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ROLE AND POTENTIAL OF INFORMATION TECHNOLOGY IN ADVISORY SERVICES

by

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1 Abstract

This paper Highlights the important role that information technology now plays in the operation and management of agricultural advisory services (AAS). The early use of computerised business management services in the 1960s to the present day use of Internet and Intranet services is reviewed along with examples of information technology (IT) applications from advisory and extension services around the world.

The impact of reducing government expenditure on advisory services has led to the widescale adoption of IT by AAS in an effort to contain or even reduce costs. The need to commercialise AAS has also resulted in the development of IT-based products in order to offer services which are attractive to the clients of AAS. The need for capital expenditure initially and in the longer term needs to be based on clear business objectives and supported by robust business plans.

Most AAS have adopted IT in two main areas of activity. Firstly to support the advisory and extension processes in working with farmers and agribusiness. This includes the development of a wide range of applications software covering such areas as business management, animal nutrition and breeding, crop husbandry, irrigation, buildings, drainage and far waste systems design, marketing and investment appraisal. In addition, much emphasis has been placed on information collection and dissemination of time critical information such as weather, markets, pests and diseases etc. The electronic storage and retrieval of information has also been a long term goal of AAS which has met with mixed success but new Internet style technologies and reducing hardware costs seem to have overcome previous obstacles in this area.

Secondly, AAS have used IT to improve the management of their operations by investing in an range of management information systems covering the areas of finance, staff, clients and work programmes. This has enabled AAS to become more responsive to clients and at the same time more accountable to their funders.

Finally, the future potential for use of IT by ASS is also reviewed and consideration to such areas as modelling, decision support systems, pattern recognition and satellite-based systems is given. The pressures on agriculture to reduce is impact on the environment, improve is record on food safety and utilise more animal-friendly productions systems will push extension services into the development and adoption of IT systems to assist farmers to meet these challenges.

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2 Introduction

All AAS have traditionally investigated and analysed problems on farms in order to provide prescriptive advice on solving those problems. The emergence of greater interest in farm business management in the 1960s and the need to assess the economic implication of new technological innovations led to the rapid development of farm management services by AAS. This in turn led to the systematic collection of farm physical and financial data and its subsequent analysis and comparison with standard published data (now collected through the farm accounts data network – FADN). The need to process this large volume of data resulted in the farm management/economics disciplines developing computerised systems to reduce costs and speed throughput. Initially these systems were run on large mainframe computers operated by specialist data processing departments. Techniques such as linear programming and Monte Carlo routines were developed in order to try and optimise at the whole farm level. Also during this period a range of enterprise costings systems were developed to analyse the physical and financial performance of individual farm enterprises. These were initially developed for livestock enterprises (dairy, pigs, poultry) but were later extended to other species and to arable crops and horticulture. The aim was to have a small amount of data collected by the farmer on a regular basis (usually monthly) and to have the data processed and a report sent back to the farmer (and his adviser) within a few days. This would enable the adviser an farmer to discuss the results and take any necessary corrective action.

AAS are, in essence, large information processing "factories" collecting, storing and processing data in order to turn it into useful information and advice which, if necessary, can be sold. Various technologies (mainly databases) were employed to automate the process but it is only since the advent of Internet-style technologies that real progress has been made in this field. The most important (and expensive) resource in AAS is the staff but the second most important is information and that is why over recent years AAS have invested heavily in IT.

3 Management of Information by AAS

The need for AAS to have efficient method of distributing business information and technical reference literature to staff is a major business objective for AAS (FAIRBANK, 1997). In the past this was largely restricted to the use of on-line bibliographic databases of the kind provided by CABI, the FAO (AGRIS) and the USDA (Agricola). The content was largely restricted to reference data, some keywords and possibly an abstract. Then came interest in full text databases such as STATUS where the whole content of the database could be searched using keyword combinations. The huge cost of loading these full text databases was a major constraint especially as AAS realised the heavy updating requirements. In recent years the availability of Internet technologies has led to the development of Intranet services by AAS. This has proved to be more reliable and cheaper than old database technologies handling information in the form of documents which can be easily downloaded and incorporated into reports and other documents which can be passed on to the clients of AAS. Information provided in this way can be categorised as follows:

- Technical and farm management information for use with clients
- Time critical information to be collected, processed and rapidly disseminated to clients
- Business information made available to staff and managers about the operation of AAS
- Subject matter discussion groups within AAS

The information that AAS collect and use becomes a resource to be managed at the corporate level and the system design must be based on an clearly defined set of business and user requirements. A process for achieving this can be based on the prototyping techniques described by HAUTZER et all (1997). Clearly the centralisation of the information resource means that access, searching and communication have to be available to all the staff of an

AAS in order for the benefits of the investment to be maximised. The system will need to be able to deliver pages of text, spredsheets, graphics and images to end users over a variety of communication means (LANs, WANs, PSTN, ISDNI. In addition, some Internet services aimed at the wider agricultural public have been developed, a good example being ZADI's DAINet.

4 "New" Information Services for Farmers

Those of us who are long on memory and years will remember the heady days of agricultural videotex services. In the UK there are now emerging Internet-style services aimed directly at farmers. Two such services exist, Farming On-line and the Rural Business Network (OFFER, 1997). These services aim to provide information to farmers who pay a subscription to join the and use the service. Both services the same private network and they aim to provide an exclusive service to farmers and agribusiness. Services are focused firmly on communication and interaction which are the key strengths of the technology. As with videotex the main focus is still mainly on market and weather information and there are extensive e-mail facilities included in the system.

It is perhaps worth pausing at this stage to reflect on the success or otherwise of agricultural videotex araound Europe. It can be argued that the only country to have marked success was France where there was massive public investment, both direct and indirect, into the development of the technology and the services. It would be interesting to know now, in France, how many Minitels are still in use and how many have been replaced by PCs and Internet services. There were modest successes in Germany and the Netherlands but failures in the UK, Belgium, Ireland, Spain, Portugal Greece and Italy in spite of EU funding to pump prime services in the latter five countries. In the UK, farmers could not be persuaded that the services were of sufficient value for them to meet the full costs. In addition, it was not possible to achieve a measure of excludability as much of the information was available from other sources at low or zero cost (magazines, radio, television etc.). Finally, in Denmark, a choice was made not to persue videotex but to utilise the systems and services available through the LEC and the Danish Agricultural Advisory Centre.

So perhaps the emergence of these services is a chance to re-visit the lessons learned from videotex with the aim of adopting a user-oriented, marketing approach to the development of direct IT services to farmers rather than pushing large volumes of information at users irrespective of their needs (OFFER, 1997 op. Cit.) The increasing use of PCs at farm level is a key pre-requisite to the achievement of success.

5 Development and Use of Applications Software by AAS

The initial development in this field, as mentioned above, were largely in the field of farm management an ecconomics, firstly on mainframe computers. The advent of the PC and the widespread availability of good spreadsheet software soon gave rise to a whole plethora of farm management applications softwar covering budgeting and monitoring, gross margins, cash flows, investment appraisals and many other applications. These are today the cornerstone of high quality fee-paid work for many extension services and provide clients with the necessary confidence in the competence and ability of their advisers. Confidentiality of data is, of course, a major area of concern for farmers and procedures need to be in place to ensure that data is safety kept and is not able to be accessed by other.

The development of bureau (post in – post out) services for enterprise costings purposes, as outlined above, has also provided useful information for a meaningful dialogue between farmers and their advisers. Again the provision of fee-paid consultancy and advice has relied to a large extent on the operation of these services which are now quite sophisticated and allow, for example, the creation of groups for comparative purposes. This often leads to the development of competitive elements in the groups as farmers vie with each other to improve the physical and financial performance of their enterprises (league table approach). Other

applications have covered the area of design software (CAD), for farm buildings, drainage and irrigation systems, livestock handling pens, packhouses, farm waste systems, glasshouses and even to the design of golf courses.

Recently there has been much interested decision support systems (DSS) mainly in the field of arable crop production covering such areas as variety selection, fertilisier applications, pest and disease control and weed control. AAS have been at the forefront of the development of these systems which in many cases have been based on physiological models developed by researchers. Expert system technology has been used in many instances to develope DSS and there are many examples in use all over the world.

6 Investments in IT by AAS

As an example of the process required, planning an studies needed and timeframe, the following section sets out how ADAS approached ist strategic investment in IT when it was still a part of the Ministry of Agriculture, Fisheries and Food.

In his report, the Director General of ADAS made a commitment to the wide-spread introduction of the use of IT into the work of ADAS (MAFF, 1984). It was noted that ADAS, like most extension organisations, was essentially an information trading organisation. It generated, collected, digested and passed on huge volumes of information in many different ways and in a wide range of formats.

ADAS had been planning its IT strategy and carrying out various studies even before charging was introduced. These studies covered a detailed analysis of the technical data flows in ADAS (MAFF, 1985), an investigation into the IT requirements and finally, a strategy study (MAFF, 1989) leading to implementation. A strategic business decision was taken early in this process to concentrate on the provision of programmes for advisers for use in their day to day consultancy work with clients. Some oft the systems would be run as central bureau services and some would be provided on personal computers for use on the far. The rationale for this was based on a simple business model which viewed providing information and giving advice as a value added process. It was decided that ADAS would not compete directly with the agriculture software houses but would use its unique position to bring its wide range of skills and expertise together to develop systems which would be poweful aids to advisers in their consultancy work with clients. The provision of laptop PCs (HOUSEMAN, 1992) to advisers has been a big step forward in this process. All the systems which have been developed provide a tangible outcome to the consultancy process in the form of reports, rations, financial results etc. In addition, the use of IT gave ADAS a modern dynamic image which was important from a marketing standpoint. The bureau services cover dairying, sheep, pigs, poultry, irrigation and arable crops. Around 3,500 clients have their data processed on a weekly or monthly basis with the emphasis on fast turn round and high quality laser printing. The advisers use these services as a basis for consultancy contracts with clients. Currently, these bureau services support over £3m worth of consultancy work (HOUSEMAN, 1992 op. cit.).

Systems Business Classification

It was important from a strategy management viewpoint to classify the systems in their contribution to the overall business aims of ADAS. The classification is as follows:

1.) support systems which are valuable but not critical to current success. The major benfit is economy

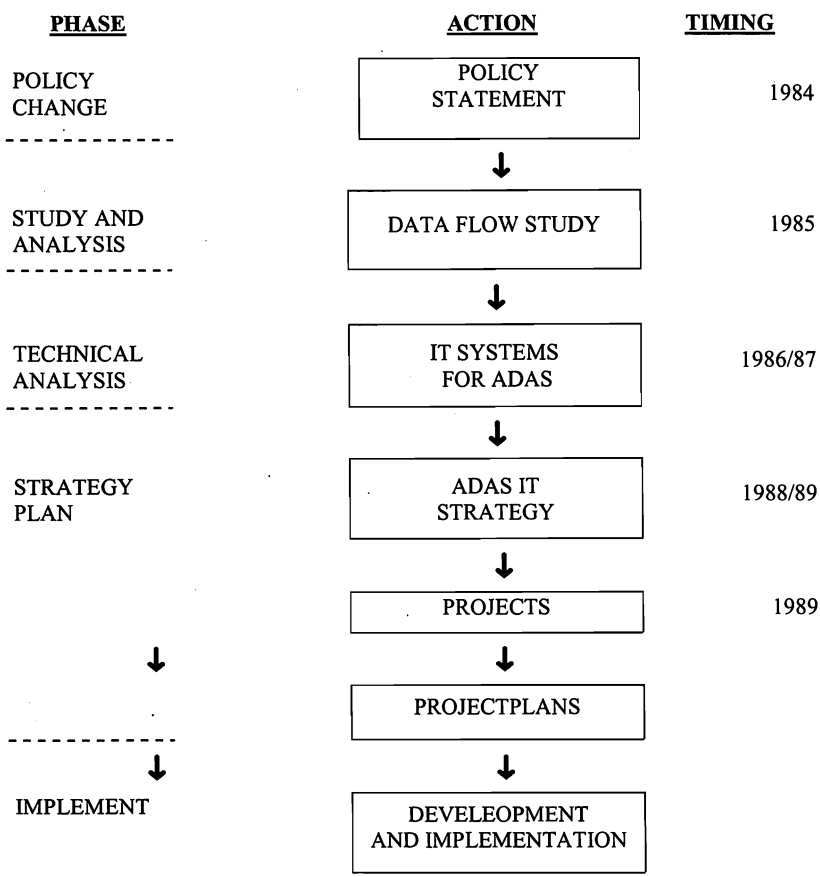
2.) operational systems on which ADAS currently depends and for which the main benfit is efficiency

3.) business impact systems which are critical to support the present and future success of the business. The major befit here is effectiveness

4.) opportunity systems which may be important in the future. Allowance is made for innovation and technology in a forward looking manner.

Each requires a different style of management. For example, support systems require low risk solutions with proven technologies with justification based solely on tangible return on investment with optimal use of resources. Operational systems are automating the primary business activities and the systems should deliver solutions with a good fit to the essential business requirements. Integrity and cost effectiveness are the key components. Business impact systems require users to play a central role and the emphasis should be on problem solving using new technologies where appropriate and accepting an element of risk. Opportunity systems however, are often user initiated and contain high levels of risk. Again they are driven from a problem solving viewpoint and represent essential investment in exploring forward. There needs to be an encouragement of innovation and risk taking but control by stringent reviews (HOUSEMAN, 1991).

ADAS STRATEGIC IT DEVELOPMENT



7 Use of IT for the Management of AAS

All AAS have also invested in IT for their own management purpose and have developed systems which will provide useful information to managers assisting them to improve the effectiveness of AAS through the achievement of cost reductions and greater focus and clarity of purpose.

- The basic requirement is to have information on 5 key areas:
- Clients – farmers and other users of the extension service
- Finances – budgets and expenditure
- Personnel – stuff information
- Work – activities and programmes
- Resources – offices, computers etc.

Extension services need to develop systems which they can use to manage their finances, staff and other resources and to operate effectively within their overall budget ceiling and to demonstrate to funders the results of their work programmes. Clearly all of the above areas are linked in many different ways and are underpinned by the structure of the extension service. Any systems which are developed will need to interface with any existing Management Information System and should be simple, cheap and effective to operate. In the initial stages it likely that certain areas e. g. finance would be given higher priority than others. The systems should serve the needs of managers at all levels and produce information designed to help them manage their part of the organisation in most cases it will be appropriate to have regular monthly and/or quarterly reports plus annual reports in all the key areas above.

All extension services need to collect and keep up-to-date a minimum set of information on their such as name and address, telephone number, size of farm and son on. The temptation here is to collect and store a vast amount of information about each farm, its cropping and stocking, how many tractors it has and of what make, its soils, crop yields, fertiliser use etc. etc. Unfortunately, although many would regard this information as highly relevant and valuable, there is a very high cost to collecting, storing and maintaining this information such that the whole exercise can become unwieldy and too expensive.

It is more important to record a small amount of information about the client interactions with the extension service and the MIS should seek to do this by recording different extension activities by time with each client. This then would be an example of a composite area of information wit data client, **personnel** and **work**.

As for finance the basic requirements are for a simple budgeting system which covers all the main areas of extension service expenditure and which can be used to monitor actual expenditure against budget. Similarly capital budget requirements have also been identified but this would need the addition of an asset register which could be used to calculate depreciation and written down values as well as holding information about the location of the asset etc.

It is also necessary to consider the links between **finance** and **work** particularly where funds may be tied to particular programmes of work. The MIS should have the facility, if needed, to link staff time with programmes and so the cost of an individual project within a programme could be calculated if necessary. These costs could be aggregated to cover whole programmes of work.

The budgeting and monitoring requirement for most AAS could easily be met by simple standard spreadsheets. Alternatively, PC-based accounting packages are freely available and offer value for money. Aggregation of expenditure up through the organisation should also be relatively easy to achieve.

The personnel of any extension service are its most valuable asset and it is highly desirable that a database of the extension service staff is constructed. The basic personnel data requirements such as name, location, qualifications and skills should be mandatory and that this data set should be extended to cover staff appraisals and annual report information.

There is, as with any personnel system, the issue of confidentiality of data. A central system managed and controlled at head office level would appear to be the best solution but it will be important to ensure that local managers have good access to the system when the need it. The programme of work carried out by the extension service will all have sponsors in the shape of funding organisations who will require information about the work that they funded. This information will range from basic measurements of the resources expended (inputs) through to the impact achieved (outputs) but in practice it is unlikely to extend beyond the collection of indicative intermediate data e.g. the number of farmers attending a demonstration.

The MIS should be used to gather information about the amount of time spent in different categories of activities (advice, promotion etc.) and this time recording should continue as the basic **input** measure for the extension staff. The MIS should also have the ability to record time against a project and it is recommended that only those specific projects which need information about the resources committed to them should have data collected. The risk is that time will be recorded against activities and projects in a way which is onerous on staff and useless to managers. The secret is to ensure that the number of headings under which time can be recorded is kept to a minimum and the time units are made as large as possible (not less than 1 hour).

Intermediate and **output** data are more useful to managers but are more expensive to collect and so should be kept to the minimum required to satisfy funders. It is recommended that basic **intermediate** information about the number of farmers visited or the number of farmers attending a meeting should be collected as routine but information about those farmers e.g. the area of their farms is only collected when a more detailed analyses of extension effectiveness is required.

8 System for the Future

Wit agriculture coming under increasing pressure, not only from an economic standpoint, bat also from the many public concerns such as the environment, food safety and animal welfare, the demands on AAS to develop IT systems to assist farmers adjust to these pressures is bound to increase. The main areas of current interest would appear to be as follows:

- Models for the environment and ecology
- DSS for management and information intensive production
- GIS for environmental and ecological mapping and pollution
- Pattern recognition for quality parameters and pest and disease identification
- Satellite and GPS systems for "precision agriculture
- Food product tracking through the food chain
- Animal tracing

9 Conclusion

In a recent paper on extension called "Empowerment through Communication", *Willem Zijp* (1998) stated that the information superhighway will have profound implications for development and he poses the question of how extension can use this technology to improve knowledge through the transfer of information and data. *Zijp* sees the possibility of interconnecting rural people and using a community based approach as a mechanism for building new partnerships and for shifting control from central authorities to the local level. It is the role to lead, to assist and to support rural communities and in the field of IT there have been many mistakes made but also many success stories. As the world telecommunications industry continues to grow exponentially there will be increasing opportunities for more sophisticated communication at reduced cost. Earlier in this paper I pointed out the formidable challenge to the world's farmers to feed an increasing population, with greater food safety, in a more sustainable manner, all at lower cost and it is clear that knowledge will be the most important factor in the success or failure of their efforts. The important role that IT will play means that AAS will continually have to reappraise their use of IT and its place in the services they offer to farmers.

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