THE ROLE OF INTERNATIONAL GEOMATICS ORGANISATIONS IN THE PROMOTION OF CONTINUING PROFESSIONAL DEVELOPMENT (CPD)

David Fairbairn [a, *], David Fraser [b]

[a] School of Civil Engineering & Geosciences, Newcastle University, Newcastle upon Tyne NE1 7RU, UK
dave.fairbairn@newcastle.ac.uk
[b] School of Mathematical & Geospatial Sciences, Royal Melbourne Institute of Technology University, Melbourne 3001, Australia david.fraser@rmit.edu.au

Commission VI, Mid Term Symposium, Enschede, June 2010

KEY WORDS: CPD, syllabus development, distance learning, international geomatics, cartographic education

ABSTRACT:

A number of diverse issues including changing labour markets, a perception among employers that employee competence in a job must be maintained, rapid development and obsolescence of technologies, globalisation and embracing of international standards, and developing views on the role of education, have directly led to an expansion of the supply of and demand for Continuing Professional Development (CPD) resources in recent decades. There is scope for international organisations in the discipline of geomatics to pro-actively create and provide CPD material. This paper addresses the various methods by which such organisations can and do address such tasks.

The nature of CPD is considered: the process is modelled and each component is examined in the context of geomatics. Firstly, the type of person and institution interested in CPD (the consumer) is addressed. Secondly, there is a range of suppliers of CPD resources including commercial companies, educational establishments or international learned societies. Thirdly, the material delivered also forms part of the model: there a wide range of content, available material, and dissemination method.

Members of the Joint Board of Geospatial Information Societies (JBGIS) include the leading international learned and scientific organisations devoted to the discipline of geomatics. The approach of one JBGIS member, the International Cartographic Association (ICA), is examined in more detail. The embryonic CPD programme of ICA's Commission on Education and Training is described, and the scope of the current programme is presented.

1. BACKGROUND

Education in geomatics can be divided into the introductory and contextual material encountered at high-school level, the specialist and vocational material provided by formal university and college courses, and continuous education as a part of the profession (the latter also includes training and practical 'on-the-job' knowledge acquisition) (Virrantaus et al., 2009). The latter, termed Continuous Professional Development (CPD), can itself be perceived in a number of different ways: a) it can be used to ensure employers maintain a competitive edge; b) it can be focussed purely on the personal development of an individual; c) it can be used as a direct replacement for formal education programmes (often in a remote manner, as in distance learning); and d) it can be used as a mechanism for ensuring establishment and maintenance of competencies against accepted thresholds.

There are a number of diverse issues which are changing the CPD landscape currently. These are both driven by, and are having an impact on, the geomatics profession worldwide. Most notably the profession itself is changing and this has a major impact on **labour markets**. Professionally, geomatics is fragmented, with a range of sub-disciplines, some of which are co-operating or merging (e.g. photogrammetry and remote sensing), whilst others are being marginalised or de-skilled (e.g. positioning). Geomatics skills are being devolved and other disciplines (e.g. computer science, engineering) are readily absorbing geomatics technologies. In order to preserve the identity and uniqueness of geomatics, it is important that those representing the industry undertake continuing professional development to maintain their 'expert' status. This can be done by ensuring that the geomatics profession, however it is organised, is politically adept, able to identify the body of knowledge that it owns, asserts its professional structures and qualities, provides accepted expert advice to government and industry alike, and maintains relevance and quality by training and re-training an effective workforce.

There is a perception among employers that **employee competence** in a job must be maintained. Thus, whether or not new recruits have received appropriate education and training in the classroom before joining industry there is considerably more in-house training undertaken today. In addition, it is recognised that individual scientists and engineers are often reluctant to take responsibility for their own training needs (Lorriman, 1997) and that CPD is, therefore, a supply-driven process, in which employers and industry are promoting such training in a compulsory manner. Clearly there is some self-interest involved: an individual will be reluctant to undertake CPD activities unless they are supported by his employer and will lead to promotion within the industry, increased salary or both, but in practice much CPD is imposed.

The rapid **development and obsolescence of technologies** is an associated phenomenon which is driving the expansion of CPD, and, within geomatics, the **rise in globalisation and the embracing of international standards** are particular trends

which have led the industry to recognise the importance of maintaining competence. These trends are evident globally, despite the ongoing disparities in education and literacy in relation to age, gender and ethnicity, and the uneven provision of education across nations and regions.

An important role for international organisations in geomatics is to meet the implicit demand from industry and society for CPD and to act as a supplier of CPD resources, whilst acknowledging the nature of the issues highlighted above.

2. THE CONTRIBUTION OF INTERNATIONAL GEOMATICS ORGANISATIONS

There is scope, therefore, for international organisations in the discipline of geomatics to pro-actively create and provide CPD material. This paper addresses the various methods by which such organisations can and do address such tasks, concentrating on the activities of the International Cartographic Association (ICA).

Within the member organisations of the Joint Board of Geospatial Information Societies (JBGIS), a number of initiatives in CPD are being pursued. Under the broad heading of **capacity building** which is a major aim of JBGIS collaborative activity, education in general, and CPD in particular, are noted. However the JBGIS societies which do address CPD tend to do so at a national level - the level of their adhering members. Thus, although the Fédération Internationale des Géomètres (FIG), for example, does have a long-standing interest in CPD (currently manifest in FIG Working Group 2.3 - Educational Management and Marketing which has a commitment to "promote the need on CPD" (FIG Office, 2007)), it tends to devolve CPD responsibility to member organisations. For example, the Hong Kong Institute of Surveyors has an active CPD programme with points awarded for educational activities in the field of land surveying (HKIS, 2010).

A similar procedure is evident in ISPRS, which has national members which operate their own independent certification and CPD schemes. For example, ASPRS, which has a successful accreditation scheme in specific disciplines (Photogrammetry, Remote Sensing, GIS/LIS) offers nationally recognised Continuing Education Units through its collaboration with George Mason University: these are awarded and recorded as a result of participation in professional activities.

Clearly there are links between **certification** - the recognition of an individual's education, training, competence, achievement and adherence to a professional standard - and **CPD** - with which that individual maintains and enhances these standards. In most cases, certification *requires* subsequent attention to keeping up-to-date, and therefore an established programme of activities needs to be created to allow certified individuals to embrace CPD and show continuing competence.

National certification and CPD programmes in geomatics have occasionally been informed by earlier work at the international organisation level, which has been disseminated downwards to member nations, but the majority of such schemes have been developed internally due to the need of the national member organisation to promote an official method of professional accreditation within their own country. Such professional accreditation is less common in the field of cartography, and there is consequently lower level of interest among member nations of ICA in developing certification and CPD schemes of their own. ICA has therefore, through its Commission on Education and Training (CET), undertaken significant work itself to establish a means for cartographers to embrace CPD.

3. ICA AND CPD

The role of ICA in CPD is driven by perception c) above - that there are individuals in member nations of ICA who do not have access to formal educational and training facilities and opportunities, and who therefore need distance learning, refresher, and/or introductory courses - and by perception d) - that the specialist cartographer needs to ensure his status and expert knowledge by establishing and maintaining competencies in the specialist discipline. The CPD programmes which have been developed by ICA, therefore, include a range of syllabus-focussed **content** to be used in curriculum (and more extensive formal programme) development, as well as a graded set of possible **activities** for participants to undertake, and also refresher **workshops** given by ICA-recognised experts.

In all cases the CPD material is presented or actively delivered to those member nations of ICA who request it. The syllabus-based material can be used to develop a professional certification and continuing CPD programme, allowing individuals to accumulate professional development points leading to national certification, which would need to be regularly renewed. This achieved certificate could be used by a cartographer to gain employment, or promotion. It would show that there has been active involvement in improving education, training and skills in cartography notwithstanding possible lack of a formal cartographic education. The graded set of activities gives ample opportunity for practicing cartographers to use their everyday professional skills to contribute to a record of achievement. The workshops are a popular and successful means of information transfer, designed to bring expert knowledge to substantial groups of aspiring cartographers.

The process of CPD is modelled in this paper to include three aspects - the consumers of CPD material, the suppliers of CPD, and the content of CPD courses - to allow for closer examination of the ICA approach.

4. ICA CPD CONSUMERS

In cartography, the consumer of CPD could be an employee within the industry, looking to maintain professional recognition and/or attain higher levels of expertise. However, because of the reluctance, noted above, of individuals to regularly embrace CPD programmes, it is more likely that geomatics companies, governmental mapping agencies, and spatial data analysis consultancies will consume formal CPD programmes on behalf of their staff.

Such programmes will benefit the international cartographic industry by:

1. providing international recognition for cartographers who improve their cartographic skills through lifelong education and training;

2. ensuring cartographic, and related continuing professional education, services meet the needs of cartographers specifically and the geographic information sciences industry in general;
3. providing recognition through the ICA for cartographers who continually make a commitment to maintaining and improving their professional status.

It is expected that the participants will feel 'rewarded' for maintaining a personal professional development profile. The reward will be acknowledgement by ICA which, through continual upgrading of knowledge and skills, will ensure recognition as a Certified Practicing Cartographer by the Association. A certificate will be provided to the participant every two years.

To qualify for the certificate, participants need to demonstrate that they have a high level of skill and knowledge in areas of their own choice, obtained, in part, from a blend of academic and non-academic education and training. A minimum number of accredited points have been set for qualification. Accreditation points will be allocated to each participant for a rolling 2 year period. The points accredited will vary according to the amount and nature of the CPD undertaken.

If the required level of professional development is not maintained then the participant's accreditation will lapse. Accreditation upgrade from bronze, to silver, to gold, can be achieved by a participant reaching a predefined level of professional development activity within a defined number of consecutive years of involvement in the CPD programme. Once this is achieved the participant's status will remain for one year. The participant would need to maintain, or improve, the level of CPD activity to retain or advance from the bronze, silver or gold Certified Practicing Cartographer accreditation.

5. ICA CPD PROVISION

There is a range of possible suppliers of CPD resources: commercial companies (in the cartographic discipline, some large GIS companies have significant CPD programmes), educational establishments (the authors have experience of CPD courses in geomatics topics offered from within their own institutions) or international learned societies (such as ICA, through its CET).

The ICA Commission on Education and Training terms of reference include:
1. developing the existing ICA-sponsored Internet Cartography Teaching Programme (modules), with regional workshops for training the teachers;
2. producing an ICA-sponsored Internet programme specifically for continuing professional development, with regional workshops for training the teachers;
3. supporting cartography and cartographic education in developing nations by holding seminars in these nations;
4. promoting joint project cooperation between participating nations represented on the Commission.

CET has identified a number of competencies which contribute to the professional development of a cartographer and the following components of the CPD programme have thus been identified:
1. clear objectives for CPD programs that meet the needs of the cartographic profession;
2. provision of a means of assessing the standard of the competencies, gained through CPD courses, and activities based on achievement and performance levels attained;
3. provision of a way of accrediting genuine self-initiated/self managed learning that is relevant to the profession;
4. provision of a basis for allocation of resources to the CPD programme by the ICA;
5. provision of a model that will enable the CPD programme to adapt quickly to meet changing labour market requirements.

There are implications for any provider of accreditation and CPD delivery in terms of creating and maintaining content; publicising and disseminating resources; managing participants; assessing quality; liaising with other governmental, industry and educational organisations; reacting to appeals; ensuring continuity; and installing insurance to cover those accredited cartographers who may not perform adequately. The totality of such activity is beyond the resources of a volunteer organisation so, like the other international societies within JBGIS, ICA does not intend to promote its own formal qualification in cartography.

Instead ICA provides the framework which defines the required material, the schedule, and the management of personal details of those seeking recognition. The framework can be accepted and modified by any national cartographic organisation which wishes to establish an accreditation and CPD programme. Alternatively, ICA can manage the programme itself in those nations where a formal structure is not available.

6. ICA CPD MATERIAL AND DELIVERY

The bounds for the CPD programme have been defined to give consideration to the tasks undertaken by the current developments in the geographic information sciences. In essence, ICA CET has developed a set of activities and curriculum headings, many supported by online material, along with a framework of developmental activities, and an intensive course which can be delivered on request.

In cartography, there is a wide range of possible content, varying in academic level, proportion of theory to practice, potential for static or dynamic delivery, and level of integration/progression/structure which the resources demonstrate. The material may well consist of complex geospatial data sets, resource-hungry software and, with high-speed connections perhaps assumed, dissemination is the final issue: methods can range from on-line, real-time, distance learning, to traditional, classroom-based, block release courses. In addition, there is a further set of activities which are incorporated into the CET framework.

The online material which can contribute to the development of both basic and advanced courses in cartography is an ad hoc, but comprehensive range of **content** sourced with agreement from a number of institutions active in cartographic education, as well as ICA-branded educational material itself (Commission on Education and Training, 2007). Such material is not designed for CPD purposes, but can give insight into the range of possible subject matter which is acceptable for advancing cartographic knowledge.

	CREDIT POINTS		
	High	**Medium**	**Low**
Conference attendance/ organisation	30	20	10
Award	50	30	10
Prize	20	10	
Formal Qualification	100	60	40
Participation at seminar	20	10	5
Attainment at training programme (Univ/tech. college/in-house)	30	15	5
Publication	60	30	10
Holding of office in the ICA	50	30	10
Research project undertaken	50	30	10
Industry project undertaken	25	15	5
Technical visit	20	10	5
Other contribution to the employer	30	20	

FOR EXAMPLE: The International Cartographic Association, requires each participant to undertake 70 points worth of CPD. Thus a Type A seminar, a couple of Type B technical visits and attainment at a Type A training programme would satisfy the CPD requirements for accreditation.

NOTE: Credit points must be accumulated across three or more categories over the two year rotation period.

Table 1 Credit points for CPD activities

Week 1	**Week 2**	**Week 3**
Geography (Physical / Quaternary)	Geographic Information Systems	Digital Generalization
Environmental sustainability	Remote sensing	3D maps and Geovisualization
The Earth's geometry	Internet mapping	Multimedia products
Projection systems	Atlas production	Location Based Services
Cartometry	Prepress and digital printing	Cartographic animation and Dynamic maps
Cartographic theory	Map Types	Navigational maps
Topographic maps	Map evaluation	Geovisualization techniques
Map Design (Symbols and layout)	Usability of cartographic products	Toponymy

Further alternative topics: Application of the mapping sciences to agriculture; Car Navigation; Cartographic design; Cartographic education; Computer assisted cartography; Electronic battlefields; Geographic/ Geospatial education using ICT; Geospatial Information Science; Geospatial information systems and nature-based tourism; GIS and Cartography on the Web; GIS design; GIS theory; GIS visualisation; History of colonial cartography; Internet applications of cartography; Land capability assessment; Map design; Map production; Orienteering maps; Prepress design and layout; Relief description; Research methods; Triangular networks for digital terrain models; Web-based cartographic research; Web-cartography; WebGIS

Table 2 Possible workshop syllabus and alternative topics

The framework of **activities** which can be used to contribute to actual CPD record of achievement is summarised in Table 1, which sets out the credit point allocation for particular activities. To receive credit for any activity a participant must provide proof relating to the nature and content of the activity undertaken.

The **workshop course** is designed solely to benefit cartographers, GIS officers and students in the host country. The timing and content are flexible and determined after consultation with the host organisation to ascertain their specific education and training needs. Generally the course consists of three, one-week parts, each of which can be offered as a separate entity by up to two specialists in cartography. Possible content is outlined in Table 2. Hands-on practical exercises can be undertaken by all participants using in-house software, if computer facilities are available. In order to ensure the active participation of expert teachers, a structured and budgeted agreement on the content, nature of delivery and support for the experts must be set up. Such courses have been effectively undertaken already by ICA CET appointed teachers to a wide range of practicing cartographers in Iran, Indonesia and Vietnam.

6. CONCLUSION

The aim of the ICA CPD programme is to provide all member nations of the International Cartographic Association with guidelines, should they seek to implement a Continuing Professional Development programme in their country. It is important to realise that it is **not** designed for those who have access to formal academic programmes in their own nation. For nations without formal programmes this CPD programme may provide a way for individuals to break through any financial, political, educational or social constraints they may face. The programme will provide an added purpose, and a goal, for their continuing professional development activities and will allow them to be recognised nationally for their endeavour.

This CPD programme will contribute to the objective of having ICA member nations at the forefront of the practice of geographic information management and presentation, thus enhancing the nations ability to provide an efficient and effective service to the international and national communities of cartographers.

7. REFERENCES

Commission on Education and Training, 2007. "Internet Cartography Teaching courses." (lazarus.elte.hu/cet/).

FIG Office, 2007. "FIG Commissions Workplan 2007-2010. Commission 2." (http://www.fig.net/comm/wp_07_10/wp02_07_10.htm). Accessed March 2010.

HKIS, 2010. "Hong Kong Institute of Surveyors, CPD list." (http://www.hkis.org.hk/hkis/html_lsd/professional_cpd.jsp) Accessed March 2010.

Lorriman, J., 1997. *Continuing Professional Development: A Practical Approach*. The Institution of Electrical Engineers, London.

Virrantaus, K., Fairbairn, D. and Kraak, M.-J., 2009. The ICA Research Agenda on Cartography and GIScience. *The Cartographic Journal*, 46(2), pp. 63-75