material needs to be developed for facilitators and learners prior to the PBL process to clarify what types of problems to use.

Reflection is central to making transparent the decision making process in PBL for companies. This will reduce the potential for a blame culture thus questioning and encouraging the learner to verbalize why they are using particular approaches to address a problem. Questioning and argumentation should be encouraged by the facilitator at each stage of the PBL process and a reflection, corrective action and further application stage will be included at the final stage of the PBL process. This can be done by educating the facilitator on the types of questioning to include in the discussions, providing a template for each stage of the PBL process and asking the learner to enter in their reason for taking particular actions (Jonassens questioning approach discussed earlier could be applied). At the final stage, a reflection or learning diary could be included in the PBL ICT tool requiring the learner to identify what they learned, where it could be improved and how their learning

could be applied in other situations.

5.3 ICT Requirements

Based on the results of IO1, IO2 and IO3 the following functional specification has been made for the ICT platform

The company can decide whether to host the platform themselves for security purposes in which they will be given a copy of the platform to download. Or the company can decide to use one of the partners hosting services for the platform in which case general data protection laws will apply. In the former case a space will be allocated for the company PBL which they have access to.

The user logs into the system

They will be displayed with a video informing them of what PBL is.

They are displayed with a list of solved problems or they can decide to identify new problems for learning purposes. A video will be available to inform the learner and facilitator of what types of problems can be used for PBL.

The learner and facilitator works through the PBL process. They will be provided with video learning material for each stage in the process. Clarify terms, defining the problem brainstorming solutions, identifying learning objectives, self study, synthesis and reflection. The learner will be able to access a general discussion forum to discuss potential solutions and approaches with peers and other companies. The learner will be able to upload self study resources.

A course will be available for the facilitator to inform them of how to facilitate the PBL process in their company.

The company will have the option of making parts of the PBL problem public in which it will be shared or private.

The platform will be developed using a collaborative system called Tiki Wiki. A template will be developed to guide the learner through the PBL process which will result in a wiki of the PBL that can be saved and viewed at a later stage. The learner will be referred to learning material where appropriate. Learning material will be developed using Camtasia and video scribe.

6. References

- Admiraal, W., Lockhorst, D. (2009) E-Learning in Small and Medium-sized Enterprises across Europe : Attitudes towards Technology, Learning and Training, *International Small Business Journal* 2009 27: 743
- Argyris C., Schon D. A. (1996), "Organizational Learning II", FT Press, p. 305..
- Armstrong, R.K. (1990), "How do managers learn?", unpublished research paper, Lancaster University CSML.
- Ashton, D. & Felstead, A. (1995). *Training and Development. Human Resource Management: A Critical Text.* S.J. London, Routledge.
- Armstrong, R.K. (1992), "Management learning and development: aspects of contextual learning", unpublished dissertation, Lancaster University CSML
- Atwell, (2013) LEARNING LAYERS PROJECT <http://learning-layers.eu/tag/problem-based-learning/> accessed on the 18th of June 2015
- Barron, J., Berger, M., Black, D. (1999). "Do Workers Pay for On-the-Job Training." *The Journal of Human Resources* 34(21): 236-252.
- Barrows, H. S. (1994). *Practice-based Learning: Problem-based Learning Applied to Medical Education.* Southern Illinois University, School of Medicine, PO Box 19230, Springfield, IL 62794-9230.
- Bell, S.(2010): *Project-Based Learning for the 21st Century: Skills for the Future, The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 83:2, 39-43
- Black, S., Lynch, L. (1996). "Human Capital Investments and Productivity." *American Economic Review* 1996(May): 263 – 267.
- Blake, R. R., Mouton, J. S., Barnes, L. B., & Greiner, L. E. (1964). Breakthrough in organization development. *Harvard Business Review*, 42(6), 133-155.
- Blumberg, P (2000) Evaluating the evidence that problem-based learners are self-directed learners: A review of the literature. Appears in Evensen, Dorothy H. (Ed); Hmelo, Cindy E. (Ed), (2000). *Problem-based learning: A research perspective on learning interactions.* , (pp. 199-226). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers, xiii, 362 pp.
- Brooks, A. (1989), "Critically reflective learning within a corporate context", unpublished doctoral dissertation, Teachers College, Columbia University, New York, NY.
- Candy, P. C.(1991). *Self-direction for lifelong learning.* San Francisco, CA: Jossey-Bass.
- Carliner, S., (2013) How have concepts of Informal Learning developed over time? *Performance Improvement*, vol. 52, no. 3, March 2013.

Carter, N. M. (1990). 'Small firm adaptation: Responses of physicians' organizations to regulatory and competitive uncertainty'. *Academy of Management Journal*, 33. pp. 307-333

Clough, G. (2010) Geolearners: Location-Based Informal Learning with Mobile and Social Technologies *IEEE Transactions on learning technologies*, vol. 3, no. 1, January - March 2010.

Conti, G. (2004). Training Productivity and Wages. The sixteenth annual European Association of Labour Economists (EALE), 2004, Lisbon, Portugal.

Curran, J., R. Blackburn, J. Kitching, and J. North (1997). "Small Firms and Workforce Training: Some Results Analysis and Policy Implications from a National Survey," in *Small Firms: Enterprising Futures*. Eds. M. Ram, D. Deakins, and D. Smallbone. London: Paul Chapman, 90–101.

Dale, M., & Bell, J. (1999). *Informal Learning in the workplace*. London: Department for Education and Employment.

Dewey, J. (1938). *Experience and Education*. New York: Collier Books.

Dodge, H. R., Fullerton, S., & Robbins, J. E. (1994). Stage of the organizational life cycle and competition as mediators of problem perception for small businesses. *Strategic Management Journal*, 15(2), 121-134.

Doyle, L., Hughes, M., Hudson, N., Stanford, K., & Small Firms Enterprise Development Initiative. (2004). *Learning without lessons: supporting learning in small businesses*.

Drucker, P. (1954). *The principles of management*. New York.

Central Statistics Office (2012): "Business in Ireland 2009," Discussion paper, Central Statistics Office.

Duden, A. (2012). Trust in Learning Organizations. *International Journal of Management Cases*, 14(4), 167-175.

Ellström, P- E. (2001), "Integrating learning and work: conceptual issues and critical conditions", *Human Resource Development Quarterly*, Vol. 12 No. 4, pp. 421- 35.

Eraut*, M. (2004). Informal Learning in the workplace. *Studies in continuing education*, 26(2), 247-273.

European Commission (2003). *SMEs in Europe 2003*. European Observatory for SMEs, European Commission.

European Commission(2013) Annual report on European SMEs: A recovery on the horizon http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/supporting-documents/2013/annual-report-smes-2013_en.pdf accessed on the 15th June 201

Fagerholm, H., & Helelä, M. (2003). *Handbook for Transforming a BBA Program in*

International Business Into a Problem-based Learning Curriculum: Case: Liibba Program at Helia. Helsinki Business Polytechnic.

Filiatrault, P., Harvey, J., Chebat, J. (1996). "Service Quality and Service Productivity Management Practices." *Industrial Marketing Management* 25

Gaile, A. (2013). EXTERNAL FACTORS FACILITATING DEVELOPMENT OF THE LEARNING ORGANIZATION CULTURE. *Journal of Business Management*, (7).

Garvan, T. N., Costine, P., Heraty, N. (1995). *Training and Development in Ireland*, Oak Tree Press.

Garvin, D. A. (1985). Building a learning organization. *Org Dev & Trng*, 6E (Iae), 274.

Gill, S. J. (2009). *Developing a learning culture in non profit organizations*. Sage.

Guglielmino, P.J., Guglielmino, L. M., & Long, H. B. (1987). Self-directed learning readiness and performance in the workplace. *Higher Education*, 16, 303-317.

[Hamburg, Ileana](#) (2012) Using Informal Learning, e-learning, and cooperation in SMEs. In: *International journal of e-business development* 2, no. 2, p. 28-31 _

Hankinson, A. (1994) 'Small Firms' Training: The Reluctance Prevails', *Industrial and Commercial Training* 26(9): 28–30.

Hill, R., and J. Stewart (2000). "Human Resource Development in Small Organisations," *Journal of European and Industrial Training* 24(2/3/4), 105–117.

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do learners learn?. *Educational psychology review*, 16(3), 235-266.

Hoffmann, B. O. B., & Ritchie, D. (1997). Using multimedia to overcome the problems with Problem Based Learning. *Instructional Science*, 25(2), 97-115.

Holzer, H., Block, M., Knott, J. (1993). "Are Training Subsidies for firms Effective? The Michigan Experience." *Industrial and Labor Relations Review* 46(4): 625 -636.

Houle, C. O. (1988). *The inquiring mind* (2'd ed.). Norman, OK: University of Oklahoma.

Huang, X., & Brown, A. (1999). An analysis and classification of problems in small business. *International Small Business Journal*, 18(1), 73-85.

Hung, W., Harpole Bailey, J., & Jonassen, D. H. (2003). Exploring the tensions of problem-based learning: insights from research. *New Directions for Teaching and Learning*, 2003(95), 13-23.

Hung, W., Jonassen, D. H., & Liu, R. (2008). Problem-based learning. *Handbook of research on educational communications and technology*, 3, 485-506.

Jonassen, D. (2011). Supporting problem solving in PBL. *Interdisciplinary Journal of*

Problem-based Learning, 5(2), 8.

Jones-Evans, D. (1996). Technical entrepreneurship, strategy and experience. *International Small Business Journal*, 14(3), 15-39.

Jost, K. L., Harvard, B. C., and Smith, A. J. "A Study of Problem-Based Learning in a Graduate Education Classroom." In *Proceedings of Selected Research and Development Presentation at the National Convention of the Association for Educational Communications and Technology*, 19th, Albuquerque, Feb. 1997. (ED 409 840)

Kok, J., Vroonhof, P., Verhoeven, W., Timmermans, N., Kwaak, T., Snijders, J., Westhof, F. (2011) Do SMEs create more and better jobs?, *EIM Business & Policy Research with financial support from the European Communities, under the Competitiveness and Innovation Programme*

Konrad, A. M. and Mangel, R. (2000) 'The Impact of Work-Life Programs on Firm Productivity', *Strategic Management Journal* 21(12): 1225–37.

Kotey, B. and Folker, C. (2007), Employee Training in SMEs: Effect of Size and Firm Type—Family and Nonfamily. *Journal of Small Business Management*, 45: 214–238

Kotey, B., & Slade, P. (2005). Formal human resource management practices in small growing firms*. *Journal of small business management*, 43(1), 16-40.

Knowles, M.S.(1980).*The modern practice of adult education: From andragogy to pedagogy* (2nd ed.).Chicago, IL: Follett.

Lawless, M., McCann, F., & McIndoe-Calder, T. (2012). SMEs in Ireland: Stylised facts from the real economy and credit market. *Quarterly Bulletin Articles*, 99-123.

Loyens, S. M., Magda, J., & Rikers, R. M. (2008). Self-directed learning in problem-based learning and its relationships with self-regulated learning. *Educational Psychology Review*, 20(4), 411-427

Malcolm, J., P. Hodkinson, et al. (2003). "The interrelationships between informal and formal learning." *Journal of Workplace Learning* 15(7/8): 313-138.

Maurer, H., & Neuhold, C. (2012). Problems everywhere? Strengths and challenges of a problem-based learning approach in European studies. In *Strengths and Challenges of a Problem-Based Learning Approach in European Studies*. APISA 2012 Teaching & Learning Conference Paper

Moorby, E. (1992). *Mentoring and Coaching*. Gower Handbook of Training and Development. J. Prior, Billing Sons Ltd, Worcester, GB: 421.

Moust, J. H., Berkel, H. V., & Schmidt, H. G. (2005). Signs of erosion: Reflections on three decades of problem-based learning at Maastricht University. *Higher education*, 50(4), 665-683.

Nottingham Trent University (2002). *Barriers to Training in Small and Medium Sized*

Enterprises. Nottingham, Learning and Skills Council.

Ravenscroft, A. Schmidt, A., Cook, J., Bradley, C. (2012) Designing social media for Informal Learning and knowledge maturing in the digital workplace, *Journal of Computer Assisted Learning* (2012), 28, 235–249

Rokkjær, O.; Nørgaard, B.; Murphy, A.; Skytte, L.; Hannemose, N.; Tort, I.; Quintanilla Garcia, I.; Montesinos, P. (2009). Dissipation of the FWBL methodology to innovative continuing professional development, report of the FWBL project.

Saatchi, E. (2008). Problem Based Learning in an intercultural business communication course:

communication challenges in intercultural relationships in internationalizing SMEs. In *Journal of business and technical communication*, 22(2), April 2008

Şendağ, S., & Odabaşı, H. F. (2009). Effects of an online Problem Based Learning course on content knowledge acquisition and critical thinking skills. *Computers & Education*, 53(1), 132-141

Senge P. (1994), "The fifth discipline Fieldbook", Crown Business, 593 p.

Stainer, A. (1997). "Capital Input and Total Productivity Management." *Management Decision* 35(3): 224-232.

Stewart, J. and Alexander, G. (2006). Virtual Action Learning: Experiences from a study of an SME e-Learning Programme, EC-TEL 2006

Stone, I (2010) Encouraging small firms to invest in training: learning from overseas, Praxis UK commission for employment and skills.

Storey, D. J., Westhead, P. (1997). Training Provision and the Development of Small and Mediums Sized Enterprises. U. o. Warwick.

Svensson, L., Ellström, P. E., & Åberg, C. (2004). Integrating formal and Informal Learning at work. *Journal of Workplace Learning*, 16(8), 479-491.

Terpstra, D. E., & Olson, P. D. (1993). Entrepreneurial start-up and growth: A classification of problems. *Entrepreneurship theory and practice*, 17, 5-5.

Thomas J. Conlon, (2004) "A review of Informal Learning literature, theory and implications for practice in developing global professional competence", *Journal of European Industrial Training*, Vol. 28 Iss: 2/3/4, pp.283 – 295

Tough, A.(1971).The adult's learning projects.Toronto,Ontario: Institute for Studies in Education.

Walters, R., & Sirotiak, T. (2011). Assessing the effect of project based learning on leadership abilities and communication skills. 47th ASC Annual International Conference Proceedings.

Wood, D (2003) Problem Based Learning *BMJ* 2003;326:328

Wynn, P. (1992). Computer Based Training. Gower Handbook of Training and Development. J. Prior, Billing Sons Ltd, Worcester, GB: 384.