by Kristine Asch¹ and Ian Jackson²

No pain — No gain

The reality of initiating and managing three pan-European geoscience information system projects

1 Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), D-30655 Hannover, Germany.

2 British Geological Survey (BGS), Keyworth, Nottingham NG12 5GG, UK.

International geoscience projects which bring together personnel from national geological surveys and research institutions can be rewarding and productive ventures. The opportunity to pool experience to tackle shared challenges is irresistible and at times it is as much the collaboration and the intangible spin-offs of collaboration, which initially attracts the participants, rather than a well specified scientific or business case. But as in all projects there is no gain without some pain and multi-national projects involve some particular pains. This short paper describes the issues and problems encountered in running three, multi-national, geoscience information system projects. It is not intended to be just a historical record of the problems that these projects faced. Our view is that these projects encountered generic issues and that in documenting them in an open way, those who are tasked with planning and managing similar projects, now and in the future, may benefit from the mistakes we have made and the lessons we have learned. It is also hoped that others, who may have already experienced them, may be able to relate to these issues and know they were not alone! As in many areas of scientific and business endeavour, it is often not the technical problems which pose the greatest difficulty, but the cultural and human ones. A brief review of the three projects is provided, the issues and problems are described and some views are put forward on how they may have been tackled better, or indeed, avoided.

An overview of the projects

This paper draws its evidence and conclusions largely from three projects (summarised briefly, see Appendix), but also from anecdotal evidence from other projects. The three projects described are large multi-national initiatives, in the geographic sense, even if comparatively modest in terms of budget in a commercial context (see list of participating nations, Table 1). They were all conceived with the aim of sharing, integrating, harmonizing and disseminating knowledge across national boundaries. Their common goal is to bring together and disseminate the dispersed information and expertise that exists in the contributing nations and improve understanding of geology and the problems and opportunities it presents. The IGME 5000 project is currently active, GEIXS concluded as an EC

project in December 1999 and the GIFT project was a proposal to the European Commission 5th Framework Programme, which failed to gain approval but may yet be revised and re-submitted.

The issues and problems

Issues and problems are described in terms of Resources, Culture, Communication and also some issues specifically relating to European Community funded projects. However, it is accepted that the first three are an arbitrary division and that several issues may fit easily into two or even three of these headings, or that the issues could be classified in other ways. It should be mentioned here that this paper is not about standards (although this is one of the underlying, fundamental objectives of the three projects described). However, standards, or more correctly, lack of them, pose difficulty for most multi-national initiatives. Despite being a relatively old science, geological projects are no different in this respect and technical (data and procedural) "standards" vary widely between countries and within the organisations themselves—even for basic items like classification of rocks!

Resources

The detailed project accounts and cost statements of GEIXS, together with the experiences of the IGME 5000 project and the GIFT proposal, show unequivocally that the project management costs of multi-national projects are significantly greater than for a project run within a single organisation or single country. The figure we estimate to reflect the true cost of managing an international project is between 15% and 20% of the total project cost. This may seem obvious to some, but in which case why are such figures so rarely factored into these projects? And why does the European Commission seem so reluctant to allow such costs in project bids?

Travel costs are considerably higher than for intra-national projects and despite phones and faxes and the widespread availability of email, it is essential for the key players and preferably the whole team, to meet face to face. The exorbitant prices of European weekday airfares are a big contributor to costs here, not to mention the high hotel rates in convenient, central locations like Brussels and Paris.

It is also important to note here that, in wishing to be a part of a perceived high profile venture, some surveys sacrifice financial prudence at proposal stage for anticipated international kudos later. Therefore, while the allocation of resources (and tasks) may be agreed to by all at bid stage, it is absolutely fundamental to re-confirm it at the project kick-off meeting. It is not unusual to find substantial differences of opinion amongst the "team" about resource allocation and primary project objectives at this late stage!

The IGME 5000 project has a special situation in terms of resources. BGR is responsible only for funding project coordination, a small team of GIS and cartographic staff synthesizing the national contributions and the map printing. There is no budget for partici-

Table 1 Countries participating in the projects .

Country	IGME 5000	GEIXS	GIFT
Albania	P		
Algeria	P		
Armenia	P	P	
Austria	P	P	P
Azerbaijan	P		
Belarus	P		
Belgium	P	P	P
Bosnia-Herzegovina	P		
Bulgaria	P	P	
Croatia	P		
Czech Republic	P		
Cyprus	P	P	
Denmark and Greenland	P	S	P
Estonia	P	P	
Finland	P	P	P
France	P	S	S
Georgia	P		
Germany	C	S	C
Greece	P	P	P
Hungary	P	P	
Iceland	P		
Iran	P		
Ireland	P	P	
Israel	P		

Country	IGME 5000	GEIXS	GIFT
Italy	P	P	
Latvia	P	P	
Lithuania	P	P	
Luxembourg	P	P	
Kazachstan	P		
Macedonia	P		
Morocco	P		
Norway	P	P	S
Poland	P	P	
Portugal	P	P	P
Romania	P		
Russia	P	P	
Slovak Republic	P		
Slovenia	P		P
Spain	P	S	P
Sweden	P	P	
Switzerland	P		
Syria	P		
The Netherlands	P	S	P
Tunisia	P		
Turkey	P		
Ukraine	P		
United Kingdom	P	C	S
Yugoslavia	P		

C = Coordinator/Project Manager; S = Steering Group Member; P = Participant

pants and their contribution is voluntary and must be borne by their parent organisation or themselves. Thus partners must be persuaded not only to join the project and give their data, time and expertise freely, but also to maintain that commitment over a number of years. To do this also in accordance with a project schedule that is required to deliver something in a fixed time is a major challenge. Without the genuine, unselfish commitment to their science that seems to be common to most geologists, it is difficult to see how a project like this could succeed.

Culture

By culture we mean the values, philosophies, practices and attitudes of an organisation as exhibited through the individual and collective behaviour of their personnel. This is thus a broad category. Whilst the diversity of culture may bring wide experience and enrich the team, it also brings its problems.

The geological surveys of Europe operate a multitude of business models, from fully government funded, public research bodies to quasi-commercial organisations, operating in a commercially aggressive, near-market style. It can be exceedingly difficult to reconcile these different approaches when it comes to agreeing project policy on such things as intellectual property rights or pricing policy. There are often related differences in the sophistication of associated project and financial management capabilities (in one instance a project partner nation entered a funded contract without possessing a bank account; in another only a government minister could sign for even small contract variations.) These differences lead to predictable problems.

Cultural differences also surface in attitudes to a range of fundamental items like the importance of, and attention given to, contract terms, scientific and presentational quality of output, punctuality and perhaps most crucial of all, *deadlines*; a foreign concept to some organisations and their personnel! It is also frequently true that the kudos of getting and belonging to an international project may be replaced only too quickly by deference to higher priority intra-organisation work. More intangible, but nonetheless difficult to deal with, are "traditional hierarchical", somewhat anachronistic, attitudes (held, by some old and perhaps surprisingly, by some young geoscientists) towards women and younger representatives in leading positions. Many contributors to international projects hold senior positions in their own organisations and some of these people find it very difficult to accept the legitimate authority of the project leaders.

This raises another point, such senior people are not necessarily the most appropriate project participants from an organisation, but seniority and influence sometimes takes precedence over relevant competence. Similarly, the selection of the most able scientist to lead a project is often a mistake, as the qualities needed to manage people and work are arguably quite different to those needed to do good science. International projects are even less tolerant than domestic ones in this regard.

It is as inevitable, as it is regrettable, that, while the majority of the project team will do what they agreed to do, some participants will fail to deliver their agreed contribution. Luckily to balance this there will almost always be one or two (usually including the project leader!) whose actual contribution exceeds their contractual obligation. To try to get participants to contribute it is sometimes necessary to use "peer pressure", i.e. tell them how much progress their colleagues are making! However, in order to achieve the project objectives the leader of an international consortium needs to be given the authority to match the collective responsibilities the individual contract signatories (usually organisation Directors) have placed on him. Unfortunately this essential obligation appears to be neither widely understood nor implemented and thus when problems do occur their resolution can be unnecessarily complex and perhaps cause tensions.

Establishing and fostering team spirit within the diverse cultures that exist takes significant time and effort. Finally and perhaps, crucially, multi-national projects require considerable diplomacy but diplomacy is not quick, often frustrating and rarely cheap!

Communication

Most of us will testify that communication, of technical, financial or human issues in a project within an individual (scientific) organisation which shares values and a common language is never easy. Communication between individuals from different organisations and with different native languages is fraught with problems. The *de facto* common language of Europe is English, but the standard of this is likely to vary considerably across project participants. Native English speakers may well—because of their ability to speak English perfectly—be given and willingly accept, chairing or reporting roles within a project, but most will (innocently) speak too quickly and use idiomatic and complex language and sentence construction. Shyness and pride may preclude many non-native English speakers from making a contribution, even when their technical knowledge is

IGME 5000

GEIXS

GIFT

Figure 1 Countries participating in the projects.

relevant and far exceeds that of the other participants. Linguistic superiority also does not necessarily enhance ability to chair meetings, make decisions or coordinate a project; someone for whom English is a second language and who speaks it slowly may be better choice.

Misunderstanding and subtle and less subtle variations in interpretation may start as early as the project proposal stage and will be encountered throughout the life of the project. It is important to write down and document everything and check and confirm agreement with all; this applies especially to objectives, actions, deadlines and resource allocations. In doing this e-mail and fax are a real asset but it is still essential to meet, to ensure discussion and debate and to *see* and attempt to confirm that the issues are fully understood and signed up to.

Some specific European community project issues

Taking part in an EC funded project can be a unique experience! The experience usually starts with confusion caused by the complex (maze-like) structure of the Commission, and the sheer volume of the information it generates. Locating the appropriate Call for Proposals and submitting the proposal correctly and on time are major challenges. Despite the abundance of guidance available (usually on a variety of labyrinthine EC Web sites) the submission procedures are not straightforward and entering a multi-national proposal for the first time is extremely time-consuming. There is usually also a fundamental question — do you wait for a Call that meets your proposal or adapt what you feel is a worthwhile project to a less than suitable Call? It is no coincidence that successful consortiums often appoint consultants/agents or set up semi-permanent advice teams to help them deal with the submission process.

A protracted period usually follows proposal submission, as independent evaluators appointed by the EC assess the proposals. Unfortunately evaluation is not guaranteed to be an objective process; lack of understanding of the proposal is sometimes evident and occasionally evaluators' opinions can appear contradictory. Should the proposal be successful, the review process continues through the life of the project. Such reviews are formal events, with progress being monitored against the initial plan (a plan that was not necessarily always thought through in detail by the project partners!).

Projects sponsored by the EC are frequently based on shared costs (e.g. 50/50): this factor compounds what is already likely to be a complex financial management operation for the project coordinator. Also, as mentioned above, the EC does not seem to understand the inevitably larger project management overhead that is required for multi-national projects, to cover not only technical management but the sizeable administrative and financial management burden. Finally, the EC is an enormous bureaucracy, it is not known for the speed with which it takes decisions and perhaps more worryingly, it can be extremely slow to release funds to pay project partners.

The lessons learned

The lessons to be learned in managing these projects follow logically from the description of the problems above. They are not appropriate in all cases nor are they comprehensive, however, they do result from real and practical experience.

Project planning is always essential, but with multi-national projects, planning is as much for the process of establishment of truly shared goals, as for the schedules and plans that result. It pays to be significantly less ambitious with setting of technical goals than would apply in an intra-organisation or national project. The lowest common denominator rule is likely to apply. When applying for a project funding, ensure that the full cost of project coordination is included, likely to be of the order of 15–20%. In addition, it is important to be clear about goals and crystal clear about the assignment of resources, responsibilities and deadlines.

Any project's prospects are enhanced by selection of competent and appropriate people to the team and while the considerable difficulties of doing this in an international context are acknowledged, it is worth spending effort trying to influence this. As in all joint endeavours personal qualities are as important as technical ones and a good team contains a blend of human attributes, not a host of assertive characters. Meet early to introduce and build the team, not forgetting the importance of pre- and post-work social gatherings. Spend time finding out the non-professional backgrounds of your foreign colleagues, just as in a national project, some non-work-related problem could upset them and therefore your project schedule. Most project teams will operate through a Steering or Executive Group, these are key people and maintaining their involvement and commitment is fundamental. Keep the numbers involved in both the project and its management to the minimum consistent with achieving its goals; meetings and documentation reviews will be protracted enough without including non-essential people. Give a native English speaker a leading role in a project only if his potential contribution merits it, not just because his English is superior to all others. Also be aware of the different abilities in English and consider taking positive action to ensure that more able speakers do not dominate.

Appointing an efficient project secretary from within the team can pay dividends, as it is essential to document and circulate all decisions, agreements and actions and to do so in a short time frame. Further, it is wise to request confirmation of receipt from partners for all forwarded documents. Do not close a meeting without undertaking a resume of the actions and decisions. All reports, minutes, papers etc should be written in straightforward, plain language and you should give a deadline for return of comments — make it clear that a nil response will be taken as assent! To do their job managers of multi-national projects need real delegated authority from the Directors of the partner organisations. While diplomacy, patience and willingness to compromise are key qualities, there will, inevitably, be times when it is necessary to be strong and direct and confront people as well as problems.

Summary and conclusions

A number of pitfalls and issues which multi-national projects may face have been highlighted and views on the way some may be tackled provided. None are insurmountable — with a skilled leader, a competent team, adequate resources and good planning, most can be mitigated, if not overcome! However, while many of the problems may appear on the surface to be just scaled up versions of those encountered domestically, initiating an international venture adds an added dimension of difficulty.

The technical achievements of many international projects may sometimes appear to be not too great. However, one of the most fundamental but understated achievements of multi-national projects, (with all their attendant problems), is that their initiation galvanises independent geoscience organisations to pool expertise and resources and adopt best practices to work towards common goals. As the Information Technology revolution continues to gather momentum, integration and interoperability will become increasingly important. Consistency of approach and use of standards between geoscience organisations, so that their data can be exploited efficiently, will be an expectation of many of our users and customers. Across the world perceptions of value and benefit are being levelled and nowhere more so than in the knowledge and information business occupied by geoscience organisations. In this context the importance of working effectively together in international teams cannot be overstated.

Acknowledgments

The authors wish to acknowledge the contribution of the IGME 5000, GEIXS and GIFT team members and the steering groups of these projects, without their hard work this paper could not have been written. However, given their entirely voluntary contribution, particular thanks are due to the IGME 5000 participants and advisors; they are the major factor in the project's successful progress to date. We would like to record our thanks to colleagues in BGS and BGR for support during its preparation and also to the GEIXS/GIFT EC project officers. This paper is published with the permission of the Directors of the BGR and BGS, however the views expressed are solely the responsibility of the authors.

References

- Asch. K., 1999, Geological Information for Tomorrow's Europe: ein (umwelt-)geowissenschaftliches Informationssystem für das Europa von Morgen: GUG Conference, Halle.
- Asch K., 2000, The IGME 5000: A 43 nation geological jigsaw puzzle (but there's no picture on the box): Conference CD, GeoCanada 2000, Calgary.
- Jackson I., 1999, Enabling access to a Key Environmental Resource. From Pan-European meta-data to high resolution decision-support systems for geoscience knowledge: ESRI 14th European User Conference, Munich.

Appendix

Summary of IGME 5000, GEIXS and GIFT Projects

IGME 5000 (1:5 Million International Geological Map of Europe and Adjacent Areas)

This is a major European GIS project. The IGME 5000 is being managed and implemented by the German Federal Institute for Geosciences and Natural Resources (BGR) under the aegis of the CGMW (Commission of the Geological Map of the World). The project now involves more than 45 European and adjacent countries and the final area covered will reach from the Caspian Sea in the East, to the Mid-Ocean Ridge in the West, and from Svalbard in the North to the Southern shore of the Mediterranean Sea. The aims of the project are to develop a GIS which will deliver a printed map providing up-to-date and consistent geological information. The IGME 5000 GIS will hold significantly more information than the previous printed maps produced by pre-digital technology could ever provide. The GIS will also offer versatility, e.g. to retrieve and present for the whole of Europe, information on age, petrography and structural and metamorphic features. More importantly the IGME 5000 GIS will provide an essential foundation for pan-European applied geological/thematic mapping.

While the main theme of the GIS is the pre-Quaternary geology of both the land and offshore areas of Europe [Asch 2000], it is planned to include additional themes, such as Quaternary geology; a key factor influencing the natural landscape. An interactive web site <http://www.bgr.de/karten/IGME5000> has been created where users can now get information on the project's progress, but later will retrieve and download geological information according to their individual requirements.

Because the project involves so many European and adjacent countries, mobilising the respective national geological surveys was essential. Participants are required to contribute draft maps and associated database details of the pre-Quaternary geology of their on- and off-shore areas. This required the establishment of over-arching standards and technical guidance on procedures for all project participants, such as a digital topographic base map, ever developing

term dictionaries, an abbreviation code, a common data model and structure etc.

Other than the funding of the project manager and a small GIS and cartographic coordination team by BGR, the project is entirely dependent on the numerous voluntary contributions of the many countries.

GEIXS

In April 1997 the 15 geological surveys of the European Union (operating within EuroGeoSurveys, an umbrella association based in Brussels) formed a project consortium to exploit the Internet to advertise and improve the accessibility of their information bases. The consortium was led by the British Geological Survey (BGS), assisted by a Steering Group of five other nations. The consortium was successful in obtaining European Community funding (approximately 650 000 Euros, to be matched by the same amount from the geological survey consortium) for their proposal to construct a harmonized database of geoscience information as far as the metadata level. The system (GEIXS — Geological Electronic Information eXchange System) was to be implemented on a web-server, creating a one-stop-shop access point to 15 disparate national data sources (Jackson 1999). The proposal to the EC argued the difficulty of approaching each national survey separately to determine what pertinent information existed, especially as each utilised different standards, formats and languages. It also stressed that geology and its associated problems do not respect national borders.

GEIXS operates down to the metadata level, i.e. holding information describing the data. It does not hold the underlying, detailed geological data. However, the GEIXS web site (<http://www.geixs.brgm.fr>) offers contacts and links to the individual geological surveys that hold the detailed, high resolution data. The metadata within GEIXS is spatially referenced and an innovative graphical user interface, which uses conventional Geographic Information Systems (GIS) software, has been developed. The database is also linked to a multilingual thesaurus so that it can be interrogated using twelve European languages.

A considerable amount of data management and systems development underlies achievement of the deceptively simple project aims. Separate "workpackages" in the GEIXS project, undertaken in the main by the 5 member countries of the project Steering Group, have addressed: the development of data models and dictionaries; the design of data entry and retrieval applications; data acquisition,

harmonisation and loading; geographic co-ordinate transformation programmes and location and procurement of topographic bases. GEIXS models and metadata follow the draft CEN Standard prEN 287009 (July 1996) modified to accommodate geoscience specifics. The GEIXS project has effectively created a *de facto* pan-European geoscience metadata standard that is being adopted by organisations across and beyond Europe. GEIXS was extended in December 1998 to include 8 central European nations and Norway and the EC contract was completed successfully in December 1999. However, the GEIXS web-site continues to be maintained and upgraded by the EuroGeoSurveys association who collectively fund the operation.

GIFT

GIFT (Geological Information For Tomorrow's Europe) was a project proposal to the European Commission's 5th Framework Programme. The aim of the 2 year project was to prove the concept of providing rapid access to consistent, spatial, pan-European, thematic geoscience information via an innovative but user-friendly Web-site. The project was to integrate and exploit web-enabled geographic searching and other leading-edge text retrieval and data mining tools. GIFT planned to seek out and document the real user need for geo-environmental data. GIFT was also to investigate existing national and international thematic data standards and models and develop new working standards where none currently exist. It was to prove its concepts on three geo-environmental themes — coastal erosion, mining subsidence and industrial minerals. A professionally implemented marketing phase was planned to raise awareness of the critical nature and increase the profile of geo-environmental issues and to ensure that the systems and standards developed by GIFT were publicised, understood and used.

GIFT was a consortium of 12 geological surveys and a commercial software company; the project coordinator was from the Bundesanstalt für Geowissenschaften und Rohstoffe (BGR). The estimated budget was approximately 2 million Euros. The project obtained a satisfactory evaluation by the EC but was not funded because other projects were considered to be of higher priority. The initiation and construction of the GIFT proposal took place over 6 months in 1998/1999 and was undertaken by a small number of the project team after an initial workshop to discuss and agree the concept. At the time of writing plans to re-launch GIFT in the light of feedback from the EC are still alive.

Kristine Asch, BGR project manager and specialist in thematic mapping and GIS, has worked since 1990 in the field of environmental geology and applied geosciences, from 1995 leading a GIS and database team within the International Mapping Section. She manages the high-profile European GIS project IGME 5000, which, in addition to its GIS and cartographic aims, is seen as a vehicle to implement geological standards in Europe. She recently edited a key publication about GIS in *Geosciences and the Environment* (Springer, Heidelberg, 2000). Latest assignments include coordinating the GIFT proposal to the EC and GIS consultancy in Namibia and China.

Ian Jackson is Director of Information Services and Management at the British Geological Survey. He started his career in mineral assessment and applied geological mapping. Use of computing systems to handle datasets associated with these projects led to his appointment as the manager of the BGS Digital Map Implementation project in 1990. Later he became responsible for BGS Information Systems. He was appointed to his current job in April 2000. Between 1997 and 1999 he was the Project Manager of the GEIXS project. His European interests continue as he is Head of the Information Policy Sector of EuroSurveys.