Education and Training Issues for National Mapping Agencies in Times of Rapid Change

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Summary

Staff education is critical for success of agencies and is an issue in focus in times of change. At present, change is driven by forces in business, technology, society and culture. It is to be understood also in terms of imperatives for change and in shifting expectations. Change for businesses is manifest in terms of change of information, in organisations, to personnel, in the professions, in the education sector and in society. The education sector is responding to change by developing more open and flexible means of education and focussing more on managerial and skills elements. These need to be incorporated into business culture and into business strategies for education at all levels. Not all agencies experience change in the same way but the trends and their implications are clear.

Introduction

The performance of staff is a pillar of any successful business. There is now a wealth of evidence showing that human factors are the principal reasons behind the failure of many business systems. It is in this context that the importance of education and training is best appreciated. It is the basis for success. Ensuring successful performance is a complex process and in times of rapid and radical change this management role requires the understanding and orchestration of a complex set of issues which is completely bound up with staff education. If national mapping agencies and other similar and related bodies are to remain successful then these issues need to be articulated and made the subject of management action.

As a contribution towards the articulation of these issues this paper outlines the processes which are driving change for the mapping industry and tries to identify the dimensions of change as they are being experienced in organisations such as national mapping agencies. It summarises the types of educational response, which are being developed by some organisations and identifies the risks to successful performance. These ideas are translated into a set of education and training objectives for national mapping agencies.

National mapping agencies belong to a type of organisation that is concerned with information products. It has a high information content in its business processes and is therefore strongly influenced in its functioning by information systems technology. The human factor and the role of education and training in the success of such organisations are well articulated in the literature and there are many lessons from mainstream study of information systems from which the mapping industry can learn (Reeve and Petch, 1999).

The overarching fact of life for such organisations is change. Change, continuing change and intensifying change characterises the information world. This means that organisational learning has to increase and the organisation has to acquire new skills. And this learning and skills acquisition has to become a continuous process. This in turn means that staff in such organisations have, at one level, to be educated to learn and to manage change. At another level their training and education has to be more focussed, more efficient and more strategic. To use the jargon of the moment, education has to shift from 'just in case' to 'just in time' and 'just for you'.

Drivers for change

Trying to understand change at a high level leads us to recognise a number of drivers for change (Reeve and Petch, 1999). At the level of the organisation the main drivers for change can be expressed as the facts that:

- Business is faster – information is of course a key to the acceleration of business. Technical revolutions in information systems mean that business adjustments can be made faster than before. Business processes are faster.
- Technology enables – computing power is increasing at an astounding rate and continues to increase. Changes to software can be made. Software becomes more sophisticated all the time and more and more tasks are accomplished by computers. Not only are mundane repetitive tasks automated but so too are complex subjectively controlled tasks such as decision making and design.
- People matter – rather than being regarded as units in the production process whose activities can by prescribed, whose roles can be given and who operate under the sole guidance of managers, people within organisations are increasingly recognised as participating in the business. Their roles are seen more as self-defining and organic and evolving.
- Culture changes – related to all these other drivers is the development of different organisational cultures. These relate to the assumptions under which businesses operate and to the bases of the relations between people inside and outside organisations.

At the cultural level, or the level of behaviour and social interaction, a number of other drivers need to be recognised in our attempt to understand change. They can be summarised as:

- The technical imperative – the seeming need constantly to acquire and use new technology, bolstered by the competitive and compliant tendencies of business.
- The imperative for progress – the need, based on the assumption that progress is good, constantly to embrace change which seems to advance an organisation or an individual to a goal.
- Shifting expectations – in a world, in which the new can be demonstrated, promised or merely articulated, people expand their conceptions of what might be possible and consequently expect more.

This complex collection of forces, processes and conditions are what lie behind the changes that are being experienced in organisations. Analysing and managing changes and working out their implications for education and training requires we identify the ways in which change is affecting the mapping industry. These are the different dimensions of change, which have a concrete association with organisations and people.

Dimensions of change

Six dimensions of change are considered as representing the scope of the problem for analysing the role of education and training in national mapping agencies.

Information use

Developments in information technology ensure that information is more accessible and generally more usable by more people. The use of networked systems and the penetration of IT to every sector of organisations has also engenders more integrated information management. Information from corporate databases becomes the common currency of all levels of personnel. Information becomes shared. Such extensions of data use change to roles of people in organisations as well as their relations to people outside.

Organisation structure

Changing information access and use promotes change in organisational structures. There is a tendency for them to become less vertically structured and to have greater integration. Their structures at a micro level are more fluid to reflect the realities of day to day work as business objectives and work patterns shift. Here there is a tendency to move from structures appropriate for production line working to those which fit project based work.

Personnel

At the level of the individual these changes mean that work becomes less mechanical. People have to be more adaptive, have to manage their own work more and communicate more with people inside and outside their organisation. There is a greater emphasis on the career of the individual rather than their position in a proscribed professional structure.

Professions

Professional structures become more diffuse as the roles of professionals are less easy to define. The progression through professional status is also less clear. Professional development is seen as a continuous process rather than one of incremental achievement. There is a strong shift to integrated skills as opposed to specific, identified technical skills. Accordingly professional bodies have to adapt as the nature of the professions changes. This is a slow process that from outside is seen often as a battle ground between traditional and progressive elements.

Education and training

The further and higher education sectors, which traditionally have supported the mapping industry, are undergoing radical changes. These changes are remarkably similar across disciplines and countries. Within education there is now, because of the coincidence of the pressure of resources and the opportunities of new technologies especially the Internet, a shift to different modes of teaching and learning. Teaching and learning are becoming more open and flexible. There is a shift to student centred learning. At the same time there is a break down of the traditional pathways to education with more part time, distance and continuous education. All these modes of learning are made viable by new technologies.

Allied to this are shifts in the style and quality of educational material as the Internet and other technologies open up what is in fact a keenly competitive market. Improvements are possible in spite of diminishing resources in the education sector generally because of technology and improvements in the education business processes. Flexibility, market orientation and cost-effectiveness are now key elements of education provision.

Society

There is a shift in many countries to what has been termed the information society. One aspect of this is a society in which decisions and the information on which decisions are made are more and more in the public domain. Individuals increasingly want to share in those processes that they see as affecting their well being or destiny.

The educational response

Traditionally, education for the mapping industry sector has been based on further and higher education provision and in-house technical training. Such education has been controlled or strongly influenced by the major professional bodies through systems of accreditation. Mainstream professions in the information industries have highly structured systems of professional qualification with detailed specification of career structures and career levels with corresponding education and training components. Traditional programmes fitted these structures closely

Such traditional education provision in the mapping sector is in decline as the markets for traditional skills change. The need for change is exemplified by the analyses of the situation in education in the countries of eastern and central Europe (UN MOLA Conference, November 1998). These were summarised as:

- focus on technical skills rather than management skills;
- lack of education in legal, economic, human and ethical aspects of land administration;
- lack of user oriented approach to education; and
- lack of continuity in education.

The consensus on the needs for education was for:

- mix of technical, managerial and sociological education with training in transferable skills of communication, problem solving and learning to learn;
- education sector managing for change and inculcating this approach in students;
- both education and professional sectors need to be more strongly user oriented; and
- education sector needs to adopt new technologies.

Some institutions have, in line with developments in mainstream education, tried to anticipate and respond to the current shift in demand and provide courses that meet these needs (Ryttersgaard, 1998; Enemark, 1998). Enemark summarises these shifts in terms of three areas. First, management skills that are developed as opposed to specialist technical skills. This has involved a shift from traditional technical skills and push button technologies to skills of interpretation and management of data to meet the needs of clients. Secondly, project base for education as opposed to a subject base. The shift here is from traditional technical skills (knowing how) to management

and problem solving skills (knowing why) with a focus on learning to learn. Thirdly, lifelong learning as opposed to vocational training. Here there is a shift from learning for life through university graduation to lifelong learning through continuous professional development strategies and distance learning.

Overall these changes can be summarised as a blending of traditional technical and natural science disciplines with social science disciplines to create an interdisciplinary area. This area has a strong focus on management and meeting user needs and includes the idea not only of managing within change but of managing change itself (Ryttesgaard, 1998).

These changes, especially those to distance and lifelong learning have come increasingly to rely on the new CBL (computer based learning) and Internet technologies. It is important also in assessing education needs and provision to understand the potential and problems of these technologies. At a basic level what they provide is on-line learning, that is access to materials, exercises, resources of all kinds and to various kinds of communication and support tools. Tools exist for discussion groups, tutor support, on-line lectures as well as for interactive exercises, on-line data processing and mapping and a host of other tasks that emulate more or less what happens in more traditional educational settings.

In concert with these delivery technologies the technologies to access and manage materials from the Internet are also being developed The Instructional Management Systems Project is foremost amongst these in creating the protocols, standards and tools necessary for building educational products from materials accessed over the web (http://www.imsproject.org).

In reality these technologies are immature in the sense that the ways in which effective education is achieved have not been well or fully worked out. The idea that large numbers of students can be supported via the Internet or using CBL at little cost and with minimal contact with educators is a myth. The education sector has embarked on a massive experiment in its means of delivery and the way to success is not yet fully clear. In fact there are major risks to education development based on the Internet that the educational sector is coming to be aware of. These can be expressed as the technological risks, institutional risks and quality risks (Petch, 1998). The main technology risk is the skills shortage in designing and creating materials and adequate sites for supporting programme. The main institutional risks relate to incorporating Internet and CBL courses into existing academic infrastructures and the problems of copyright and IPR. The main quality risks relate to the intellectual level of materials and the loss of personal contact. In other words these technologies are not a quick fix for meeting the changing needs for education. They are however the chosen route for much education development and for the more progressive educators who are seeking to adjust provision to the changing needs of the mapping industry.

One aspect of the technology-based education that is important in the context of this discussion is the manner and extent to which the old relations of educator to student are overturned. Students can control access and progression as opposed to educators. The student decides when to get on-line and takes material in the order they want and at a rate they control. In this way the traditional educator-student relations collapse and there is a tendency in this style of education to look for models of self-governed or negotiated learning. Education becomes much more of a two-way process with students learning from each other and with the educator becoming more of a manager of the learning experience in which they are participating rather than a guru or expert handing down knowledge. Such learning models do not sit comfortably with hierarchical organisational and professional structures that have more traditional mind-sets of the education process.

In short, the education sector is in the process of a radical transition that has dimensions in the curricula to support professions, in the educational pathways students follow, in the modes of education and in the technology it uses. The education and training for professionals in national mapping agencies must be decided and designed with this set of issues as a framework. And this is in spite of the fact that the whole situation is fluid and there are no established experts in the new forms of professional education.

Education in national mapping agencies

The changes outlined above in the mapping professions, in the mapping business and in education all point towards the development of a particular model of education and training in national mapping agencies. That model has several elements that relate to the working of these agencies at every level from their place in society, through strategic and management levels to business processes. These elements can be understood in terms of the risks agencies face and the sorts of response that are needed to deal with these risks. The point here, of course, is that part of the response is going to be education and training.

The greatest and most pervasive risk to an agency, or to any organisation, is the failure to recognise the nature of the business it is engaged in and how that business is changing. Not all agencies are the same of course but the principle is common. There has to be a functional and cultural self-awareness of what the business is about and how it works. These issues may not be critical in periods of stability when roles and relations within organisations don't have to be thought through and when traditions of working at every level are established and in line with professional structures. In periods of change however, staff at every level have to develop a shared concept and a personal view of what is going on. Too often failure of business is due to a failure to understand business objectives and to the inability at all levels to translate business objectives into business processes.

There has to be linkage between the culture (for example, power structures), business processes and business methods in an organisation. Part of the education particularly of senior people in organisations has, therefore, to be about the culture and the structure of organisations. Senior people especially need to understand (be educated in) the models of business structure and the elements of business culture and how both these relate to business methods, to processes of change and to management.

Effectively meeting objectives requires an understanding of how the nature of business relates to information systems processes and their design. Part of this story is about understanding how the methods used by designers, managers and operatives are critical to success. The study of management methods is not some esoteric, marginal activity for academics. It is central to having sound, appropriate information systems and business processes. Traditional methods of management are widely regarded as inappropriate to modern information systems operation and to working practice in organisations (Reeve and Petch, 1999). Traditional hierarchical, stable, narrowly defined roles associated with these methods are also widely regarded as inappropriate. A key element of education has therefore to be about methods and roles of working. Critical to this has to be an acceptance (education) of executives (those who rule) that everyone has a role in management, that participation is crucial to success and that nothing is stable.

Below the executive level there is in the mapping industry, as in other related industries, a well-recognised agenda for improvements in education and training (Ryttersgaard, 1998; Enemark, 1998). In brief, education has to move away from the traditional, well prescribed skills of professionals with an emphasis on professional quality and stable career structures to situations in which emphasis is placed on management skills, on project skills, on managing under conditions of change and on learning to learn. Of course this ‘requires’ cultural change in organisations as well as by individuals and there should a clear understanding that the skill of learning to learn is fundamentally an intellectual skill. All this has to be applied to the education in the context of education in the traditional areas recognising that the core business of mapping agencies remains fundamentally the same but the operating environment is different. There is a need to recognise also that having a professional skill alone is not enough.

These areas of skill, understanding and practice which are necessary to the success of modern organisations can be identified and understood. Mainstream information organisations and the more progressive elements of the mapping education world are now addressing the key issues for business success. The educational agenda for mapping organisations (as for any other type of organisation) cannot however be met simply by addressing educational needs with encapsulated programmes of training for the sorts of skill we have identified above. There is more to education and organisational success than that.

Two issues are especially important. First is the creation of systems of personal and institutional incentives for both individuals and sectors of a workforce to embark and complete education and training programmes. Personal incentives for education and training have to relate to the perceived career benefits of education, which can be articulated in terms of professional development and accreditation systems. Some of these systems have been worked out to very high levels of precision based on a matrix of career pathways and career levels. Typical of these matrices are those produced by the British Computer Society and the ISO. They are adopted and copied widely. However, they have an inherent tendency to fossilise career structures and narrowly to prescribe areas of responsibility as well as career pathways. A related problem for organisations is how to fit their ambitions with the model of the educational process implicit in professional structures. This means of course, that organisations may find difficulty in fitting the organisations ideas to those of the professions as the realities of business move ahead faster than the professional bodies.

Secondly, the message from mainstream management and business analysis is that education needs to be integrated into the business. There are parallels here with the ideas about the integration of information systems strategy with business strategy. The point is that there is risk in independently articulating a business strategy and an information systems strategy. They are likely to be incompatible and this indeed is found in many organisations that have a poor information infrastructure. There is risk also in devising an information strategy in the light of a business strategy since the information strategy has itself implications for how a business is run. The two should be worked out together as one part of the same strategy. By extension the education strategy should be part only of a single coherent strategy dealing also with business objectives, information systems, business processes, marketing and financial objectives. Education is rarely considered in this constellation of issues but the point being learned by many organisations in mainstream information business is that it should.

Education and the real world

The analysis of education need in mapping agencies rests on the stated assumptions about the changes in education, in the professions and in business. It represents a model which, therefore, may or may not apply to any specific agency (or at all in reality) depending on the degree to which the assumptions are met. It has to be accepted that not all agencies fit the same business model. Not all social or business cultures are the same and this in turn means that not all are susceptible or amenable to change to the same degree, Neither are all business situations the same so the forces affecting agencies will differ. Further, not all agencies have the same sorts of relations to the education sector or to professions and many of the points made about education may be altogether inappropriate. However, what the trends are and what they mean is clear.

In the modern world there is a surprising degree of uniformity in business pressures and a globalisation of activity and perspectives. Many in mapping agencies and in education have expressed the points made here about the nature of change and its implications. It seems the pressures are common to a diversity of economies and cultures. So whether or not the model fits or the specifics of the implications are appropriate there is at least a clear message about education. That is that the elements of change and the possibilities for response are at the very least a checklist of issues for national mapping agencies behind which stands the principle of the key role of education.

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