EVENT-BASED MEASUREMENT OF LEARNING IN PROJECTS: A METHODOLOGY

Paul A. Fuller[1], Andrew R.J. Dainty[2], Tony Thorpe[3] and Russell MacDonald[4]
[1,2,3] *Department of Civil and Building Engineering, Loughborough University, Loughborough, Leicestershire LE11 3TU, UK*
[1,4] *Mouchel Plc, Export House, Cawsey Way, Woking, Surrey GU21 6QX, UK*

Measuring learning is problematic and there is an apparent lack of research establishing methods of capturing the benefits of learning which may accrue in project based environments. This paper reports on the ongoing findings of longitudinal case study research to explore how learning can be measured. A new approach to measuring learning is being piloted in an infrastructure support services organisation. The focus of the research is on a large scale IT-led business transformation project. A key objective of the approach is to create a learning culture in the project implementation teams that incorporates the measurement of benefits. The case study reveals that there is difficulty in communicating the complex concepts surrounding learning and its measurement. This can be overcome, however, by carefully explaining the benefits of the approach being proposed. The basis of the approach currently being developed is to adapt existing project lifecycle reviews in order to create time and space for reflective learning. The process will be progressively reviewed and evaluated and if it proves to be successful, the aim is for the approach to be adapted for wider implementation on projects across the whole business.

Keywords: benefits, events, learning, measurement, projects.

INTRODUCTION

The topic of learning and the related cultural issues was originally the domain of the Organisational Learning (OL) theorists such as Argyris (1992) and his collaborator Schön (1974; 1978). These debated the existence of organisations and whether they had the ability to learn. Over time another group of researchers emerged who were practitioners whose main activities concentrated on the application of learning theory to create a Learning Organisations (LO) which include Senge (1990), Garvin (1993), Pedler (1995), Pemberton and Stonehouse (2000). In recent years there has been a spill-over into Knowledge Management (KM) (Cavaleri, 2004) and in terms of measurement into research into the study of Intellectual Capital (IC) (Marr and Schuima, 2001). Proponents of OL approach its study from a highly theoretical viewpoint and debates have ensued whether organisations exist and if they do exist can they learn (Easterby-Smith *et al.* 2000) either as individuals or as organisations (Kim 1993). Measurement of the impacts of learning and knowledge on organisations is difficult due to the abstract nature of both. Attempts to investigate the benefits have

[1] p.a.fuller@lboro.ac.uk or paul.fuller@mouchel.com
[2] a.r.j.dainty@lboro.ac.uk
[3] a.thorpe@lboro.ac.uk
[4] russell.macdonald@mouchel.com

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been addressed mainly in the field of Intellectual Capital measurement. The Intellectual Capital researchers investigate the impact of intangibles on a business, particularly in terms of their impact on asset value calculations (Lev, 2001; Andriessen, 2004; Pike and Roos, 2007). However, this tends to apply to the whole business rather than individual elements of businesses e.g. individual divisions, business units or projects. These effects were investigated in a construction context by Chinowsky *et al.* (2007).

Rather than simply focussing on fostering a learning culture, which is difficult to define, in this research the aspect of measuring learning and its benefits is addressed. It explores whether measurement of learning can be successfully demonstrated, and if so, whether this indicates that organisational learning has taken place. The progress of the research has been documented in earlier publications. These include papers based on the literature review (Fuller *et al.*, 2007) and exploration of the intellectual capital, and related knowledge management fields covering measurement (Fuller *et al.*, 2008). Based on this initial work the current approach to propagating a learning culture and the measurement of learning has been developed. Earlier attempts by the researcher to encourage deutero-learning were unsuccessful due to the difficulty of explaining the complex theories to the non-academics. Thus, in this paper the key challenge of grounding abstract theory into praxis is addressed through the development of a methodology for events-based learning.

RELEVANT LITERATURE

Early work by Argyris and Schön, (1974 p. 2-4) proposed the concepts of single and double loop learning, theories-in-use and espoused theories. The latter two are said, by the authors, to guide interpersonal behaviour, the (behavioural) worlds we live in, our effectiveness and capacity for learning. Argyris and Schön, (1978) went on to introduce a number of key definitions. Organisational Learning (OL): "Organisational learning occurs when members of the organisation act as learning agents for the organisation, responding to changes in the internal and external environments of the organisation by detecting and correcting errors in organisational theory-in-use, and embedding the results of their inquiry in private images and shared maps of the organisation." (p.29). Deutero-learning – "When an organisation engages in deutero-learning, its members learn, too, about previous contexts for learning." (p.27). This type of learning is about applying organisational learning concepts to the learning process itself. The focus is on analysing successes and failures. From this the barriers to learning can be identified. Strategies can then be developed to overcome these barriers which are then communicated to the individuals in the organisation and implemented.

Many of these basic concepts were adopted by the Learning Organisation practitioners who in turn gave their definitions of what constitutes a 'learning organisation'. Senge (1990), introduced the following definition of a Learning Organisation (LO) " …organisations 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.". There has also been significant discussion over the years concerning individual vs. institutional learning as outlined in Easterby-Smith *et al.* (2000) and Pedler (1995). The latter raised the importance of individual and organisational learning not just what learning is carried out but how it is done and how an

organisation intends to use the learning at all levels individually and collectively including wider stakeholders.

A development based on Brown and Duguid (1991) was the emergence of practice as a unit of analysis to explore learning and knowing. The focus has now moved to studies at the organisational level and is moving even further to encompass studies of learning across boundaries (Scarborough *et al.*, 2004) and between organisations (Bresnen and Marshall, 2000). Work by the educational researcher McNiff with Whitehead (2000) has covered how practice can be improved using action learning methodology. This was influenced by the work of earlier researchers on action learning in particular the concept of reflective practice by Schön (1983). Measurement of the benefits has not been covered comprehensively in OL or LO research. Case studies have been written but there is little hard evidence in terms of quantifiable 'bottom-line' benefits of implementing Organisational Learning or a Learning Organisation. There is a lack of empirical studies which explore this important aspect.

The main interest in measuring the benefits of intangibles such as learning and knowledge has come from the field of Intellectual Capital measurement based on the work of Lev (2001), Sveiby (2001), Andreissen (2004), Marr (2004), Pike and Roos (2007). The significance of this work in the context of the case study organisation was explored in a previous paper by the researcher (Fuller *et al.*, 2008a). This proposed using a highly pragmatic common approach to measuring both knowledge management and learning using empirical methods rather than the high level intellectual capital methods. In their paper Marr *et al.* (2003) called for more empirical research to test out the theories and drivers for intellectual capital measurement. Sveiby (2004) observed that it is not possible to measure social phenomena accurately and that measurement is fragile, open to manipulation and only adds value if these limitations are taken into account. He concluded that establishing purpose of measuring intangibles is crucial. The measuring process should be regarded as an 'invitation to a learning dialogue'.

A common theme emerging from the literature is that due to the abstract nature of knowledge and learning, there is a need for more tangible evidence in order to ground the various theories. In order to try and take into account the difficulty of measuring such an abstract and complex entity as learning, it is necessary to identify conditions or points in time where the learning becomes more explicit or at least is more easily demonstrated and, where 'value' can be established in monetary terms.

RESEARCH METHODS

The research has two main goals. The first is to propagate deutero learning (c.f. Argyris and Schön 1978) within projects, where the organisation (in terms of project teams) and individuals learn how to learn through event-based activities following completion of key phases. The second is to encourage a culture of learning benefits measurement through the development of methods/tools for the identification capture and measurement of benefits which may be quantifiable or non-quantifiable. The key research questions that can be derived are: Can the proposed event-based approach be shown to propagate deutero-learning (learning how to learn) and promote a benefits measurement culture?; Can organisational learning, within projects, be shown to exist through measurement of benefits?

This study adopts an action research approach as part of a longitudinal case study which is used to establish a methodology for improving organisational learning modes

in projects. A key feature of action research is that the theory is "grounded in action" (Eden and Huxley, 1996) which establishes the validity of the research. The specific case example covers a business transformation programme in the support services sector. The fully developed methodology, once validated, will be applicable to projects in general. The use of a longitudinal case study allows pragmatic learning measurement approaches to be developed over time using the 'natural' boundaries of project phases in large projects. It also allows the use of research instruments such as interviews and surveys to assess culture change in terms of the views and attitudes to learning and it's measurement over the lifecycle of a key project. The relationship between the research instruments used and the research questions is shown in Table 1. Together the methods will establish the efficacy of the event-based approach to propagate duetero-learning and promote greater awareness of benefits measurement throughout the organisation. Pilots are used to test the impact of the tools and approaches used for lessons/benefits capture and measurement. In this case, the project is a major IT-led business transformation through the implementation of a business-wide Enterprise Resource Planning (ERP) software application. The main unit of analysis is the multi-disciplinary project team.

Table 1: Research methods employed

Research question	Research instrument(s)
Can the proposed event-based approach be shown to:	Surveys of participants and semi-structured interviews to establish the extent of deutero-learning
a. propagate deutero-learning (learning how to learn)	Semi-structured interviews with senior managers across the business
b. promote a benefits measurement culture	This will allow a comparison between Managers and other staff
Can organisational learning, within projects, be shown to exist through measurement of benefits	Surveys of participants and semi-structured interviews to establish the extent of deutero-learning
	Semi-structured interviews with senior managers across the business
	Compilation of empirical evidence of quantifiable benefits

Methodology development for the event-based approach

The approach is broadly based on two concepts. Firstly, the learning knowledge spiral as proposed by Nonaka and Takeuchi (1995) which refers to organisational knowledge creation as a "continuous interaction between explicit and tacit knowledge" (p.71). This is triggered by different modes of knowledge conversion i.e. socialisation, externalisation, combination and internalisation. It has been adopted for this methodology on the premise that learning is a subset or generator of knowledge. This allows for knowledge, and therefore learning, to be captured and re-used at successive phase review events held during the lifecycle of the project. Secondly, the promotion of reflective practice which is achieved through the use of an action research methodology for the research "which is undertaken by people who are trying to understand their practice to improve the quality of their work with others" (McNiff, 2000) and, structuring the process to create "learning how to learn" loops or events which give the workshop participants the environment and the time for reflective learning.

The methodology was developed through a series of steps. Firstly, an area of activity was identified that would benefit from improved learning and measurement. In the project selected the main emphasis was on delivery to time and budget in a short overall timescale. Due to this the established processes for lessons learnt and measurement of benefits measurement were not being employed as they could adversely affect the delivery timescales. The standard methods were reviewed and new tools and techniques based on the earlier research were identified that could be used without affecting the overall timescales. Essentially, the methodology was developed to overcome the limitations of the established methods as well as having the aim of introducing a culture of learning and benefits measurement. Pilots were used to test and improve the methodology. Ongoing monitoring of the effectiveness of the process and review of the outcomes will be used to further improve the process.

The use of a specific time-boxed event overcame some of the difficulties that arise from the usual lessons learnt, capture and dissemination mechanisms used in projects. Typically, they are part of an overall end of project review with limited time. The outputs are usually captured on flipcharts which are subsequently typed up later for review and often this is too late. In this case the event is designed to give the participants time, space and tools to think reflectively and openly about their experiences during the project. A key enabler is the use of 'open space' facilitation that lets the participants review and feedback at their own pace and in their own style. Post-its are used as the capture mechanism for the relevant ideas as this allows their re-use from initial brainstorming through grouping and on to prioritisation.

The methodology addresses the issue of making the capture of learning and benefits part of normal project working throughout the complete project lifecycle. It is designed to enable project based generative learning through creation of a learning cycle approach to measurement of learning through a series of events designed to propagate duetero learning (Argyris and Schön, 1978 p27). In this case the frequency of the reviews is based on the specific nature and requirements of the project phases. Capture and dissemination of knowledge and learning is through simple tools that encourage measurement, take up of best practice and aid selection of techniques to improve projects and processes throughout the project lifecycle.

The key challenge of grounding abstract theory into praxis is dealt with by not attempting to describe the complex theories involved to the participants. A methodology has been developed in the form of a series of facilitated process-based workshop based on the theories of learning, knowledge management and intellectual capital outlined above. The workshops are focussed on achieving the clear goal of producing lessons learnt and benefits realisation cards. The emphasis is on the outcomes of the workshop in terms of quantifiable benefits measurement arising from the lessons learnt from the perspectives of both project implementation and business process improvement. Instead of the workshops forming a new activity, they are designed to be adaptations of the normal phase reviews that typically take place at key stages in projects. They are designed to bring a focus on lessons learnt which is normally reserved for the final project review. They also promote thinking about empirical benefits measurement throughout the project which is usually covered by KPI's (key performance indicators) that are normally agreed at project planning stage. The latter allows the benefits, in financial terms, from the project to be aggregated as they accrue rather than simply a change in a performance indicator. These can then be related back to the original business case for the project.

The event based approach consists of a facilitated workshop that appears unstructured at first to encourage open thinking but then, through subsequent review and prioritisation activities, focuses the thinking down to create high quality tangible outputs. These are in the form of benefits realisation cards which are commonly used in these types of project to disseminate the lessons learnt. In this case they will be used to promote a culture of measurement and monitoring in subsequent phases of the project. The workshop had two distinct phases. A "Looking Back" phase covering the identification of key learning points and, capture of the as-is and to-be states. It takes the participants through the following sequential steps: personal reflection (pre-work); brainstorming; refining; short-listing; open space review; prioritisation; production of benefits cards initial sections. A "Looking Forward" phase covering the identification of benefits measurement methods followed by outline implementation planning to achieve benefits. The participants are taken through the following sequential steps; production of benefits cards remaining sections; periodic open space review; finalisation of outputs; outline of next steps.

One of the main aims of the workshop is to publish the outputs, in the form of benefits realisation cards, as soon as possible after the event. To achieve this, each event is 'stage managed' through close facilitation by two or three experienced individuals who direct it towards a successful conclusion. They are assisted by event recorders who capture the outputs as they are produced straight into the final publishing format. This allows final moderation to be carried out rapidly by a small group after the event, prior to publication to a wider audience in a short timescale.

A key element of the workshop is the use of 'open space' facilitation. This differs from the traditional syndicate/group work process where feedback is from the lead person appointed for each group often resulting in lack of participation by some participants with the views of the lead person and/or vocal group members dominating the outputs. The 'open space' approach is far more dynamic and caters for the individual learning styles of the participants it also promotes dialogue amongst the participants. As such the workshop becomes a structured storytelling session. A paper by Gray (2007) describes this and other tools that can be used to develop critical reflection in management learning. To enable maximum interaction between the participants and the groups the room is laid out with no tables and a random seating arrangement to allow ease of movement during the 'open space' review sessions. Flipcharts are available for each group with wall space to create a giant exploded version of each of the output cards. During each 'open space' session the groups rotate round the room to review the outputs from each of the other groups adding comments and taking ideas back to update their own cards. This process result provides a more participative environment, far richer more inclusive outputs, more time for personal critical reflection and promotes thinking about new ideas.

The main principles for the pilot events were: share experiences on the journey; identify lessons learnt both good and not so good; lessons learnt capture and dissemination covers whole project, take learning from completed phases to improve these; carry learning forward to future phases; use of ‘open space’ facilitation; benefits can be quantifiable and non-quantifiable; bottom-up aggregation of benefits; learning captured during the event using ‘event recorders’; rapid dissemination; publicise as news in the project newsletter. There is no reference to theory, the main emphasis is on the practical application of lessons learnt and measurement of future benefits.

CASE STUDY RESULTS

The case study company is experiencing rapid growth due to a key change in corporate strategy implemented in 2003 aimed at annual growth in the order of 20% based on turnover. The organisation is moving from a construction/engineering consultancy based operation towards business process outsourcing in local and central government sectors. This growth means there is an imperative for the company to maximise the knowledge and learning from delivery of projects and services. Many of these are in construction related activities covering infrastructure design and maintenance in the roads, rail, utilities, central and local government sectors.

Two pilot events were held to test the lessons learnt and benefits realisation process. Invitations were sent to delegates representing a cross section of the project implementation team including both external consultants and business representatives. The facilitation team was made up of three facilitators and two event recorders.

The half-day duration event was split into two sessions. The first was aimed at looking back at what had occurred in the initial design and initial build phases of the project. Pre-work was sent out which was designed to encourage the delegates to reflect on their activities and the rest of the team during these phases of the project. The event started with a brainstorming session, in groups, on the lessons learnt and benefits from completed phases. These were shortlisted down to four per group followed by an 'open space' review. Prioritisation was carried out by voting using a Boston box approach with the axes of impact versus ease of implementation to select the final six areas moderated by the facilitators. Each of the teams then populated the first three sections of the benefits cards looking forward covering: lessons learnt/ benefit summary; current state; future state; and, benefits measurement and target range. An open space review followed and then each team finalised the content which was simultaneously captured by the event recorders ready for production. The second session was aimed at looking forward covering identification of benefits measurement methods and outline implementation planning. The six areas identified in the first session were re-allocated to new groups for completion of the remaining benefits card sections covering: critical dependencies; risks/issues and mitigation; resources/actions/reviews; timescale; owner; key contacts. During this session there were periodic open space reviews. A total of six benefits cards were produced.

The findings from the initial pilot results are based on the observations of the researcher, his fellow facilitators and the feedback forms completed by the participants. The quantity and standard of the outputs was affected by the reduced number of attendees nine instead of the planned fifteen. The four cards that were fully populated focussed on the project implementation processes and did not also cover the anticipated future business process improvements as originally intended. This was mainly due to the stage the project had reached which was post design but still prior to the first go-live phase. The issues were somewhat negative and there was an understandable reluctance to publish these widely despite moderation. This was accepted but needs to be taken into account in future phase reviews. Overall the workshop process was considered to be proved as successful.

A small working group reviewed and moderated the outputs. This recommended that in order to overcome the lack of focus on business process benefits and measurement focus in the first pilot event, a further pilot event should be held. This event was held several weeks later and adapted the approach used for the first pilot workshop to create an event focussed on identifying key business process benefits and their

measurement. The revised aim for the second pilot event was to identify business benefits with a target of over £10m in the next five years. The structure of the second pilot event was based on a modified format of the first pilot focussing on business process benefits and their measurement. Pre-work was sent to delegates prior to the event requesting them to list five examples of benefit that would accrue in their business area with an order of magnitude. The outputs from the first event were also provided examples of likely project benefits to encourage the delegates to reflect on the impacts on their business and where benefits might arise and also be quantified.

The half-day duration event was split into two 'time-boxed' sessions. The first was aimed at looking forward to future benefits based on knowledge gained in completed/current phases. This was carried out in groups who brainstormed the benefits, reviewed these against the pre-work, and then shortlisted these down to 10 per group. An 'open space' review then took place. A prioritisation process was carried out by voting using a Boston box with the axes of impact versus ease of implementation to select the final six areas. The facilitators moderated the final choices. An impact analysis was then carried out against the "Four Big Wins" identified as areas of project benefit i.e. sales, forecasting, integration of project management, visibility plus the more traditional areas of size of benefit, costs, ease of implementation and, lead time (to achieve benefits). This was used to prioritise the order in which the areas would be tackled in the next session which was aimed at realisation of the benefits. Four of the ten areas identified in the first session were re-allocated to the two groups (which were reorganised) for completion of all the benefits card sections. During this session there were periodic open space reviews. This was followed by an outline of next steps i.e. moderation, initial publication in project office prior to wider dissemination. Four benefits cards were produced, lower than planned as project delivery pressures resulted in fewer attendees. The feedback and the output quality again demonstrated that the methodology used was successful. This time the outputs were published to the wider project team for comment.

The project is currently at a stage where the initial pilots to test out the approach have been completed. Following this, further events are scheduled through the remaining four phases of the project. The ongoing progress of the research will be recorded and disseminated in further publications. It is proposed that the approach can then be rolled out to improve practice and benefits realisation on construction and infrastructure maintenance projects. Further work will include critical reflection on the researchers' experiences in carrying out the research highlighting the benefits and the difficulties in carrying out action research in the area of grounding complex abstract theory. This analysis will allow the efficacy of the event-based approach to be reviewed.

CONCLUSIONS

The research demonstrates that event based approaches can be used to capture learning for re-use in projects. The pilot events suggest that the methodology developed enables a 'learning to learn' and benefits measurement culture to be propagated amongst project implementation teams. The key outcome is the empirical demonstration of the benefits of implementing learning across the full lifecycle of a project. The study has also shown how the body of research may be grounded through a longitudinal case study designed to bring about improved praxis. However, persuading an organisation to think in these new ways is a complex and difficult task.

This is overcome, in part, by not referring to the complex theories involved and instead focussing on the beneficial outcomes from applying the new methodology.

REFERENCES

Andriessen, D (2004) IC valuation and measurement: classifying the state of the art, *Journal of Intellectual Capital*, **5**(2), 230-242.

Argyris, C (1992) *On Organisational Learning*. 2nd Ed. Oxford: Blackwell.

Argyris, C and Schön, D A (1974) *Theory in Practice*. San Francisco: Jossey-Bass.

Argyris, C and Schön, D A (1978) *Organisational Learning: A Theory of Action Perspective*, Reading Massachusetts: Addison Wesley.

Bresnen, M. and Marshall, N. (2000) Learning to co-operate and co-operating to learn: Capturing knowledge of partnering in construction, In: Akintoye, A (Ed.) 16th Annual ARCOM Conference, 6-8 September 2000, Glasgow Caledonian University. Association of Researchers in Construction Management, Vol. 1, 313-323.

Brown, J S and Duguid, P (1991) Organisational learning and communities-of-practice: towards a unified view of working, learning and innovation, *Organisation Science*, **2**(1), 40-57.

Cavaleri, S A (2004) Leveraging organisational learning for knowledge and performance, *The Learning Organisation*, **11**(2), 159-176.

Chinowsky, P S and Carrillo, P M (2007) Knowledge Management to Learning Organisation Connection, *Journal of Management in Engineering*, **23**(3) 122-130.

Eden, C and Huxham, C (1996) Action Research for Management Research, *British Journal of Management*, **7**(1) 75-86.

Easterby-Smith, M, Crossan, M and Nicolini, D (2000) Organisational learning: debates past, present and future, *Journal of Management Studies*, **37**(6), 783-96.

Garvin, D A (2000) *Learning in Action: A Guide to Putting the Learning Organisation to Work*, Harvard Business School Press, USA.

Gray, D E (2007) Facilitating Action Learning Developing Critical Reflection through Reflective Tools, *Journal of Management Learning*, **38(**5), 495-517.

Fuller, P.A., Dainty, A.R.J., Thorpe (2008) Using Measurement as an Enabler for the Implementation of Knowledge Management and Learning Processes, In: Harorimana, D. and Watkins, D. (Eds) 9th European Conference on Knowledge Management, 4-6 September 2008, Southampton, 201-208.

Fuller, P A, Dainty, A R J., Thorpe, T, Slater, I (2007) Learning Organisations: Can they be shown to exist through the realisation of benefits, In: Boyd, D. (Ed) 23rd Annual ARCOM Conference, 3-5 September 2008, Belfast, Association of Researchers in Construction Management, Vol. 2, 713-714.

Kim, D H (1993) The link between individual and organisational learning, *Sloan Management Review*, **31**(1), 37-50.

Lev, B (2001) Intangibles: Management, Measurement, and Reporting, Brookings Institution Press, Washington D.C.

Marr, B (2004) Measuring Intangible assets - the state of the art, *Measuring Business Excellence*, **8**(1), 3-5.

Marr, B, Gray, D and Neely, A (2003) Why do firms measure their intellectual capital, *Journal of Intellectual Capital*, **4**(4) 441-464.

Marr, B and Schiuma, G (2001) Measuring and managing intellectual capital and knowledge assets in new economy organisations, In: Bourne, M (ed.) *Handbook of Performance*, Gee, London.

McNiff, J accompanied by Whitehead, J (2000) *Action Research in Organisations*, Routledge, London.

Nonaka, I and Takeuchi, H (1995) *The Knowledge Creating Company*, Oxford University Press, New York.

Pedler, M (1995) A guide to the learning organisation, Industrial and Commercial Training. **27**(4) 21-25.

Pemberton, J D and Stonehouse, G, H (2000) Organisational learning and knowledge assets an essential partnership, *The Learning Organisation*, **7**(4), 184-193.

Pike, S and Roos, G (2007) Recent advances in the measurement of intellectual capital: a critical survey, In: Remenyi, D. (Ed) 8th European Conference on Knowledge Management, 6-7 September 2007, Barcelona, 131-138

Scarbrough, H, Swan, J, Laurent, S, Bresnen, M, Edelman, L and Newell, S (2004) Project-based Learning and the Role of Learning Boundaries, *Organisation Studies*, **25**(9), 1579-1600.

Senge, P (1990) *The Fifth Discipline - The Art Practice of the Learning Organisation*, Century Business, London.

Schön, D (1983) *The Reflective Practitioner*, Basic Books, New York

Sveiby, K-E, and Armstrong, C (2004) Keynote Address: Intellectual Capital Congress 2004, Helsinki. http://www.sveiby.com/articles/measuretolearn.pdf (accessed 21 April 2009).

Sveiby, K-E (2001) Measuring Intangible Assets, available at: http://www.sveiby.com/articles/MeasureIntangibleAssets.html (accessed 21 April 2009).