

DEVELOPING INNOVATIVE, SUSTAINABLE AND EFFECTIVE EDUCATIONAL AND TRAINING PROGRAMS FOR THE ASIA PACIFIC REGION: A CASE STUDY

R. FURNESS (Member, Academy Board)

D. WARDLE (Director, Program Development)



Abstract

Formal training in the professions of hydrographic surveying and nautical cartography has long been an issue within the Asia-Pacific region. In the Australasian and S.W. Pacific regions specifically, due partly to geographic considerations and the small sizes of potential student cohorts, training and educational programs have been notoriously difficult to maintain. When combined with a general lack of client support over many years by industry for cartographic programs within the main education sectors, appropriate professional educational and training opportunities in hydrographic surveying and nautical cartography are minimal. There are, no doubt, many possible options. After discussing regional imperatives, we present a case study of how one organisation has developed a model to redress the identified problems. The case study covers a methodology for delivering internationally recognised courses that have been successful in meeting both its own requirements as well as those of its clients within both public and private sectors. It is hoped the lessons learned will provoke thought for those seeking to solve the dilemma of a changing profession and a changing core of students within our particular region.



Résumé

La formation officielle pour les professions liées aux levés hydrographiques et à la cartographie marine est une question récurrente depuis longtemps dans la région Asie-Pacifique. S'agissant en particulier des régions australasienne et du Pacifique sud-ouest, il est bien connu qu'en raison notamment de facteurs géographiques et du nombre d'étudiants potentiels peu élevé, les programmes de formation et d'enseignement sont difficiles à maintenir. Ajouté à l'absence en général et depuis plusieurs années de soutien en tant que client de la part de l'industrie pour des programmes de cartographie au sein des secteurs éducatifs principaux, les opportunités professionnelles, d'éducation et de formation dans les domaines des levés hydrographiques et de la cartographie marine sont minimes. Il y a, sans aucun doute, de nombreuses options possibles. Après avoir examiné les besoins de la région, nous présentons une étude de cas sur la manière dont une organisation a développé un modèle afin de remédier aux problèmes identifiés. L'étude de cas traite d'une méthodologie permettant de dispenser des cours homologués sur le plan international qui ont réussi à satisfaire les propres besoins de l'organisation ainsi que ceux de ses clients dans les deux secteurs public et privé. Le retour d'expérience devrait susciter la réflexion des personnes cherchant à résoudre le dilemme de notre région particulière avec d'un côté une profession en mutation et de l'autre un profil d'étudiants évolutif.



Resumen

La formación oficial en las profesiones de los levantamientos hidrográficos y la cartografía náutica ha sido durante mucho tiempo un tema en la región de Asia y del Pacífico. En las regiones de Australasia y del Pacífico Suroeste especialmente, debido en parte a consideraciones de orden geográfico y al reducido tamaño de los entornos de los estudiantes potenciales, los programas de formación y educativos han sido notoriamente difíciles de mantener. Combinando lo anterior con una ausencia general de atención al cliente durante muchos años por parte de la industria en lo referente a los programas cartográficos en los principales sectores educativos, las oportunidades adecuadas profesionales, educativas y de formación en los levantamientos hidrográficos y la cartografía náutica son mínimas. Sin duda alguna, hay muchas opciones posibles. Tras discutir sobre los imperativos regionales, presentamos un estudio de caso de cómo una organización ha desarrollado un modelo para corregir los problemas identificados. Este estudio cubre una metodología para la entrega de cursos reconocidos a nivel internacional, que ha tenido éxito en el cumplimiento de ambos, sus propios requisitos y los de sus clientes en ambos sectores, el público y el privado. Se espera que las lecciones aprendidas harán reflexionar a quienes intentan resolver el dilema de cambiar de profesión y a un núcleo cambiante de estudiantes en nuestra región en particular.

EDITOR'S NOTE: This paper has been reprinted by the kind permission of the Australasian Hydrographic Society. In particular, the Editor wishes to thank the Australasian Hydrographic Symposium 2015 Chairman and technical committee. It was felt important to include this paper in this Review as it discusses issues that are impacting hydrographic agencies and companies on a global scale. As such it provides an important case study and reference for future training and education initiatives for our profession.

Introduction

Formal training in the professions of hydrographic surveying and nautical cartography has long been an issue within the Asia-Pacific region. In the Australasian and S.W. Pacific regions specifically, due partly to geographic considerations and the small sizes of potential student cohorts, training and educational programs have been notoriously difficult to maintain despite at least three commendable, but ultimately unsustainable, attempts to establish hydrographic surveying education programs. There has also been a general lack of client support over many years by industry for cartographic programs within the Australian technical (TAFE) and tertiary university education sectors. Put simply, there is a dearth in this region of appropriate professional educational and training opportunities in hydrographic surveying and nautical cartography.

From discussions over the past few years across our profession within our region, several questions recur in the quest for a solution to the present limited opportunities. In summary:

- Are we pursuing the right goal? Are employers really interested in their staff gaining university qualifications that do not necessarily make for an industry-ready and employable person with the right skill and competency set? Can they afford to release their people for the lengthy periods demanded of many courses?
- Do students have access to the resources needed to meet the expenses

of a higher education (time, finances, and support from employers)?

- Is there a better way of providing the training?
- How best can the demands of continuing professional development be met?
- How can the "tyranny of distance" and its associated and stultifying cost overheads be ameliorated?

For these questions we see emerging potential solutions.

- Is there a more effective way of delivering the training? How can the required training be delivered in a more flexible way, perhaps exploiting technology, while maintaining and even enhancing modern pedagogical principles?
- Is there a way by which the strengths of the various education and training sectors can be brought better to bear? Is there room for more synergistic cooperation between all the interested sectors?

Major imperatives impacting effective delivery of training programs

Regional

There are many readily identifiable factors contributing to the regional situation which is characterised by irregular and infrequent opportunities to develop professionals within the region. There exist many wide differences both in the region's States as well as its potential students: in hydrographic capability, resource availability, uneven cost impacts of travel and sustenance for long periods, variability in technological access, significant cultural and aspirational differences, and widely varying impacts from successful charting programs on national economies. A number of island economies, for example, are increasingly dependent economically on having effective hydrographic services and consequent charting at a time when the larger hydrographic nations are under severe

budgetary pressures (LINZ 2004). Most, if not all of these factors seem unlikely to alter in the foreseeable future. In recent times, the need has probably been exacerbated in light of the negative effects on some island State economies from regional weather induced disasters.

Students

Much recent educational literature has made reference to the so-called Millennial Generation and has discussed in detail the putative characteristics of members of this generation, suggesting teaching and course delivery strategies that deliver effective learning outcomes [Murthy ca. 2011]. As we are now 15 years into the present millennium, the term may be dated. However, it is subsequently being subdivided further as increasingly we recognise the changes taking place in successive generations which impact on their entire behaviours and motivation (e.g. Generation Next, Generation Tech, Generation Y, Boomer Babies, etc.) It is tempting to consider that such terms really only apply to the major or more developed nations, but personal empirical evidence alone suggests the term is perhaps more aptly applied globally. One thing is certain: the changes are fundamental and cannot be ignored.

Much of the literature is consistent when describing the characteristics of the millennial student. Modern students the world over seem to be linked physically and mentally to their online devices and many inhabit an online perception of their personal world. They typically read less of the printed word, but spend many hours playing games on their devices. They expect and generally get instantaneous communication and response feedback. They are impatient for knowledge but expect to obtain it online - instantly! They anticipate this level of service from their educators or program deliverers. They are typically confident in their technical dexterity and, for many students, their social networks are serviced by the net connected culture they inhabit. Of whom he terms the 'download generation', those born after 1990, Casey (2009) has noted: "We are about to see an amazing transformation over the next decade,

as the generation that grew up with the internet, wireless communication and geo-location starts to take over the work force. Never before has a generation had such a technological leap over their parents. As technologically savvy as 'baby boomers' perceive themselves to be, they are no match for their offspring. It is so common that parents defer to their offspring or grandchildren for technological guidance that it's no longer a cliché or point of humour; it just "Is, what it is". This 'download generation' will change our charting world."

They are mobile and always on the move. They use wikis, digital forums and blogs. They are visual and expect to experience sophisticated and complex graphics. The volume of information they have to hand, literally at their fingertips or a few clicks away, is profoundly huge. Sitting through two or three hour classes with a so-called "sage on the stage", using a "chalk and talk" delivery, is seemingly virtual torture for such students in the face of what they have experienced in learning outside the classroom. All but the most sophisticated electronic slide presentations disengage them: they expect to find the material presented online. Their concentration spans are perhaps short: the length seems to be based on their degree of confidence at being able to find what they need when they need it. They are used to having access to information when it best suits their schedules. They are resistant to having to travel to the information: the information needs to be to hand.

They seem very capable of multitasking, but want immediate feedback. Aspirations vary greatly, of course, between different geographical areas and cultures, and it is axiomatic that in any cohort group, learning speeds and capacities can vary greatly. They seem to expect to be challenged, but want to learn with their friends as well as alone at times that suit them. They want to have fun and are technologically adept. They blur the traditional precepts of class time, reading time, laboratory time, self-study time and fun time.

Startling claims have been made in recent times in the Sydney press which seem extreme but at least highlight why the current crop of students see their futures differently than they might have in past times. Dunn (2015) introduced her readers to “Generation Z” (teenagers in 2015) and states that at a time of high youth unemployment (13.5% in Australia) tertiary education is more sought-after but more expensive than ever before. Some researchers, she states, expect that this generation in future can expect each to have in their life-times, seventeen jobs, five careers and live in 15 homes. If correct, these expectations point to challenges for those who seek to educate and train.

Traditional models of delivery are consequently challenged to engage with such students in order to achieve effective learning outcomes. Yet the very characteristics of the millennial student underpin effective education that aims to cater to these characteristics. The characteristics offer potential strengths and advantages to the educators who can exploit them effectively.

Comparisons of the advantages of conventional higher educational learning have been made with those of experiential learning that highlight the latter’s strengths and advantages. The main strength of experiential learning comes from its potentially powerful ways of addressing the individual student’s style of learning and own strengths. While the more traditional styles of learning focus on lectures, presentations, examinations, observation and role play, experiential learning approaches can build on the more theoretical emphases of traditional methods, being inherently more flexible than the more traditional structured approach (“one approach fits all”). The experiential approach can particularly benefit from the incorporation of well targeted case studies that bring out the benefits and strengths arising from group work (Kolb 1984). We believe that an experiential approach to learning particularly suits effective delivery of both hydrographic surveying and nautical cartography programmes.

While all approaches have their advantages

and disadvantages, a balanced approach which combines the best features of each can enhance the learning experiences of the student while simultaneously meeting the aims of the teaching organization [Edmond and Tigge-man, no date].

Universities

The traditional university or college model for delivering programs is well known, tried, tested and proven at least, it is sometimes claimed, with past generations. Students typically enrol for a program over a usually lengthy period and, typically, at some significant cost and commitment to university scheduling. Lectures are supplemented but expected reading and research time lengthen the period of attendance commitment needed by both the student and the university. Variations of the classic model of program delivery have built on part-time attendance and delivery models that take the education to the student with more or less flexibility. Examples of this flexibility include varieties of “open university” models, various online models with remote site delivery; but there is usually some degree of attendance required by the university. Even many on-line courses and programs usually demand a lengthy period of attendance at varying degrees of opportunity cost of finances and time.

So, it can be seen that, anecdotally at least, universities have moved with the times. Unfortunately, it remains more difficult to deliver the more intensely technically based programs such as hydrographic surveying and nautical cartography with their significant experiential requirements when such programs require access to fairly sophisticated, expensive, equipment. It is also not easy to deliver such programs that require and demand a degree of group participation remotely.

Universities are increasingly under pressure to reform from all their stakeholders. Government funding can no longer be relied upon: increasingly universities must look to recovering costs from fees with resultant impacts ultimately on programme viability. Students demand more flexibility in university courses.

University-based research, in Australia at least, has not always been translated into industry and community development (Penington 2015). There is evidence of pressure on universities generally to reduce the number of programs on offer and concentrate and tailor fewer courses more effectively to produce “industry ready” students. There seems to be space for more effective collaboration with industry for the delivery of programs that meet industry requirements and expectations.

In the Australasian context, universities, reasonably, must rely on adequate student numbers from an intrinsically smaller base to sustain technical programs which can be expensive to deliver. This has always been a vexed issue in this region and probably lies at the heart of the difficulties the region has faced in trying to sustain hydrographic surveying and nautical cartography courses. Simply put, we do not have the numbers. Costs to the students reflect these factors and are increasingly high.

Industry

Industry has been unable to rely completely on the job market to supply a steady stream of competent professionals. In the local region, an element of “boom or bust” has probably exacerbated industry demand for professionals. In seeking to meet its requirements, industry has looked to train and educate its human resources itself. Needs must be met and the lengthy times of most programs require greater financial investment by industry than it is sometimes able to make. It is hardly surprising that the cost-effective equations brought to bear on the issue of training have seen much innovation in the way industry has sought to equip its employees with the necessary skills needed for it to run its business.

Government tendering processes which meet all the requirements for openness and probity in so many ways exacerbate the “boom or bust” nature of the general hydrographic industry. Industry must live with this, but it does little to encourage significant investment in long term approaches to training and educa-

tion of their staff. It makes sense for targeted approaches which are industry recognised and which ultimately lead to professional accreditation.

Professions

Coming together in cooperation, the work of the FIG/IHO/ICA International Board for Standards of Competence in Hydrographic Surveying and Nautical Cartography (the “Board”) has seen the development and maintenance of peer developed and internationally accepted Standards of Competence in both Hydrographic Surveying (S-5) and Nautical Cartography (S-8) (FIG 2014). Over almost forty years many courses and one Accreditation Scheme have been recognised by the Board. The list of currently recognised courses is published on the IHO website (IHO 2016). Even a simple cursory examination of the lists for both hydrographic surveying and nautical cartography will reasonably conclude that few, if any, of the programs are readily accessible to aspiring students or their employers within this region, unless they work within a military program or have funds to apply for overseas study where such programs might be openly available within a university program. However, a closer examination of the lists will reveal that some programs are now offered from within industry. This is an increasing trend. Recognition has not been an easy path, or a low cost one, for such programs in both professions, but it is one that is increasingly being pursued at a number of levels by industry.

Around the world, our professions have therefore found it necessary to react and seek to advance the availability of education and training for its personnel in many ways and have become increasingly proactive in so doing. Cooperation in delivery of programs by industry and the educational sector, adoption of technology and exploring remote delivery options, modular delivery patterns and blended learning approaches that seek to exploit available options are all being considered and, more or less, are being developed. In-house options do not readily meet the profession’s expectations for recognition or the continuing

educational requirements of the professional bodies. Effective delivery options remain expensive overall and quite possibly remain out of reach of many within the region.

Case Study

IIC Technologies (IIC), a global geospatial services group, has faced many of the issues raised immediately above across the whole range of geomatics. Recognising its own significant education training requirements, IIC has invested heavily in developing cost-effective education and training programs. IIC with its 2,000 plus professional geomatics professionals has to train each one in some way or other. For example, since 2011, we have provided significant geospatial training courses to over 1,200 people: a number of these have been related to the S-5 hydrographic surveying and the S-8 nautical cartography programmes and additionally, specialist hydrographic training in such specialist areas as multibeam survey equipment and its use. This has encouraged IIC to evaluate the range of available techniques against their effectiveness to meet both the aims of the organisation and of the individual, particularly the new millennial learner. While its focus has been its own requirements, gradually through its educational arm, the IIC Academy, IIC has been opening its doors to the wider community and learning further from that experience.

It is axiomatic to its very business existence that IIC remains in the forefront of professional development for its staff. IIC has now accrued many varying training and educational experiences in widely differing geographical regions, each with varying degrees of difference in its requirements but nonetheless, many commonalities have been identifiable. The experiences thus gained by the IIC Academy group in greatly disparate regions are presented as a case study.

Recognising its own education training requirements in the marine geospatial sector, IIC has invested heavily in developing cost-effective education and training programs and now has three Board recognised programs (one of S-5 Hydrographic Surveying and two

of S-8 Nautical Cartography). The structure of all its training programmes permits IIC to offer them locally within different regions in a modular but structured way. The IIC Academy also delivers customized training programs to students and experienced professionals, based on evolving industry demands and challenges and thus contributes skilled, employable resources to the geospatial industry. A number of these programs are of a short-course nature and are targeted specifically to the hydrographic, nautical cartography and GIS domains. One example is IIC's established two-week practical course on the use of multibeam equipment which can also be delivered locally where facilities meet the course requirements.

The programs utilise modern pedagogical techniques for delivering effective results using a blended approach and appropriate practical peer-delivered methods for effective learning. The company is particularly sensitive to supporting multicultural, international groups which bring to the learning environment varying aspirations and program goals.

The Approach

In developing its course programs, IIC has sought to tailor its approach in a way that addresses the imperatives identified above. It sought to modularise its programs in a way that allows discrete modular "packets" while recognising the logical flow of the learning experience. Shorter periods away from the workplace, coupled with guided mentoring between module deliveries, allows for strong, logically incremental, experiential learning exposures for the student who can build on and strengthen the personal development outcomes progressively achieved.

Modularization allows greater flexibility and better opportunities for delivery of programs within the student's own workplace or region. This is critical to being able to accept smaller cohort groups cost-effectively, thus enabling a more personal style of tuition which exploits the student's strengths and helps focus on overcoming weaker areas.

Establishment of the IIC Academy, with its staff base of professional educators, strengthened by a team of subject matter experts and industry professionals and, when appropriate, manufacturers, is able to bring about focussed learning outcomes that lead to better industry ready professionals. It has been able to work with universities in developing various targeted courses and, having access to the modern technology required for it to survive and contribute in the industry, allows it to provide co-operative access arrangements with other sectors. It can also provide the “real world” production and work experiences required of experiential based courses. Supervised project work is facilitated.

Rather than take the student to the course, the course can be taken to the student, or at least to a region. The pros and cons of getting away from the workplace to learn are recognised but have to be weighed against the alternative approach. On balance, feedback (from students and managers alike) is that training is more effective when it has context and meaning – when it is real. Using new and real life situations and material to aid learning has been an approach that continues to attract positive feedback. It is an approach with potential, and it is suggested as one that could be useful for the Asia-Pacific Region by which to review its requirements for training and ultimately benefit the unique characteristics of the region.

Conclusion

Potential professional development courses have more chance of succeeding in this region if they are targeted and cost-effective while meeting defined industry expectations. This suggests expectations of programme design based on Modularity and Flexibility. Delivery, to the student in appropriate environments with appropriate technology access, is likely to best meet local requirements. Delivery to smaller groups can be very effective while better permitting support to the individual to meet his or her learning style and needs. Studying within the work space, supported by professional, qualified tutors and with ongoing support and mentoring has potentially greater

effectiveness. Closeness, and access, to methodologies borne of modern technology in turn boosts the students’ motivation to continue their programmes. It heightens their perception that they are not learning outdated information from outdated approaches but relevant practical information, from relevant practical courses.

The region must find ways for delivering cost- and outcome-effective, sustainable, hydrographic surveying and nautical cartography education and training. It needs to modernise. Modernising means our region driving more cooperation between all the players within our profession and breaking down some silos. With that we may stand a greater chance of achieving our collective goal.

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Biographies

Ron Furness represents the international company IIC Technologies in the Australian and SW Pacific Region. He also is a member of the IIC Academy Board, providing advice on its training and educational policies and courses. His long career in hydrography commenced in 1960 at the UKHO. Most of it was spent in the Australian Hydrographic Office from where he 'retired' in 2002. He has been a long-serving member of the FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers. He has held a number of positions in the Australasian Hydrographic Society over many years. It is disappointing to him that there are *no* local opportunities for hydrographic surveying and nautical cartography training within the immediate region. At

a time when Australian politicians are begging 'Australians all' to be innovative and technologically challenging, Ron, with the assistance of his colleague, is attempting here to 'stir the pot' and challenge the broader local industry to come up with an innovative, collaborative model through which to achieve appropriate industry training and education within the region. Innovative offerings are beginning to emerge internationally. Ron feels strongly that there are opportunities in the region if we can energise the debate.

E-mail: ronald.furness@iictechnologies.com

Duncan Wardle has been involved in the geographic information profession for almost forty years. Trained in photogrammetry, survey and marine cartography his career has taken in both government mapping organisations and the private sector. He currently leads the IIC Technologies European operations, as well as being involved in the direction of the Group. Throughout his career, he has been instrumental in implementing new systems and new ways of working always involving the development of training programmes. From this comes a deep rooted passion to promote educational standards. This includes trying to solve the conundrum of how training methods can best keep pace with the speed of change happening around us, in both emergent technology and the new generation of professionals. He was the architect of the first private sector Nautical Cartography course to be recognised by the FIG/IHO/ICA International Board of Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (the IIC Academy Marine Geospatial Information programme). He is currently working on the next evolution of this programme and the IIC recognised Hydrographic Survey course. The next stage developments will build further on the belief in the experiential learning and blended learning approaches as ways of better serving the student and employer alike.

E-mail: duncan.wardle@iictechnologies.com

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