EUROPE'S OFFICIAL MAPPERS – QUO VADIS?

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INTRODUCTION

Enormous technological developments have accelerated into our lives. Their effect on the requirements and expectations of those who use the services of National Mapping Agencies (NMAs) is profound. We need to change in many ways to respond effectively. As just one example, there is a prototype mobile telephone able to present its GPS position marked on a map on its screen. If we are to satisfy the need this creates, and keep ahead of requirements that evolve from it, we will have to react with purpose-designed products. The demand will be for a speed of response and an involvement in technologies that are both beyond our current experience.

There is an alternative - to surrender saying *"we must leave that to others"*, and to comfort ourselves that if we concentrate on the jobs we have always done, all will be well. But major changes in government ideology suggest that the roles and status of NMAs are unlikely to remain unchanged. Indeed, all have to a greater or lesser extent already experienced changes that only a few years ago would have been unthinkable.

I know of NMAs that claim that they are the only organisation capable of producing large and medium-scale topographical mapping of their country, and others that say that the administration of land and property will always remain in the public sector. If, like me, you do not share their confidence, the question we must ask is not just *"Quo vadis?"* but *"In what direction, and how far do the official mappers have to go?"*

FORCES FOR CHANGE

We all accept it as a basic tenet of surveying that you work from the whole to the part – you bring in survey control from outside the immediate area before you map the extent of your local property. Without a wider reference, your survey lacks scale or relative position. In recognition of this, all countries created a national geodetic framework on which they mapped to their borders. This was achieved many years ago, and a very good job most of them made of it. It is true that there were problems of fit along those borders, but that was of no great concern until international Regions were formed. Then there were problems – all sorts of curious anomalies appeared. If you believed the statistics even the weather changed at the border!

When people appeared wanting a global picture the problems multiplied. This was because for the wider scene we had not worked from the whole, but from the constituent (national) parts.

Whether we like it or not, we are now in a world where global forces elicit rapid national responses that sometimes seem foreign to the local culture and experience. Yet whilst their acceptance may be rueful, there is a growing recognition amongst national service providers that satisfying external requirements will probably bring local benefits

too. Certainly many of the NMAs of Eastern and Central Europe seem willing to consider the introduction of costly changes now in the longer-term interests of compatibility within the European Union (EU). And all European NMAs have signed-up in principle to support the Global Map initiative.

But this acceptance of the need to behave internationally does not always seem to reach those responsible for deciding the strategic policy for their NMA. Is this because mapping is taken for granted by politicians and central government administrators, unlike such "big issues" as education, defence, or health. If they think about at all, do they see mapping as a fundamentally national matter?

NATIONAL MAPPING AGENCIES

It is national forces that have determined the mapping available in each country and this explains the differences that exist – in terms of the range of scales, cartographic styles, accuracies, levels of currency, and in the ways the "geography" is stored and accessed. The extent to which the activities of an NMA overlap with those of other organisations varies too in each country. Their "competitors" can be other government agencies, Municipal Authorities, the military, or a growing number of commercial companies. Their activities can cover anything from large scale mapping to space imaging.

Of course there are similarities too between NMAs - all are in public ownership and all provide some form of national frameworks that others can use as spatial references for their own interests. Most also provide the topographical map containing such associated information as place names and the extent of administrative areas. Created harmoniously, these together form a vital national spatial infrastructure.

The ultimate fate of each NMA is in the hands of its political masters, but it is the NMAs themselves that can influence these decisions. They need a clear vision of the role they should have, and then to convince all interested parties that this will indeed contribute to the creation of a better society and environment. In expressing this message it is vital that they demonstrate awareness of the wider picture – that they present their suggestions for change in the context of public good, rather than as arguments for their own survival.

What follows is an evaluation of the activities of Mapping Agencies. Although addressing the European scene, the conclusions will perhaps be as relevant to other parts of the world. The Paper ends with a list of actions that need to be taken, and the attitudes that have to be developed. None of these can be completed successfully in isolation, but those who act early will win themselves certain longer-term advantages.

THE VALUES OF "JOINED-UP" GEOGRAPHY

The term "joined-up" has come into common usage in the UK to describe the desire of its current government to provide a consistently high level of national services. They demand that their official Agencies collaborate more closely, and that they involve and work harmoniously with companies in the private sector. The same term "joined-up" has been applied by Ordnance Survey to describe its dream of a national system for geo-

referencing consistent with the country's topographical mapping and other associated spatial information.

The value of constantly updated Geography

Every nation has a mapping agency because, whether or not our users always remember it, no country can be administered or developed without a current and comprehensive picture of what is there to be managed and improved. In that sense national mapping is as vital as the operating system on which a computer system depends and, in the same way, it is as "invisible" to the user. i.e. national mapping is like MS Windows®! The trouble is that because a country has been adequately mapped for as long as anyone can remember, it is taken for granted by public and politician alike, and to that extent it is not valued or supported in the same way as are other elements of the national infrastructure. Unless, that is, a lack of official funding has prevented sufficient maintenance of the nation's "geography".

If not maintained, mapping quite quickly becomes so outdated that real problems are created. (This is particularly true for large-scale mapping which supports the vital business of land administration & registration of property). Such a situation was experienced in UK in the 1930's and action was demanded from all sectors of the community. The costs involved in recovering the situation far exceeded those that would have been spent in modest but constant revision. If any benefit resulted from this unhappy event it was that the importance of the role of the National Survey became recognised. (It is a pity that politicians only tend to act "after the horse has bolted". They need to be convinced early of the need for a solid stable door!)

Driven by the increasing ease with which information is available, everyone expects it to be up-to-date, and is frustrated when it is not. Where more than one source of information exists, it is the combination of its perceived currency and its form of presentation that dictates most people's ideal choice. That is because the lay-user equates "accuracy" with these qualities. An example of a legitimate need for both aspects is the vehicle navigation field; however "accurate" the position-fixing system may be, it is the presentation of that position to the driver that convinces him or not that he is in safe hands. The map itself needs to be designed for the purpose (e.g. uncluttered), but even more important, it must be up-to-date in terms of new road or housing developments. If it is not the driver's faith is instantly destroyed.

It is perhaps stating the obvious, but the survey of change should be done once only for the whole range of products, rather than for each separately. That requires a sufficiently "scale free" structure to allow revision to be cascaded down the scales from the largest to the smallest.

The value of "national interest" mapping

A recent estimate of the amount of Britain's GDP dependent upon Ordnance Survey information gave a figure of £100 billion a year. This figure excludes non-quantifiable social and environmental benefits which some might argue are even more valuable. Those who direct an NMA need to acknowledge that some of its activities have a social value that will not be paid for by individual users – the economically unrewarding but

nevertheless vital services that almost every public sector agency undertakes. A good example is the rural bus service that never travels more than half-full yet provides the only link with those who live and work in such areas. Or the topographical mapping of less developed parts of the country for which only the local Planning Authority or Environmental Control Agency is likely to be an occasional user under normal circumstances.

But then something unforeseen happens – a natural or man-made disaster like an earthquake or the remote crash of a civil aircraft. These events will demand immediate and detailed knowledge of the site so that rescues and repairs can be carried out.

There is also the geodetic framework to which all other surveys are tied. The role of ensuring national coherence and accuracy may be overlooked by most, but its maintenance is still essential.

These "national interest" services - unavoidable and intrinsically "infrastructural" investments - have to be publicly funded, and should not be an intolerable burden on the expenditure budget of an Agency.

The value of accessibility

There are many aspects to the accessibility of information, and all affect its value to the user. Theoretically the simplest to overcome should be those involved in making it available – *"you want it, we'll provide it!"* But in practice it is issues like copyright, public liability, national security, and cost-recovery policies that prevent easy supply and that raise the biggest and most complicated debates. They strike at the very heart of a country's institutional structure and, when introduced into an international forum like the European Union, they raise questions about the relative importance of Regional interests and those of so-called National Subsidiarity.

Despite the potential pain involved, these problems must be tackled because they entangle the supply of every form of public information. The EC has made a start with its Green Paper on Public Sector Information in the Information Society, but we must hope that this initiative does not get bogged down through the weight of consultation that its first Draft encouraged. No-one underestimates the difficulties of managing a Region as big and diverse as Europe, but the EC really must be persuaded of the importance of drawing up a policy for the creation and supply of all kinds of information. This cannot be done by setting up a so-called High Level Working Party unless <u>all</u> interests are represented – those of user <u>and</u> supplier, European <u>and</u> national. (NMAs or their representatives have an important role in educating and assisting the Commission in this initiative.)

Another aspect of accessibility is the extent to which the systems and products of suppliers are able to "talk" to their customers. This is actually never very easy, but the subject of standards is addressed below under the heading of "interoperability".

Not only does the customer expect his purchases to match his needs in all respects, but he also expects the process of shopping to be simple. Ideally he would like to sit at his computer terminal, view what's available, and having decided what he wants, buy it

there and then. “One-stop-shopping” is the concept by which Supermarkets have flourished. Requiring buyers of information to seek and purchase separately the various layers they need is no way to encourage their custom, particularly if they then find that the data can not be combined, or that they are forced to buy more data than they want. Well-presented information about what is available is becoming ever more essential, and the more comprehensive and user-friendly it is, the better. Having matched desire with availability, the ideal metadata service should then facilitate the purchase – in other words you supply not only the shop-window, but also the shop-counter, and remove the need for the shopper to leave his desk to visit either.

The value of the right terms

The days have gone when one designed a compromise product for the general market, (or more likely, the product that was demanded by your paymaster that everyone else had to make do with). Technology has come to the rescue in the sense that customisation to meet even minority interests is now often viable. This ability, however, questions traditionally held views: *“Should the NMA attempt to meet all specific needs because in that way proper quality control and the recovery of some official costs is ensured? Or should the NMA restrict itself to making only its basic information available and leave it to entrepreneurs to profit by using it to meet specialist markets?”* In other words, should the NMA be retailer or wholesaler?

The differences between the “American” and the “European” positions on the pricing of publicly-funded products and services are too well known to discuss in detail here, but the model followed could have a profound effect on the future tasks of an NMA. Of course one can see the wider benefits of stimulating the private sector to satisfy profitably the market for derivatives of the basic product. However, there is a serious concern over the sustainability of a mapping agency, or its ability to satisfy “national interests”, if it is dependent upon Government grants as its only substantial source of income.

Whatever the financial environment may be in which an NMA currently operates, the terms under which it makes its information available to its customers is a key element of its long-term future. To sell digital data outright may make sense for (say) a raster version of a small scale route-planning map – its “shelf-life” is relatively short, there are competitors in the market-place who will offer a similar product on similar terms, and it will be a useful “taster” to encourage subsequent purchases of more valuable products. To make available on the same terms the base data on which the whole product range is dependent might prove to be suicidal. But this is not a static situation, and the terms must respond to other forces in the market. And the market expects us to react quickly!

The value of the right-priced information

Currently market forces are all tending to push prices down and a balance has to be struck between under-valuing your product and creating price resistance. But what is the real value of information? Many suppliers still structure their prices on a basis of the cost of supply, and the great majority find it difficult to break loose from the discipline of “the same price to all”. They defend this on the “fairness” principle, only making exceptions for those who buy in bulk, or for such “public good” uses as education or

research. This approach was perhaps justified when there was a limited choice of products and it was possible to make meaningful comparisons of price. At that time, too, the true worth to the user was often underestimated. (The quoted example of Ordnance Survey's contribution to UK's economic wealth suggests that most users could afford more, although they might argue the point!)

The right model for pricing must come from the Agency's own fundamental business strategy. In an ideal world that is internally generated rather than imposed from outside by a central Administration operating on a standard policy for its entire public sector. Geographic Information is different from many other government goods and services because in the right environment its sale can generate revenue by which the on-going tasks of maintenance and product-development can be funded. There seems much to commend the marketing strategy of MAXIMISING THE BENEFIT of the products and services as this is in sympathy with the "public good" principle referred to above. Given time, and sensible pricing, it should also ensure a longer-term maximising of return to the originators. The barriers to this approach tend to be those erected by governments. By demanding year-on-year financial results they make price rises easy, and speculative and long-term investments extremely difficult.

The value of the right product

One aspect of "the right product" is its inherent quality. Like other government agencies NMAs can be too shackled to traditional standards – to produce the most accurate products because you never know the uses to which they will be put. This is indeed the justification for building and maintaining the national framework to a quality that meets the needs of the more demanding user, and of derived products. For example, we need the length of a base line linking USA and Europe to be accurate to the thickness of a coin if we are to monitor the movement of tectonic plates. But this does not justify the mandatory supply of Rolls Royces to those who want bicycles! Because of the direct link between quality and cost, top quality is frequently not what a particular user wants; he may want a diagrammatic route plan rather than a detailed topographic map. Convincing production staff of the appropriate quality of the specific task ("fitness for purpose") requires a thorough and well managed system of all aspects of Quality assurance and control.

The particular products needed by a nation depend upon the market place created by its economy and development – what is right for one will not be right for all. Neither will any particular product be necessarily appropriate for a whole country. Detailed vehicle navigation may be marketable in a major city but not viable in its rural surroundings, whilst the level of definition that is required from a digital terrain model will be dictated by the site value or the development plans of the particular area.

But there are products that seem likely to be needed by all nations. Constructing a means of linking all spatial information is one such. A map-base of the necessary scale, content, and quality may be all that is needed for some applications, but increasingly often "hooks" have to be positioned on which to hang specific information. Examples are the "geo-addressing" of buildings, or of road junctions. Indeed, completing every map polygon (whether building, land parcel, stream, wood, or any other extent) and providing it with a unique identifier seems likely to become an essential requirement

everywhere. So too will be the ability of users to transform co-ordinate systems painlessly – to transfer easily between GPS and "map co-ordinates" for example.

A requirement for new products will go on developing as new technology or human desires create the need, but there appear to be some which despite an existing need have never been satisfied adequately. In many countries the business of land registration has always been carried out on a "flat map" – the ingredient of height with its important effect on construction potential, drainage, surface area, and site value etc is not included in the otherwise satisfactory base map on which ownership details are recorded. Yet most land agents would argue that elevation is as necessary an element for the management of land and property as it is for site plans of new developments. Many will ask that the third dimension be provided as a connected but separate layer of sufficient accuracy to meet their specific needs. (e.g. as a digital terrain model of an urban environment). Others will go still further and demand "the fourth dimension" – a continuous historical record of change linked to every parcel (on which for example a national record of contaminated land would depend.)

The value of technology.

Technology not only allows more effective production, but it also opens doors to more innovative product-development and supply. In an ideal world technology responds to user needs, but in fact it is frequently the creator of new needs – a case of technologists seeking uses for what they have invented. Information suppliers must keep abreast of such developments and by thinking laterally, have their new products ready and waiting for the customers to beat a path to their door. Exploiting opportunities for internal use requires the same ability to see beyond the technology.

As an example it is all too easy to see the Internet principally as a threat, instead of a wonderful opportunity as both a delivery and a marketing platform. If in response to the needs of e-commerce we fail to provide the right product on the right terms at the right time (very soon!) we will truly be marginalised. Satellite communications offer all sorts of possibilities too, both internally for keeping the basic surveys more effectively up-dated, and externally for improving its access by users. WAP technology (as used for example by mobile telephones) is yet another medium by which exciting new product- and access-needs is being generated. These current forces for change are all powerful, and they are all most definitely <u>global</u>.

It is the relative ease by which technology allows customisation that at the same time lowers the entry price for potential new competitors, opens the door to illegal copying by others, and creates difficulties of proving that you have had your intellectual property rights violated. Some of the more "commercial" NMAs have spent large sums of money protecting these rights – in the courts and by introducing "finger-printing" as a means of proving their claim. They argue that not to do so encourages the thief, damages their revenues, and leads to a culture in which the true value of such information is not recognised. Indeed, it is from the last of these that the concept of "free public information for all" can suffer.

Finally on the subject of technology, when purchasing it for internal use there is a strong temptation to buy the best available. i.e. to include "all the bells and whistles".

Paying for attributes that are seldom used seems a waste of scarce resources, particularly as their presence increases the costs and the needs for servicing. “Appropriate technology” strikes one as being a more sensible maxim.

The value of interoperability

One may not like the word, but its place in our thinking is unavoidable!

Just as it is vital that there is a maintained national base layer on which all other spatial data can be laid, so too is it desirable to carpet the globe seamlessly. The subject of international standards probably generates more discussion and meetings in far-away places than any other aspect of our business. Despite being indispensable to success, the concept of persuading everyone to adopt a common approach is essentially frustrating. However, unless there is compatibility between suppliers and users, their data, and the systems on which to use it, data remains data - it can never graduate to being INFORMATION.

Great efforts are being made to enforce open standards, and market-forces appear to be achieving even more in the technological field, but we still have far to go. When a single supplier multiplies into an international consortium, the complexities of achieving a consistent product become even greater. This is the situation being faced for the so-called Global Map project, and in Europe over the creation of a coherent 1:250,000 scale topographical database. (For the latter the problems are exacerbated by the need to incorporate existing data in which the military have an interest).

It is easy to say and difficult to achieve, but we must find a solution to international interoperability. If we who have existing data cannot, those who start without such assets will. Microsoft has already demonstrated what they can do employing modest resources on the project but a pragmatic determination to succeed, and there are others out there just as eager to follow suit. In the European arena AND Mapping and TeleAtlas are just two that come to mind. The NMA can ensure almost certain benefits to these and other potential competitors by encouraging collaboration rather than out-and-out competition. The latter is likely to result in wasteful duplication of effort, or a failure to ensure interoperable specifications from the outset. Given the increase in data sources, marketing skills, and contacts, successful negotiation of a joint product should also ensure that it has a wider range of attributes and markets.

The value of collaboration

Recruiting and retaining staff with the skills to exploit technological opportunities is often difficult within the public sector, and indeed the requirement may be insufficient to justify employing them at all. Frequently the solution is a joint venture with a suitably qualified organisation. Whilst the skills needed may be available elsewhere within the government service, the more likely source is outside.

Differences in attitude and ability between the public and private sectors are endemic, but not necessarily as great as some think. However before you can build a successful partnership between those from different business cultures you certainly have to lose potentially corrosive attitudes. For example there are government servants who seem to

believe that short-term profit is the only motivation for those from the commercial sector, and there are private sector companies which claim that government agencies are incapable of making quick or business-like decisions. Of course neither is infallibly true, and given the right atmosphere of mutual trust and respect, and the right terms of agreement, an alliance of this sort can be enormously satisfying. The need for harmony across cultural boundaries is even greater when working internationally.

Joint ventures demand certain principles from both parties, and those on the government side involve "fairness" and "public good". For example, it will be hard to justify the granting of exclusive use of certain public data to any user; the public has a right to expect its government agencies to be even-handed in all their dealings.

There are obvious differences between the agendas of civilian and military mappers too. What we need is an acceptance from both sides that there is mutual benefit in collaboration; that both can work to tight deadlines, can respect different specifications and standards, and can even compromise when it serves the common good.

One skill that all NMAs have developed is as managers, manipulators, and presenters of spatial information – the modern-day cartographers. These attributes should not be overlooked nor undersold when negotiating a joint venture, and they are particularly relevant when arranging to incorporate with the base geography another Agency's data thereby improving the usefulness and accessibility of both. The NMA will usually be the better manager of the combined dataset, but only if it demonstrates flexibility in the way that it accepts the new material. The format in which this is delivered will have been shaped by the use for which it was originally created, and there will be a question about which layer should be amended to achieve a comfortable fit with the other(s).

No NMA can meet every surveying need of its society. For example a land developer or a road constructor will have to carry out accurate setting-out surveys long before building starts. NMAs argue that duplication should be avoided at all costs – that mapping should be left to them as part of their national remit. But what is really needed is a specification to which all "surveyors" work (whoever they are), and a method of reward for the avoidance of duplicative costs that is publicly funded. Of course the NMA should retain responsibility for ensuring that everything that is incorporated into the national survey does meet the required standard.

There will be occasions when licensed arrangements are more appropriate than joint publishing – when the role of the NMA is to do no more than to make the basic ingredients available to another organisation that has all the required skills for the adding of value. Reward to the originator (the NMA) does not necessarily have to be earned by direct involvement, but by the terms under which the data is leased. This could be a single up-front payment, on-going payments based on results, or any other variation that meets the particular needs of the venture.

The outcome of any joint venture should be that a profitable product is brought to market at a price and quality not achievable by either partner on its own.

The value of joining the others

There are, of course, many NMAs that are not yet allowed to look beyond their national borders or required to earn levels of revenue to balance their costs (although very few that are not facing severe cuts in their expenditure budgets.) They will be asking themselves whether the strategies described above are relevant for them. Despite the short-term risks involved, I believe that a failure to persuade their governments to move with this tide will commit them to a long-term sentence of satisfying only their immediate masters, and leaving the rest of their potential market unfulfilled. In that scenario it will suddenly prove not to be a long-term sentence after all, but a future cut short by the arrival of outside forces who exploit the opportunity. Even worse from the point of view of the NMA, such entrepreneurs will frequently find a way of satisfying their masters too, and at bargain prices. In that situation it will not be long before a government begins to ask *"Do we really need a national mapping agency of our own?"*

NEXT STEPS?

Accepting that the values of national mapping are as described above, a range of actions need to be taken before NMAs can play their full potential role even at home, let alone internationally. The reader may claim that some of these are obvious, some merely idealistic, and that others are already in hand, but he will accept that all require a change to existing attitudes. Most affect more than one of the many parties involved - other government agencies, national and European governments, the military, private sector competitors and manufacturers, and all users of GI including local government and the Utilities - but all start in some way with the NMA itself. For convenience therefore they are listed as actions for the NMA to initiate:

	Actions & Attitudes for change	***Notes***
1	Study & understand **users' real needs** (for current & future products and services, their presentation, format, access, and terms) – of all users, not just the traditional (government) users.	Users' requirements vary greatly, even within sectors. (e.g. water, gas, and electricity do not all have identical mapping needs.) Where possible involve the customers in the development process.
2	Demonstrate to officials and influential users the vital need for and practical **benefits of GI**. Help them to develop policies for the use of GI in their areas of responsibility. *	Make the cases relevant to <u>them</u> & their agendas, not yours. (Resist the temptation to talk about the method, unless it helps them. Use pictures not jargon. Use society as justification, not self-interest.) Convince them of the argument that certain uneconomic activities are in the "national interest" and that funding is necessary. There <u>are</u> still nations unrealistically protecting their visible secrets when they are already in the public domain via satellites!
3	Persuade the same audience that mapping requires **long-term investments**, most of all for continuous revision. Demands they make for short-term financial returns (or for free products & services) are inappropriate. *	
4	Persuade national governments that **international interests** are a natural extension to the NMA's more traditional national remit, and that concerns for national security can no longer be dealt with by extreme secrecy over mapping.	* *Whilst the need for understanding of these issues is just as great in Europe as in each separate nation, the means of getting the messages accepted in the wider arena requires international co-operation.*

5	Offer advice and encouragement to those who are attempting to understand and to adapt national **institutional policies** (e.g. Copyright) for use internationally.	These have become "political" issues needing the interest and support of politicians (national and international) to resolve. Lobbying is required.
6	If resources are not sufficient for everything, spend them on **continuous revision,** and European harmonisation. These are the NMA's key roles.	Product development is important, but revision & enhancement of existing products is vital, (including the geodetic framework.)
7	Develop **collaborative partnerships** with users (& encourage them to provide feedback on the products they use.)	Customers frequently make ideal partners as both sides can see particular benefits to themselves from a joint enterprise.
8	Negotiate **business relationships** with Value Added Resellers, Service Providers, and with specialist publishers, on terms that are attractive to both parties.	Many of the tasks associated with making Geographic Information more useful and accessible involve skills that others have in abundance, and NMAs do not.
9	Liase with **the military** in order to establish areas of common interest, and share resources and standards for their joint satisfaction.	Tradition has encouraged the view that military interests need to be kept separate from civilian. Issues of secrecy have also got in the way. No longer necessary?
10	Appoint at least one person with time to **think about strategies**, and require them to link these to practical implementation.	However scarce your resources, release the right person from day-to-day administrative duties.
11	Support the drafting, introduction, and adoption of all **international standards** involved in the creation and use of GI.	International collaboration is essential for our future. It is impossible without recognised and accepted international standards. *De facto* standards are best but only possible if they satisfy ALL interests and not just those of the supplier.
12	Assess the information currently **published in association with topography**, and decide if additions or deletions are now called for.	Technology allows the layering of additional information, not all of which has to be made available to other than the specifically interested audience. Existing associations are usually long-standing, and may not reflect all of to-day's needs. e.g. for traffic control, coastal zones, or for census etc.
13	Consider seriously the broader benefits of **closer organisational ties** with other agencies in the "information business" (e.g. land administration) and encourage government to re-think the structure of government accordingly.	Many NMAs are already responsible for land registration. They enjoy a greater kudos than those restricted to mapping only. It helps them to meet more effectively the need for secure title to land & property (which is a politically recognised objective).
14	Protect **intellectual property rights** as a means of ensuring a fair and rewarding market place for all.	Society has invested huge sums of money in the creation of its NMA's archive. This investment should be protected.
15	Apply **terms for the provision of information** that support the NMA's business strategy.	Be prepared to introduce entirely new terms (e.g. data leasing). Keep terms quick to adapt and as simple as possible. Decide on the revenue required, assess the total market, and try to price products to their value for the customer. Take note of competitor's terms.
16	Set the **price of products & services** using the same criteria.	
17	Introduce **Quality Control and Assurance** systems, and train staff to employ these methods.	Identify the appropriate specification and production methods for every product, and insist on adherence.

18	Create a comprehensive and user-friendly national **metadata service.** Create links between it and other metadata services that provide details of information that can be related to the NMA base.	Use emerging standards to allow expansion to international audiences. Include the facility for customers to purchase products direct from the metadata service.
19	Employ sufficient resources in **R&D** to bring the right product to market and the right production method to the factory floor, both at the right time.	There is scope through the forums created by professional organisations and others to reduce local costs in this field. Joint ventures with partners may offer similar opportunities.
20	Give serious consideration to providing both **heights and unique parcel identifiers** to topographical databases.	In doing so, employ international rather than local standards; the pressure to export these attributes will become inexorable.
21	Consider the need for the **linking of place and time**, and of **GPS referencing** with mapping.	Actual dates of change could become essential? Map referencing for GPS users already is!
22	Buy **appropriate technology** that allows more effective production, and more useful, more accessible products.	The ideal technology is fit for purpose, but ensure that there is an upgrade path available to meet developing production methods.
23	Encourage those who survey for their own purposes to offer the results for **incorporation into the national archive.**	An agreed scale of fees, and a specification against which the survey can be checked, are both necessary.
24	Work with **schools and colleges** to instil an understanding of GI in the young, and appropriate training for professional users.	Suitable material to excite interest and understanding in GI is a worthwhile investment by the NMA.
25	**Be prepared to contemplate new destinations – at home and abroad - and to travel quickly**.	The changes we face are more fundamental than we have ever faced before, and they are AC-C-E--L--E---R---A---T----I-----N------G!

SUMMARY

There are important potential roles for National Mapping Agencies in to-day's world of technological developments and global initiatives. However, other organisations could undertake at least some of them and we have critics who believe there to be definite advantages in a take-over of NMAs by the private sector. On the other hand, there are those who defend the quality of the work we do, and who argue that the demands of commerce would result in a less complete satisfying of "the common good".

The ideal solution is more likely to come not from either scenario, but from partnerships between NMAs and those who can complement their existing and latent skills. For such partnerships to develop as comprehensively as they must, changes have to take place. Many can be achieved by first assessing the strengths each has to contribute, and then developing them in harmony – whether at home or in the international market place.

The rightful place of the National Mapping Agency is based not in history and tradition (long and honourable as these may be), but earned by their current relevance. It comes down to NMAs convincing themselves, their masters, their users, and their potential partners not of what they could do, but of what they should do in order to maximise national benefit. If they can achieve that, National Mapping Agencies can look forward not only to playing a vital and sustainable role in satisfying to-day's needs for "joined-up geography", but those of tomorrow also.

Biographical Note:

John Leonard retired as Deputy Director General of Great Britain's Ordnance Survey in 1995 following a career in map-making at home and in a number of overseas countries. In early 1996 he was appointed Secretary General of CERCO (Comité Européen des Responsables de la Cartographie Officielle). CERCO represents the Heads of National Mapping Agencies in 37 European countries.

John was a member of the recent UK Bureau of FIG and was Director of the 1998 Congress in Brighton.