

# Using learning styles and Action Learning, over the Internet, to drive learning for innovation in Small and Medium Enterprises — a case study from construction

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## Abstract

Virtual universities open up the potential for more, and rather different, communities to take part in higher education. Increasingly, small and medium-sized enterprises (SMEs), which mainly comprise the educationally disenfranchised, will have much to benefit from virtual higher learning. This is because they will truly be able to learn about almost anything of personal or work interest, directly and cost-effectively, in their own workplace or home. However, research has shown that this differently intelligent learning community will need special early nurturing if its members are to gain sufficient 'confidence in themselves' to want learn. Furthermore, once such learners have become motivated to learn again, parallel research has also revealed that the knowledge and information made available to such learners must be presented in a manner to support their particular modes of learning. This chapter shows how 'Action Learning' can give employees of SMEs confidence to want to learn again and thence become more innovative. It then reveals how a four-fold model of learning can be adopted by learning technology designers to develop better educational materials, enabling those with differently pragmatic styles of learning to self-inform themselves to new depths of understanding. In this way SMEs will extend the boundaries of the traditional university, bringing a new richness to its intellectual debates. In return, SMEs will acquire new knowledge, skills and understanding that will lead them to become not only more inventive and more innovative, but also able to ask deeper and more penetrating questions about their ideas. This should drive them to improve their working practices, to develop better products and services and to embed the cultural change needed to ensure sustainable success for themselves and their university partners.

## Context

*By 2010 people throughout the world will be more distrusting and suspicious. Employees' attitudes to work will be more short-term, instrumental and cynical. Working lives will be characterised by uncertainty and unpredictability. There will be greater self-employment (particularly among women) and the growing importance of small firms will create a more varied and flexible labour market. Working lives will become short, with more people opting for early retirement. Employees will need to adapt quickly to a broader range of people and ideas in different work contexts. Emotional, creative and intellectual skills will become just as important as technical expertise. The information economy will be small businesses, an entrepreneurial economy.*

This extract from a major report, entitled *Britain Towards 2010: the Changing Business Environment*, researched and written by Professor Richard Scase [1], was commissioned by the Economic and Social Research Council, and I believe it succinctly portrays what many now see as the most likely scenario for future business in the developed world.

Reflecting these views, and those of most developed countries, the British Government has itself developed a White Paper dealing with this future-looking issue, entitled *Our Competitive Future. Building the Knowledge Economy* [2]. It is clear from this paper that the British Government believes the global economy is already with us and, furthermore, that in order for the U.K. to remain competitive and profitable it must fully embrace the new ways of working that it implies. For in such a global economy, "capital is mobile, technology spreads quickly and goods can be made in low cost countries and shipped to developed markets" [2]. This will require a shift in the business mind-set towards greater receptiveness to 'know how' and the ability to see its commercial potential, eagerness to keep on learning at all levels in a business, and a flair in spotting new customer needs and fresh business opportunities. As Professor Richard Duggan reveals, in order to survive "we will all need to look where everyone else is looking, and see what no one else can see" [3].

In such a context, knowledge is *the* primary resource, or, as Charles Leadbetter [4] so clearly puts it, "the engine of growth will be the processes through which an economy creates, applies and extracts value from knowledge". Furthermore, in such an economy, the present author believes it will only be fast-acting, knowledge-aware enterprises with good business acumen that will survive and flourish. Following directly from this, it is clear that it is the small firms who stand the best chance of flourishing in such a context, for it is they, and not the large companies, who have the real ability to develop highly innovative technologies quickly. For, as Utterback's Massachusetts Institute of Technology studies of innovations over the last 100 years confirm, "radical innovation never originates in the large scale market leader" [5].

With the above in mind, probably for the first time in history, innovative small and medium-sized enterprises (SMEs) will have a real need for higher education in order to survive and to put themselves in with a chance of real

success. Such an increase in higher-education demand, from leading-edge knowledge-based SMEs, comes at a time when large blue-chip multi-nationals, the traditional university partner, are themselves looking to internalize their higher learning through their own corporate universities, such as the Virtual University of British Aerospace, Motorola University, etc. As a result, knowledge-driven SMEs are seen increasingly as a huge new market, and as key new partners for future higher intellectual endeavour.

Until recently, even with the above understanding, it has been almost impossible to help such SMEs learn about the new, because their size and scale of working, and their 'hand-to-mouth' existences, did not permit them to release staff for sufficient time to take part in realistic higher education, no matter how well designed or delivered. Fortunately, the Internet, e-mail, the worldwide web and now the concept of the virtual university has changed this situation for the better. As you will have read in other chapters in this publication, and elsewhere, we now have cost-effective means of delivering first-class learning support to SMEs, so that their workers can learn at their own pace, in their own place of work and in a manner most suited to their particular ways of working. 'Just-in-time' learning is clearly now coming on to the agenda of all progressive SMEs as they can increasingly obtain it at a cost they can afford and in a form often better than traditional modes of education can presently offer. So, for instance, Phoenix University in Arizona, U.S.A., now offers a comprehensive series of high-quality courses, worldwide, for as little as US\$7.95 per month, and the British 'University for Industry' (Ufi) intends to offer free online learning packages to support SMEs. Furthermore, this author's own experience with Manchester's 'Virtual Chamber of Commerce' has indicated clearly that SMEs will even pay handsomely for learning that truly supports them, especially if it answers three critical questions: What's in it for me? How will the learning improve my profit margins? Will the learning provision actually enable me to understand my context and how to handle it better?

In other publications, Powell [6,7] has given clear and positive answers to the first two of these questions. In this respect he has shown that once educationalists recognize the needs and demands of SMEs, they can produce learning materials that will support them in such a way as to develop profitable margins through better working practices and knowledge of improved technologies. Bearing this in mind the rest of this chapter deals with the third question posed above. This was felt to be extremely relevant to the current readers of a volume so clearly focused towards developing suitable higher-educational environments that make the best use of virtuality. In this respect, the discussion which follows indicates how SMEs can be helped to become more responsive to 'learning about the new' and then how educational technology providers can produce both the relevant knowledge, and learning support, for these very different forms of learner. I say different, because those who run small firms have rarely been through the traditional academic 'mill', often leaving school early, disillusioned with how they were taught, or rather not taught. They often opted out of conventional learning because it failed to recognize their needs, and they don't want more of the same from a virtual university. This does not mean SME professionals are unintelligent and do not want to learn. Recent studies, sponsored

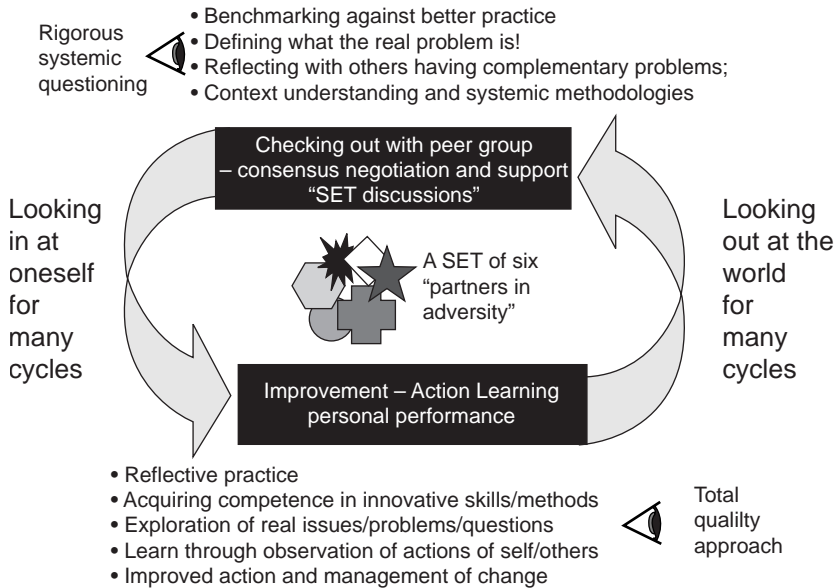
by the European Union's ADAPT programme, of busy professionals from small successful companies reveal them to be well above the norm with respect to intellectual, skill and knowledge attributes, with a desire to improve their understanding through learning [8,9]. However, the research goes on to show that SME learners invariably learn in ways rather different from those who succeed through conventional, academically focused pedagogy.

The remainder of this chapter presents two learning-process support mechanisms that can be used successfully by those who truly wish to support higher learning in SMEs. Controlled experiments with a range of SME learners have shown the importance of providing mechanisms to drive real learning in SMEs. The next major section of the chapter reports how 'Action Learning' can give SMEs confidence to want to learn again, and thence become more innovative. The subsequent section reveals how a four-fold model of learning can be adopted by learning technology designers to develop better educational materials, enabling those with differently pragmatic styles of learning to self-inform themselves to new depths of understanding. Both sections use a case study from construction to illuminate and reinforce the argument.

Virtual universities intending to deal with this new and large group of SME learners should give deeper consideration to the above two learning approaches to ensure that they properly engage this new form of higher learner. For, while the new Internet-based delivery mechanisms available to virtual universities provide the necessary conditions for SME learning, they are not sufficient in themselves to truly open up this process to SME learners.

## **Action Learning — motivating SMEs to a learning cultural change**

People learn best when they want to learn something. Unfortunately, SME professionals have got into the frame of mind where they have become somewhat resistant to change. This is because such professionals, as managers of uncertainty, protect their sanity and parsimoniously manage their way to the completion of successfully finished projects by developing "private frames of reference" [10], which enable them to discuss and understand their problems quickly and effectively. Unfortunately, such frames often 'blind' them to new ideas because they have developed what Lakatos [11] calls "negative learning heuristics", and they also portray what Thompson [12] refers to as "information rejection strategies". These self-protective mental heuristics appear to help individuals keep to their existing professional values, mental models, attitudes and resulting behaviour, thus preventing the ready adoption of new and better ideas and approaches. In this context, the process of achieving a positive learning culture needed to drive SME learners to seek for continuous personal and organizational improvement through higher forms of learning, is neither a trivial nor a short-term exercise. Once a way of working has become embedded in a culture it is indeed difficult to change. The findings from many studies (including those by Powell [6,7] and Green and Simmister [13]) indicate that those who wish to drive such a change process need to work slowly at the change and, little by little, on



### A summary of Action Learning

many different aspects of the learning processes of SMEs at the same time. Action Learning is one of the few learning approaches that has been shown to be generally valuable in helping such busy professionals to want to learn again. The present author believes that, with adaptation, this approach is the best one currently available to underpin the real learning required in a virtual campus which focuses some of its attention towards SMEs; he has recently completed a major programme of studies for construction showing this to be the case for this industry.

The processes of engendering Action Learning in any group are simple in principle. However, getting individuals to adopt such an approach is difficult, and requires subtle and careful nurturing. The core idea behind Action Learning, shown diagrammatically in Figure 1, is to create small mutually supportive groups (known as SETs) of people who band together to solve real problems or difficulties that are not solved in current best practice.

Members of a SET first look inwards at their own problems or failures to understand them, and then try to improve one recognizable quality at a time as they observe a failure, a problem or a weakness needing change. Ideally they should try to deal with larger problems first, or those that appear to have a higher priority or reward. Then they look outside their own knowledge and experience to benchmark themselves against the world's best. Operationally, Action Learning is developed by forming such a small group of people who are prepared to bring with them observations, problems and issues from their own working experience and, by a process of sharing, develop possible solutions to take back to their work and test in practice. Such a group provides a supportive environment in which new, and highly innovative, ideas can develop and be evaluated. In short, Action

Learning is simply a collaborative inquiry with fellow learners who are undergoing the same experience of questioning what to do next. For such a partnership in learning to be effective, it needs to be supportive and, at the same time, challenging, deeply caring and questioning.

The principle aim of any Action Learning SET is to discuss the real personal (not abstract) case problems that its members are currently experiencing; this problem ownership appears to be critical in the learning process. Essentially, Action Learning SET members must focus their interest on simple practical problems that hinder the capacity of any business to improve its work and the quality of its output. This diagnostic stage may last for several meetings. It is always difficult to give examples of how SETs work because they are all very different and part of the purpose of SETs is to identify a member's own real problems in the modern construction industry.

Research by Revans [14] has shown that gradually, through discussion and by asking questions of each other, SETs learn to understand and define some of their problems more specifically and to pick out issues that might be open to some experimental action. One of the major concepts behind Action Learning is that the best way to learn is by trying out ideas in real-life situations and learning from one's own experiences and the experiences of others that one trusts. Something can always be gained even if the new ideas turn out to be failures. If ideas do succeed, then people know that they have learned how to solve the problem, but if they fail, they will also have learned a little more about the nature of the problem.

It could be argued that this is what happens in any work experience. This is true, but the value of an Action Learning SET is that it creates a more formal setting in which a focus on learning can develop. It is the momentum of working as a group that can help the SET act more effectively than if its members were working alone. It is also true to say that in the busy modern world we do not have the time to think about what we do routinely. The pressure of business life, particularly for the smaller business, with the ever-demanding mobile 'phone and too many meetings, make it hard to find time to reflect and improve. Today people are either overloaded with work or are too worried about finding new work. Research shows clearly that by creating mutually supportive Action Learning SETs, and by giving them time to think and reflect on routine business and construction activity, new, more innovative and better ways of doing things will emerge. Let me give you a practical example.

### **A case study of virtual Action Learning — towards remotely supported construction practice**

The present author recently completed a study aimed at finding out how effective Action Learning was in developing more innovative working methods, including continuous improvement, in 28 small and medium-sized building businesses in the construction industry. This programme of work was supported by the ADAPT programme of the European Social Fund, the Innovative Manufacturing Initiative of the Engineering and Physical Sciences Research Council (EPSRC),

the Chartered Institute of Building, George and Harding Group of Building Companies and many other small contractors who have participated in our construction Action Learning developments.

In this case project, specialist Action Learning tutors, chosen for their expertise in leading other similar professional SME Action Learning SETs, were encouraged to use their standard induction and learning-support procedures/protocols to develop 'observed contractor's' innovative learning. The role of the experimenter was not to intervene but to act as a participant observer, simply monitoring and evaluating the entire learning processes, both formatively and summatively, as they developed. The key aspect of the first year of any Action Learning SET's operation is its monthly meetings, which initially are led carefully by an experienced SET advisor. This person helps SET members 'find their feet' by encouraging them to exchange their experiences about their own actions and to explore what they can learn by examining their own actions. SET members also learn how to benchmark their learning against the Action Learning of others in the SET. The following questions are normally asked continually by the advisor to get the dialogue going: "What are we trying to do?"; "What is stopping us from doing it?"; "What can we do about it?" The SET members are also continuously refocused on learning from their own action; superficially this may appear to be a trivial task but in reality professionals find it difficult to maintain such self-questioning. In particular, most Action Learning SETs find it difficult to focus on the diagnosis of their 'own real problems', often preferring to discuss more abstract notions so as not to admit they have any worries, failures or problems. The role of the SET advisor is to gently, but firmly, lead members back to a simple interrogation of their own actions and how they can learn to improve their actions through reflection (supported by other members of the SET).

The case study found that once the SET members gained confidence in their SET, they readily began to explore their own personal concerns and shared them with others who they know would be constructive and helpful. As a result each SET member soon identified key practical questions to pursue and then gained the confidence necessary to find their own way of tackling the questions that they had revealed to themselves, and others, to be important. As the confidence of the SET members developed, the SET advisor began to take a lesser role; and it was at this stage that the project began to support the SET remotely using ISDN-based video conferencing. This simple and cost-effective means of remote but face-to-face communication provided the necessary reinforcement of good Action Learning practices by the SET advisor, who could work remotely. It also provided SET members with continuous remote access to a powerful higher-education construction information database, so that they could 'pull' learning from a suitable information source whenever they felt they needed it. One cannot understate the importance of this 'knowledge pull on demand', rather than the more traditional 'pedagogical push' of training.

When ready, our Action Learners could demand precisely the knowledge they required from a construction 'learning bank' in a 'just-in-time' manner. Salford University set up a range of different learning banks to support the observed needs of SET members. It is difficult to create truly comprehensive and yet responsive learning banks, but the range of options so far offered by

Salford University seems to have provided our Action Learners with what they demanded. Namely, (i) access to a panel of experts; the most responsive learning bank element offered by us is composed of a number of easily accessible experts from the University of Salford's Department of Surveying. They are fully accessible on a construction Action Learning 'chat line' and through more conventional telecommunications. (ii) An asynchronous case material learning bank; case material originally developed in a Chartered Institute of Building scoping study by Powell and Poyner (1996) [15] formed the basis of the more permanent and remotely accessible learning bank, which is mounted on a multimedia server. (iii) A Virtual Construction Index, developed in a recently completed IDAC2 EPSRC study (1998) [16].

Our construction Action Learning SETs therefore had a powerful construction learning bank to satisfy their queries for better technical, process or product understandings. It was always open to them when they knew what questions to ask and what information they required. By the end of the case study, the contractors were, *de facto* and almost without realizing it, receiving higher education in a virtual way. They were enjoying it and improving their innovative ways of working at the same time. They also felt able to take part in high-level academic debate, which even led to a series of new research programmes; one of which has now received major external funding. Our SME learners have become true members of Salford's Virtual University.

Furthermore, during the case study, four construction Action Learning SETs were all formally supported in this way for almost 1 year, with further monitoring for up to a year following formal tutoring to ascertain the power of the process to become self-supporting. In their year of formal support all four small and medium size contractor (SMC) Action Learning SETs developed new ways of working which engendered different forms of creative and innovative construction practices. These fully self-developed and extremely exciting construction process and managerial innovations have given the SETs great confidence in their own creative capability. The members of each SET have recognized the power of Action Learning in engendering better ways of working and learning for themselves, their SETs and their organizations. They now regularly benchmark against each other and against the world's best practices. Even though Salford University staff no longer formally support the SETs, all have continued to the next phase of self-supported growth and we have been excited to monitor their continuing progress.

It is clear that the most difficult phase in any Action Learning SETs development is their early working as a SET. Nearly all Action Learning SET members found it extremely difficult to open up and share their problems and failures with other professionals. Unfortunately I cannot presently see how such a nurturing process can be undertaken remotely, especially with present video conferencing fidelity, but it will come with progress in technology, I am sure. However, once the initial reluctance for people to 'do work on themselves' has been overcome, and they begin to question their old ways and to suggest new ways of working from within, progress towards greater creativity, innovation and productivity in all our construction Action Learning SETs began to flourish. It is



then that the concept of the virtual university comes into play and remote support becomes a reality.

The major finding of this case study was that small SETs of acting as 'partners in adversity', working together, with the facilitation of a SET advisor, can learn from their own actions when they are prepared to question their own previous failures or problems. I have further shown that when a SET gains sufficient confidence in its real technological/managerial needs, but cannot answer its own problems, it soon also feels able to learn from more expert and even highly remote capabilities, such as those now available from Salford's Virtual University and its learning banks. Action Learning does seem to be able to create the sort of deep-seated cultural change needed by the construction industry and to lead to innovative and productivity improvements. The present author believes this finding is more generally applicable across many different SME sectors providing that, once learners are motivated to learn, the knowledge available to them from virtual universities is presented in a manner with which they can readily engage. The next section reveals the importance of this.

### Four-fold approach to improved learning and knowledge transfer

Research by the present author [17] has found that one of the major ways of motivating busy professionals to learn about new ideas, methodologies and technologies and, in the present context, to adopt an Action Learning approach, is to use a language of communication and technology-transfer processes that reflect learners' preferred ways of being informed about the new. In a previous paper [18]

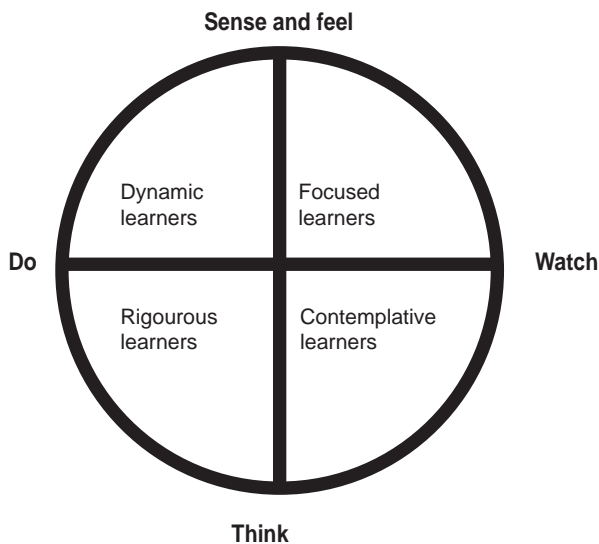


Figure 2

empirically based research was presented which indicated that many professionals adopt only one of four strategic interaction patterns and self-informing strategies when learning about the world of acting and decision making in it. These strategies have been termed dynamic, focused, contemplative and rigorous [17], and a résumé of the characteristics of each is given below. The descriptions of these strategies are interpretations based on a topology (see Figure 2) that combines two previously independent four-fold topologies — Kolb's learning styles [19,20] and Leary's [21,22] interpersonal circumplex — into a single self-informing topology [23].

In short, this work indicates clearly that, for learning-support material to communicate, inform and enable, it has to be presented to prospective learners in one of four ways, reflecting different professionals' needs and demands. For those developing remotely accessible learning materials, such as those to be delivered over a virtual university network, the need to match the style of information presentation with learners' preferred ways of learning is paramount, because in such a system there is no tutor to mediate. Thus any system needs to respect the fact that there are four kinds of learner; their needs are as follows.

### Dynamic learners

Dynamic learners are 'sensor/feeler-doers' in terms of learning. They demand to be deeply involved in any interactive learning process. Simple theory or guidance is no good for these professionals: their learning has to be hands-on; they learn by doing. These learners, located in the top left-hand quadrant of our self-informing strategy typology (Figure 2), have a preference for both controlling action and sensing needs. Emphasis here is on self-discovery and a need for raw experience — a sensory-doing relationship between individual and environment. Exploration at first needs to be private so that no loss of face is incurred, but finally there should be encouragement to share concepts with others. This strategy gains understanding through challenge and a dramatic, active environment — interactive simulation is the perfect medium for such a learning experience. It also encourages independence and assertiveness, providing a perception which allows for an opportunistic nature. Learners within this strategy have an adventurous attitude, which gives them the ability to switch swiftly from being entrepreneurial, initiating profit centres, to rapidly producing innovative change. Such learners are self-centred individuals and this includes their learning, which also tends to be self-directed discovery. They seek to learn through contact with those who do not try to direct them or inhibit their chosen direction. Once acquired they strive to keep in control of these social relationships, including the complexity of information people bring with them to such relationships. Within the resulting and continual information flux, these talented learners are those with the skill to shape the events around them. Wilson [24] suggests that these types of individuals are clearly dividing their perception between "nurturing-helpful things (which it approaches) and noxious-dangerous things (which it flees, or attacks)". Learners who engage this strategy appear dynamic in the sense that their involvement with their environment and others is immediately responsive. They wish to dominate situations and in Thompson's [12] terms be 'the big man', able to change the rules, the ever sharp and smart entrepreneur. Dealing with raw

experience, feeling it and quickly manipulating it, is the only perceived way of informing themselves.

### **Rigorous learners**

Rigorous SME professionals are 'thinker-doers' who want simple standards, guidance notes and the 'facts' so they can get on with the task in hand. Within this topology these learners prefer abstracting patterns and controlling action. Such learners are rigorous in the sense that they observe and act on rules. Learners who use this strategy rely on informing themselves of their environment by means of constructing abstract models, which allow them predictive power over the environment. They are enabled to make decisive statements and act with rigour, knowing that they can back their actions up from a rationalized, theoretical standpoint. The attention of these learners is centred on creating standards both for guidance and as rules to protect their own interests. Rigorous professional learners therefore stand as the guardians of professional standards and aim to produce competent solutions. However, there is a tendency amongst them to give very rigid solutions to design problems and this can lead to designs that are restrictive with respect to human behaviour, where too much emphasis is placed on unseen control. This sense of paying heed to outside control is within their nature as they prefer to work in hierarchically structured organizations. In these hierarchies sometimes such learners will be the boss and sometimes they will be supervised by a superior. In this respect they tolerate the need for group action because this co-operation is an effective way to be kept informed and acts as an authority that provides support for their design solutions. These learners use an interpersonal style that is directive as they plan, organize, present and evaluate their world. At times this way of acting may be interpreted as unfriendly. However, they themselves feel that being frank and honest draws from others clear, precise information. They perceive this approach as effective and efficient in that it avoids any elaboration that may question their perception of the situation. Demand here is for a logical set of procedures that allow a formalized model to be perceived. Computer-based training is an appropriate strategy here. The learners using this strategy know that things can be done if a guiding paradigm is made available. They therefore look for a rigorous bureaucracy to protect their interests and take a stern manner with others in an attempt to avoid emotion. Their desire to negate emotion, of course, only demonstrates the central role it actually plays in this strategy.

### **Focused learners**

Focused SME professionals are 'sensor/feeler-watchers' who are also very practical, but prefer to see the world from the outside. 'Small is beautiful' documentaries and simple metaphoric models of the world give simple explanations that truly enable them. Located in the top right-hand quadrant of our topology (Figure 2) they prefer to be patient or sensing needs. They are focused, in the sense that they both bring into focus the reciprocal harmony of humans and nature, while emphasizing the importance of focusing on what they see as key details within this whole. Learners who adopt this self-informing strategy are looking to respond to, and be in tune with, their environment through

means of adaptation. They appear focused because they attempt to both stand back and directly sense the relationship between individual and environment. They make themselves open to the accumulation of observations, but these observations only gain meaning when such information can be used in a practical, beneficial way to satisfy their needs and, equally important, the needs of fellow human beings. Their strategy calls for a 'down-to-earth' approach where clear-cut reasons and benefits are given. At a group level this strategy comes across as sectist and protective even though on an individual-to-individual basis it is inviting. Focused learners seek to bring forth and maintain a strong sense of group human identity. To achieve this sense of collaboration their predominant interaction with others is centred on being friendly and open. However, such warmth also enables a manipulation of others' views towards their own. In this way their self-informing strategy aims to increase the number of like-minded individuals. This is effective in decreasing the potential for argument and allows these learners to feel instead that others have lent them their support. In other words the focused self-informing strategy is a means to obtain parsimonious solutions that give the least distress to humans and nature. To be a member of a group with similar passion and to work for clients whose values are in accord with their own are prime goals for the focused designer. Step-by-step guidance from respected others encourages confidence and conveys validity in a subject. Documentary films, especially case studies of actual problems, provide the useful information core of this strategy.

### Contemplative learners

Contemplative SME professionals are 'watcher-thinkers' who just need the raw data to mull over, and a complex theory to concentrate on. These learners are found in the bottom right-hand quadrant of our topology (Figure 2) and have a preference for abstracting patterns and being patient. These learners are contemplative in the sense that their preoccupation is biased towards mentally viewing rather than becoming actively and physically involved in order to inform themselves. They have thoughtful intent, but the thoroughness of their contemplation may reduce the possibility for them, by themselves, to take otherwise competent designs to completion. Such learners have a desire to receive unbiased information and in an effort not to be pre-emptive they take a submissive role in interaction with others — encouraging others to convey to them their understanding of events, etc. However, this stance can lead to a lack of self-confidence and an inability to articulate to others the scope of the concepts such contemplative learners have assimilated. A montage of information, especially from primary sources, is appropriate for this learning strategy. This information should present concepts that can be examined fully by means of comprehensive data sets, enabling a thorough investigation of any topic under consideration. Note: few contemplatives actually become practising SME professionals, for people with such an understanding of the world normally become trainers, lecturers and educationalists and perpetuate the conventional ways of the traditional 'telling and showing' pedagogy.

The above descriptions are thumbnail sketches that are described elsewhere in more detail for those who are interested [25]. The main point of the foregoing descriptions is to suggest that each learning style has its own self-

informing strategies. Initially, each self-informing strategy broadly outlines an approach, which allows a sense of order to be given to the seemingly chaotic and endless interactions which manifest between individuals and their environments. This notion is supported by Kolb's suggestion that we all bring a particular pair of tinted spectacles to bear upon the options open to us. Kolb's comprehensive studies [20] indicate that individuality will always preferentially affect an individual's approach to learning and that, once engendered, such a preference appears to become relatively stable.

The present author has developed a template, based upon the above four-fold model and used in Salford University's Virtual Chamber internet project, through which the learning support for Action Learning has been trialed. This will shortly be delivered on a regular basis in support of Salford's Virtual University for SMEs. It enables SME professionals with different learning styles to access learning-support materials reflecting their own world views and information needs.

Empirically based research [18] of busy professionals using such a system has shown how a four-fold model of design-information transfer can be used to enable, rather than disable, content-rich information and technology transfer. The work has also developed protocols and templates of value to other developers of information systems. Multimedia information systems, configured according to this model, have been shown to have a far better chance of breaking through professionals' natural information-rejection strategies and thus properly connecting them to new and different understandings of the world. The research has clearly led to the development of more advanced and precise interface specifications for appropriate knowledge representation, supporting alternative modes of information transfer to busy SME professionals. The developed systems have won three British and two major European awards for quality in Multimedia Design for Interactive Learner Support. In short, developers of information systems for use by SMEs must tailor their systems to the 'four parishes of learning' if those systems are to improve technology and knowledge transfer to SMEs.

## Conclusion

The future for virtual universities is extremely exciting. They now have the opportunity to widen access of higher education to large and highly differentiated groups of people. SMEs, so often educationally disenfranchised, will clearly have the opportunity of benefiting from virtual higher learning. Research reported here has shown that these differently intelligent learning communities will need special early nurturing if their members are to gain sufficient confidence in themselves to want learn. The chapter shows how Action Learning can at least give construction SMEs confidence to want to learn again, and thence become more innovative. It has also shown how Action Learning can be supported remotely, using inexpensive ISDN video conferencing, to enable SET advisors to continuously reinforce good practice. The chapter goes on to reveal how a four-fold model of learning can be adopted by learning technology designers to develop better

educational materials, enabling those with differently pragmatic styles of learning to self-inform to new depths of understanding. This model has been used with some effect to provide a prototype remotely accessible learning bank for busy construction professionals. When the information presented in this learning bank matched the learning style of the SME construction learners their uptake of new knowledge was shown to increase markedly. Careful adoption and adaptation of Action Learning and the four-fold model of learning within any virtual university concept should ensure its ready engagement of this new SME audience.

Professionals from SMEs are differently intelligent to most students attending traditional universities. They will therefore extend the boundaries of traditional debate at those universities, bringing with them new richness, freshness and contextually founded awareness to academic argument. In return, SMEs will acquire new knowledge, skills and understanding that the presently reported research has shown will lead them to become not only more inventive and more innovative, but also more able to ask deeper and more penetrating questions of their own ideas. This should drive them to improve their working practices, to develop better products and services and towards the cultural change needed to ensure sustainable success.

## References

1. Scase, R. (1999) *Britain Towards 2010: the Changing Business Environment*, ESRC, Swindon
2. H.M. Government (1998) *The 1998 Competitiveness White Paper: Our Competitive Future: Building the Knowledge Economy*, HMSO, London
3. Duggan, R. (1997) *Innovation Translators*, Private Communication
4. Leadbetter, C. (1999) *Living on Thin Air*, Viking Publications, New York
5. Preston, J. (1997) Success factors in technology based entrepreneurship, in *Questions of Energy and Technology*, MIT Press, Tokyo
6. Powell, J.A. (1998) *Action Learning in Construction*, Proceedings of ENTAC 1998, ENTAC, Porto Hegré, Brazil
7. Powell, J.A. (1999) Action learning for continuous improvement & enhanced innovation in construction, in *IGLC 7, Lean Construction* (Tommelein, I., ed.), pp. 97–107, University of California, Berkeley
8. Powell, J.A. (1999) Action learning in construction, in *IMI Construction as a Manufacturing Process Review* (Williams, J., ed.), pp. 85–91, EPSRC, Swindon
9. Heywood, J. and Bamber, D. (1999) *ADAPT Study of Learning Styles and Potentials of SME Directors*, Salford University
10. Russell, B. and Powell, J.A. (1983) Model blindness and its implications for some aspects of architectural design research and education, in *Proceedings of the Congress of Problems of Levels and Boundaries* (Pedretti, A. and de Zew, G., eds.), pp. 56–71, Pincelet Editions
11. Lakatos, I. (1978) *The Method of Scientific Research Programmes*, Cambridge University Press, Cambridge
12. Thompson, M. (1986) *Rubbish Theory*, Oxford University Press, Oxford
13. Green, S. and Simmister, S.J. (1999) Modelling client business processes as an aid to strategy briefing, *Construction Management Economics* 17, 3–76
14. Revans, R. (1998) *The ABC of Action Learning*, Chartwell Bratt, Bromley, UK
15. Powell, J.A. and Poyner, B. (1996) *Towards a New Construction Culture*, CIOB, Ascot, UK
16. IDAC2 (1998) Virtual reality in construction, in *Proceedings of Constructions as a Manufacturing Process Initiative* (Williams, J. and MacMillan, S., eds.) EPSRC, Swindon
17. Powell, J.A. (1987) Is design a trivial pursuit? *Design Studies* 8(4), 187–206
18. Newland, P.M. and Powell, J.A. (1992) *Practice Based Validation and Development of an Intelligent Technology Transfer Mechanism for Use by Building Designers*, SERC Final Report, EPSRC, Swindon

19. Kolb, D.A. (1971) *Experiential Learning: Experience as the Source of Learning and Development*, Prentice-Hall, Englewood Cliffs, NJ
20. Kolb, D.A. (1978) *The Learning Style Inventory: Technical Manual*, McBer and Co., Boston
21. Leary, T.F. (1957) *Interpersonal Diagnosis of Personality*, Ronald Press, New York
22. Leary, T. (1989) *Info-Psychology: a Manual on the Use of the Human Nervous System According to the Instructions of the Manufacturers*, Falcon Press, Las Vegas
23. Newland, P.M., Powell, J.A. and Creed, C. (1981) Understanding architectural designers' selective information handling. *Design Studies* 8(1), 1-17
24. Wilson, R.A. (1992) *Cosmic Trigger*, vol. 1, New Falcon, San Francisco
25. Newland, P. (1990) *Understanding Designer's Knowledge Acquisition Processes: a Potential for Enhancing Information Transfer*, Doctoral Thesis, Portsmouth University