APPLYING THE GLOBAL UNIVERSITY MODEL TO GEOSPATIAL EDUCATION

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Recent advances in computer capabilities and the successful transfer of Department of Defense (DoD) positioning and imaging technology to the private sector are rapidly moving geospatial information handling and processing into the realm of profitability for large and small businesses and government entities.

This technological explosion, combined with the outsourcing recommendations of the National Performance Review\(^1\), the Defense Reform Initiative\(^2\) and the Federal Property and Administrative Services Authorization Act of 1992,\(^3\) are forcing federal mapping agencies to contract out much of their geospatial information collection and processing activities to the rapidly growing private sector.

Draft Joint Publication 2-03 “Joint Tactics, Techniques, and Procedures for Geospatial Information and Services Support to Joint Operations” recognizes that the evolution of the digital battlespace requires our soldiers, sailors, airmen, and Marines to become geospatial-processing experts.\(^4\) This evolution will undoubtedly place tremendous pressure on the DoD geospatial training community to make experts of many military service personnel. Add to this pressure the competition of a rapidly growing private sector trend for similarly trained personnel it is easy to see the need for a dramatic increase in the availability and quality of geospatial information handling and processing education.\(^5\)

Unfortunately, geospatial information handling and processing technology is evolving much faster than industry and academia’s ability to adequately train and educate the future geospatial information specialists.\(^6\) Keeping up with government and industry’s demand for trained geospatial information specialists dictates a new approach to technology training that will require the establishment of unprecedented partnerships between government, industry and academia.

Applying the Global University Model to Geospatial Education

The government’s geospatial information training institutions, notably the National Imagery and Mapping College (NIMC), enjoy a technological lead in the scope and availability of educational materials available for GIS/GPS/RSI exploitation. Unfortunately, as the defense budget is drawing down so too is the quality and frequency of update to those materials. Thus adoption of an adaptation of Condit and Pipes “Global University Model”\(^7\) (see Table 1) for geospatial information education is warranted. To accomplish this, NIMC and the other DoD institutions must consider transferring many of their course materials to mainstream academia to take on the care and feeding of the courseware. This can be legally done using the current technology transfer laws (notably the National Technology Transfer and Advancement Act of 1995)\(^8\). In return for this sharing of courseware, the government should encourage academia to adopt the Global University model as follows.

1. Locate “remote campuses” near industrial customer(s)

A force projection military like that of the United States and the increasing global reach of the American geospatial information processing industry means global availability of geospatial
education is required to gain and maintain rapidly changing technical skills. However, rather than rely on a single university locating remote campuses near military or industrial locations as Condit and Pipes suggest in their Global University Model, it may be more advantageous to enlist the support of institutions already existing near military bases and industrial centers where the training is needed. Where facilities do not currently exist, federal technology transfer laws allow government research institutions to share their facilities and resources at no cost. Thus government may, via a cooperative agreement, make equipment and adjunct faculty available to help augment the remote campuses’ capabilities.

1.a. Remote campuses include traditional classroom instruction, interactive multimedia, and distance learning

Traditional classroom instruction is what both government and private training institutions excel at doing. Thus virtually no improvement is needed in classroom instruction. Interactive multimedia training is a different story—it is a very expensive proposition that most universities cannot easily afford to create from scratch. Experience has shown that DoD schools often get enough resources to create comprehensive multimedia training materials from scratch but are then unable to keep these materials updated to keep pace with technological innovations. A possible model to consider is collaborative efforts between DoD schools and academia whereby the DoD schools transfer the first generation multimedia training to a partner at an academic institution or publishing house. In return, the partner agrees to periodically update, upgrade, and maintain the multimedia training and provide the updated material back to the government. The partner retains the rights to sell or franchise the training with the government’s endorsement.

1.b. Training opportunities at remote campuses are available to local undergraduates

Taken to the extreme, maximum use of government- and/or industry-provided course materials at remote campuses by academic or industrial partners can eliminate much of the basic training government and industry are currently providing. Remote campuses will provide to undergraduates (for a fee) the same training that government and industry are currently providing newly hired college graduates. The remote campuses may eventually transition from the government providing post-hire basic training program to a non-government undergraduate degree program. Eventually, government and industry can eliminate much of their basic training (or retraining) and focus on advanced technology instruction.

1.c. Remote campuses act as “technology parks” providing facilities and services tailored to the needs of local industry customers

There are several options for a Government/Industry/ Academia partnership such as that being sought for the geospatial education community. These options are all variations on a theme based on one or more of the following concepts:

- Government provides space at within their operating locations and, through a technology partnership agreement, teams with a local university to operate the campus.
- Government and industry provide computer hardware for the campus’ laboratories
- Industry provides software and initial software training for the instructional cadre
− Government and industry provide raw geospatial information
− Government, industry, and the university develop and maintain educational material
− Open the facility to all partners to perform testbed analysis, beta testing, training development, etc.
− The university provides the cadre of instructors--government and industry provide adjunct instructors

The above scenario represents only one possible solution. Other solutions are subject to negotiation among the partners to each individual remote campus and the capabilities and facilities available to each partner.

1.d. Remote campuses act as the certifier of educators

As will be discussed below, the remote campuses will have instructors from academia, government, and industry. To guarantee that the quality of instruction is uniform the instructors must go through a certification process. The remote campuses vice the main campuses provide the most convenient method of providing certification. Of course this certification must be in accordance with standard academic certification processes. If, however, the remote campus is not equipped to perform this certification then another local university could be “franchised” to provide the instructional certification either at the remote campus or on site at their own facilities.

2. Provide continuous education

As Marquardt and Reynolds note in their book “The Global Learning Organization” the most successful large businesses in the United States have made a commitment to continuous education for its employees. Companies like Motorola and Xerox operate their own corporate universities to train their employees on a spectrum of topics from basic technical skills to strategic leadership. These companies are fortunate to be large enough to devote the kind of resources to maintain their corporate universities. In the geospatial era, the federal government operates a pseudo-corporate university system. Training in the geospatial technology area is offered at NIMC and other DoD technical schools. Mid- and senior-level management and leadership training is offered at military service schools and Office of Personnel Management development centers. Agencies must compete among themselves for positions in these mid- and senior-level training institutions.

The burgeoning geospatial marketplace is marked by a small number of relatively large companies (2000 employees or more) and a large number of small entrepreneurial companies (200 employees or less) that provide GIS/GPS/RSI services to a variety of government and industry customers. The geospatial information market on the government side consists of increasing numbers of state and local planning, zoning, and tax assessor offices.

Because the geospatial market is dominated by smaller businesses and state and local government offices, there is no focused “geospatial corporate university” that provides continuous education. The concept of a remote campus co-sponsored by government, the larger members of the geospatial industry, and academia can provide a corporate university opportunity for the smaller businesses and state and local governments that cannot afford to create their own. In addition, it can provide more training opportunities for federal government agencies that must
compete for increasingly scarce training billets at the government’s pseudo-corporate universities.

2.a. Focused technical training for younger employees

In the geospatial information arena younger employees typically need to round out their generalized education down a specific technical track. Example would be focused training on image interpretation for intelligence purposes, or collection of data to support cadastral surveys. Remote campuses offering a variety of short courses that focus training down these specific technical tracks are required.

2.b. Broad based technical training for maturing employees

As employees mature and become technical leads on projects, the need still exists for technical training but now on a broader scope of activities. An example of this in the geospatial arena is someone creating a cell of NIMA’s new foundation feature data. This includes not only image interpretation, but also data extraction, quality checking, control point verification, and data integration. Courses such as geospatial information production management, quality control measures, and database management, would be the focus of this training.

2.c. Management and humanistic training for mature employees

As employees continue in their careers many will move into management ranks. Subjects such as personnel management, equal-employment opportunity, diversity issues, budget formulation and execution, project management, legal issues, etc., are all subjects for this form of training. Although many of these courses are easily obtainable from a variety of local institutions the remote campus should select and package existing courses for the busy executive. Courses taught in a 16 week semester during normal business hours at a university may be condensed into short courses taught at the remote campus over a one or two week period to accommodate busy schedules.

3. Development and adherence to education standards to ensure that students at widely separated learning institutions receive the same education

Geospatial information education is only one of many technology areas that are suffering from the lack of education standards. In the United States two groups have stepped up to try to fill this void—the National Center for Geospatial Information and Analysis (NCGIA) and the DoD-sponsored Community Geospatial Information Training Committee (CGITC) and Community Imagery Training Committee (CITC).

In 1996 NCGIA proposed a core curriculum for Geospatial Information Science (GIScience). The primary purpose of this core curriculum was to provide the academic community with a generic design of courses that act as the foundation of a comprehensive GIScience program.

The DoD efforts are under the auspices of the National Imagery and Mapping Agency (NIMA) as DoD functional manager for the United States Imagery and Geospatial Information System (USIGS) Community. The National Imagery and Mapping College (NIMC), as NIMA’s
functional manager designate for training issues, is responsible for establishing training standards for imagery and geospatial information related activities throughout the DoD and intelligence community. NIMC sponsors both CITC and CGITC which are focused toward defining basic and advanced education and training requirements for military and DoD/Intelligence professionals. These professionals will eventually act in the capacities of Image Analysts, Terrain Analysts, or Geospatial Information processing specialists. CITC and CGITC intend to go beyond development of a core curriculum into developing actual course materials to be shared by DoD and Intelligence schools.

Both the NCGIA and CITC/CGITC efforts have their strengths and weaknesses. NCGIA’s primary strength is the nearly universal acceptance of the core curriculum by the GIScience academic community. The primary weakness is that many of the courses specified in the core curriculum are hollow shells--outlines for curriculum content that need to be fleshed out individually by the institutions that elect to implement these currently hollow courses.

CITC/CGITC’s primary strength is the ability of their members to create state of the art course materials focused for their particular training needs. These course materials include lecture and lab materials that are unprecedented in the traditional university environment. Typical of the DoD/Intelligence community training environment is the use of current geospatial information processing hardware/software, imagery available only to US Government employees, and processing techniques taught by individuals with literally “battle-tested” skills. CITC/CGITC’s primary weakness is that their core curriculum focuses not on the achievement of a degree but in the certification of individuals to perform their duty tasks efficiently and effectively. As such, these individuals are “trained” but not “educated”--they are taught rote solutions to typical problems but generally lack the well-rounded theoretical and analytical background academic institutions generally provide.

It is reasonably obvious that the NCGIA and the CGITC efforts are complementary. NCGIA has a draft geospatial information education core curriculum but little or no courseware. CITC/CGITC has access to, and management responsibility of, geospatial information training courseware but no core curriculum. Collaboration between NCGIA and CGITC to create and promulgate a geospatial information training education and training standard is clearly in both organizations’ interests. A successful collaboration between NCGIA and CITC/CGITC could lead to the next discussion point of “franchising” educational programs.

4. Development of specialized “franchise” educational programs to commercial providers or other universities

This is the point where the most impact on geospatial information education may be felt. If the NCGIA and CITC/CGITC educational standards efforts can be developed in a collaborative environment then course materials can be “franchised” to the more than 800 US colleges and universities that are currently teaching GIScience courses. How would this work? First, the rich course materials that the CITC/CGITC have at their disposal can be provided to the NCGIA under the auspices of the technology transfer laws. Members of the NCGIA would be authorized and assisted by the Government schools to modify the course materials to make them more generic--in essence to “demilitarize” the courses. Then, in conjunction with a publishing house, course materials are packaged, marketed, and sold to participating institutions at a
significant discount over most other science courses. These course materials could contain lecture materials, presentation graphics, and lab materials (e.g., satellite imagery, geospatial datasets, run-time versions of geospatial processing software, etc.) which would all be designed to run in a PC environment.

Thus is the initial set-up for geospatial education franchising--creation of a core curriculum in GIScience supported by prepackaged course materials made available to “franchisees” at attractive prices. A final key to this franchising concept is the award of a highly marketable degree or certificate for graduates of the program.

5. Support for collaborative granting of academic degrees

It is already recognized that the geospatial information community, particularly that of the DoD/Intelligence community, is widely dispersed around the world. Taking the franchise concept a step further is the granting of certificates and/or degrees to individuals that may have participated in programs administered by several academic institutions. This concept is perhaps the most difficult to attain but is by no means impossible. The key here is what is the geospatial industry looking for? Reviewing the help wanted sections in the geospatial industry trade journals (notably GIS World and GeoInfo Systems) the answer appears to be a “certified” graduate who holds a certificate typically from one of the large geospatial software houses (notably ESRI, Intergraph, and ERDAS). Thus a two-sided key here is for the ESRI’s, Intergraphs, and ERDAS’ of the world to allow “franchisees” to award certificates where the awarding of certificates is the main draw of students to franchisee’s programs.

Conceptually, students participating in the “franchise” program should be able to move around the country (or world), picking up courses along the way and eventually graduating from an institution with a degree and a certificate. Under current curriculum guidance many academic institutions are reluctant to award degrees to students who do not use that particular institution to complete the majority of their degree requirements. The way to overcome this reluctance will be for organizations such as the NCGIA to encourage franchisee institutions to award collaborative degrees. This concept runs so contrary to traditional academic paradigms that it will probably take several years before franchise degrees will be available. Therefore it is critical that students of the franchised programs obtain the certificates mentioned above as the fruits of their labor. An alternative is for the National Imagery and Mapping College to offer accredited degrees and act as the accrediting authority of the franchisees. This may be difficult or impossible as the guidelines for federal degree granting authority may preclude a federally operated school from providing degrees where traditional academia currently offers similar degrees.

Certificate granting by franchisees is clearly the short-term solution. The long-term solution is to co-opt academia to provide collaborative degrees to graduates of franchised geospatial information education programs.

6. Incorporation of industrial practitioners in academic training delivery

Incorporating industrial practitioners in academic training delivery is actually one of the easier things to perform in the geospatial community as there is already quite a bit of this happening today. For an institution such as the National Imagery and Mapping College it would
be worthwhile not only to provide some of its instructors to academia for periods of time but also allow academia and industry to spend internships at government facilities. Again, this is not only legal but also highly encouraged under the auspices of the federal technology transfer laws.\textsuperscript{xv}

**CONCLUSION**

The preferred solution to eliminating the void in geospatial education is for the large federal government agencies and large geospatial systems manufacturers to partner with academia to create geospatial education standards and adapt the Global University Model proposed by Condit and Pipes for geospatial education. This strategic partnership of the government, industry, and academia will lead to rapid transfer of geospatial technology and training techniques to academia. Accompanied by the stewardship of industry and government, academia can rapidly fill the void in geospatial information education and training for the benefit of all.

Table 1: Model for the Global University\textsuperscript{xvi}

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vi Ibid.


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