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**DESIGNING AD-HOC
MANAGEMENT
REPORTING
SYSTEMS**

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Designing Ad-Hoc Management Information Systems

1. Introduction

As the title implies this paper aims to give an Actuarial viewpoint on the factors that may be considered in designing a Management Information system. This is an area that would traditionally be viewed as outside the realms of an Actuary, but there is no doubt that for many Actuaries the availability (or lack of it) of good quality management information has a significant impact on their productivity. As the roles' of Actuaries expand there are both challenges and opportunities. The challenge is that the expanded role will require even more management information, and the opportunity is that of being able to influence the design of the Management Information System.

2. The Problem

We are all familiar with the scenario. You have been appointed Actuary/Statistician/Analyst/Researcher to XYZ Insurance Co. You have a terminal that gives you access to the on-line underwriting and claims systems and a PC equipped with a spreadsheet, database and word-processor.

You ask for the Management Reports and are given 500 pages of flow line output that on examination turns out to be virtually a dump of the claims and underwriting systems. You are told that the report is produced weekly and that the last 6 months worth are in your cupboard.

You are asked to produce a detailed evaluation of the Company's 6 major classes of business - reserving, pricing and proposals for future strategy - the works!

You go to see the IT manager who tells you that he is short staffed and while he is happy to help, it will take some time to specify and program the new reports you require.

You traditionally have two choices: The company has a Management Information System for the Senior Managers' use. You are offered access to it. Alternatively, as a special concession, IT offer you access to the programming environment.

Let us consider each of these possibilities:

2.1 Existing "Management/Executive Information Systems"

These systems are always designed for senior management, and are designed to provide the specified information in an environment that is easy to use, visually attractive, and least expensive to provide within the specification required.

These systems generally meet the requirements of the intended recipients, but create problems for an inquisitive Actuary:

The system is inflexible, producing only those reports designed for the system. Any change to reports requires programming effort, and can often only be achieved by fundamental system re-design, as the cost element often results in information being stored and accessed at a highly summarised level.

The software used to write the systems is intended for use by IT specialists and is not intended for use by non-IT staff to produce quick ad-hoc report generation.

The inflexibility of the system and the need for continual development creates continuing development costs which include:

i)   Cost of IT resource in developing new reports/data sources etc.

ii)   Cost of lost productivity caused by inability of system to meet continually changing needs

These costs are often significant in relation to the initial development costs, and can increase the overall cost of the system dramatically over a long period of time.

There are already a large number of products in the market which Actuaries are using today, such as Microsoft Access, Lotus 1-2-3, Paradox, FoxPro and so on. These products all have limitations as to the amount of data which can be manipulated, and also involve steep learning curves. This results in Actuaries being more involved in learning and programming the application software, rather than in Actuarial research.

2.2 Raw Data Access

Researchers may elect to write their own analytical programs on raw data files. This requires a high level of computer literacy, and may still require IT Department involvement in production of downloaded data files. This is because it is unlikely that the Actuary would be allowed to run his own programs on live corporate databases during working hours, and in any case the Actuary is unlikely to be happy with a constantly moving dataset.

Unless very carefully controlled this method often has poor system documentation, both of programs and data, which makes the risk of mistakes much higher. It may also lead to problems if staff change, as the programs can often be understood only by the original actuary. A steep learning curve is inevitable if new staff are unfamiliar with the information environment.

Of course, many Actuaries and other researchers have no desire to become systems analysts or programmers, but the raw data access approach would push them down such a route unless they want to be restricted to specifying

reports to a separate programming function, with all the attendant delays and "political" problems that this approach brings in large organisations.

This method also imposes continuing costs on the organisation, although they are different in nature to the EIS/MIS approach:

    i)   The additional cost in using Non-IT staff (particularly Actuaries) to develop and maintain systems.

    ii)   The costs imposed by steep learning curves, poor documentation and risks of mistakes.

2.3 Summary

Neither of these "solutions" are ideal, or, let's face it, attractive.

What then is an alternative approach which aims to solve the problems identified above? There may be many answers to this, but we believe that significant progress could be made by using a 'Rules' based Management Information system, which is explained in more detail below.

3. "Rules" Based Management Information Systems

A "rules" based system sits in the middle between a rigid MI system and the raw data access. The aim of the system is to provide the flexibility of the raw data access approach, combined with the ease of use and visual appeal of the rigid MI system. The "rules" based approach can be (and is) applied to many practical problems both within insurance and in wider fields. The structure of the system is explained below:

3.1 The Information Environment

The first phase of a "rules" based system is the creation and maintenance of an Information Environment.

The Information Environment consists of a "data warehouse" and a "data dictionary" that together form the data that is accessed by the system.

The "warehouse" is the structure of the data (be it simple databases, relational databases or whatever) which is to be used within the system. It should be designed at a low level and be concerned mainly with ensuring availability of good quality information. This is purely an IT task, although the Actuary may be involved in determining the definition of "quality" information.

The "dictionary" is a system through which all items in the "warehouse" are defined with standard corporate labels and are given validation tables where appropriate. All access to data in the "warehouse" is channelled through the "dictionary" thus maintaining corporate standards and allowing global

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changes to standards to be implemented simply by changing the data dictionary. The "dictionary" can also define standard derived information, such as earned premium, which again is important in maintaining consistency. The maintenance of the data dictionary is an IT task, again with *the involvement of end-user staff.*

3.2 The Structured Reporting System

The production of reports from the data "warehouse" is achieved by writing (in a plain English format) sets of rules that can extract, format and output the data as required by the user. The existence of the data dictionary ensures that the user does not need to worry about data format, and the controls placed on the data warehouse ensure that data quality is maintained.

The language and environment used to define the rules is designed by the users (particularly if an in-house system is developed) to meet their requirements as they see them. This should provide an environment that is easy to use and visually appealing, at least in the eyes' of the users.

The rules can be simple, such as defining how to format an address field on a report, or complex, such as calculating the linear regression of a set of data. The important point is that the scope of the rules is defined by the user and can be extended as required by the user.

The rules can be maintained using "rules" libraries that collect similar rules *together. New reports can then be constructed by linking together existing* rules from the libraries with new rules where necessary, rather than by writing a completely new report. This approach allows consistency across reports, and an economy of effort.

Under this system, the division of responsibilities between the IT department and users can be clearly defined. The exact details will be influenced by the particular situation, but a generic approach would be as follows:

3.3 IT Department Responsibilities

i)   *Collection and maintenance of corporate databases (as ever!)*

ii)   Provision of suitable database files to the enquiry environment. These are to be on a monthly or weekly download basis, for the same reasons mentioned above in relation to raw data access.

iii)   Creation and maintenance of the Data Warehouse and Dictionary.

iv)   Development of a simple to use interrogation language for use by the analysts.

3.4 Actuaries' Responsibilities

To design the basic framework for the "rule based" enquiry language. Where special computed variables are required (like the earned premium) then it is

the actuaries' job to set out the rule.

To start the process off by suggesting the kind of reports that other users might find useful and to demonstrate how they might be generated.

To accept responsibility to ensure that different users do not either reinvent the wheel or deviate from agreed corporate definitions. The rule based system should in any event make this difficult.

3.5 Costs
There are obviously initial costs in developing the Data Warehouse and Interrogation Language and in training staff in new systems. In the long term, however, the additional running costs should be relatively low:

i) The maintenance of the Data Warehouse is essential, but should *not generate any additional cost over and above that which is* required to update existing corporate systems to allow for new data.

ii) The fact that the system is designed essentially by the users should mean the learning curve is shallow, and that the costs imposed by poor documentation and risks of mistakes are alleviated.

Overall, the total cost of the system described above should, if properly implemented, be significantly lower than the first two approaches, while at the same time providing significantly more flexibility to the users.

An example of how this approach can work will be presented during the Convention session.

3.6 Summary

A "rules" based management information system has many advantages which are covered above, but in summary we can see that:-

i) There is a clear division of responsibility between production and *maintenance of data and development and maintenance of* reporting.

ii) Data integrity is ensured because users are not able to introduce corruptions in the data held in the data warehouse.

iii) Integrity is further enhanced because the combination of the in-built Data Dictionary with the rules defined ensure that terminology is consistent and not open to misunderstanding.

iv) New and exploratory reports are generated as and when needed by *those who need them, thus eliminating the frustrations of queuing* for programmer resources.

v) Analysts are able to generate reports they need using a system without having to learn a complex programming language.

vi) In the long-term this should be a low-cost option.

There are also other benefits to be gained from this method, and in particular the existence of the data warehouse and dictionary:

i) The existence of the dictionary imposes a discipline on the structure of the data which can be extended to include the on-line underwriting, claims and accounting systems of the insurer. Thus for example, if a new rating feature is added to a product, the process can be initiated by adding the rating feature to the data dictionary. The changes necessary to update underwriting screens, claims screens etc. will then be driven by the need to comply with the data dictionary, which will indicate the necessary validations etc. required. This also ensures that new information is immediately available throughout the various centres of operation without the need to re-design each system separately.

ii) The information which can be accessed through the data warehouse is not limited to internal information. Any external source of information can be added to the data dictionary with all the links and validations required for the information set up within the data warehouse. This extends the usefulness of the system significantly, particularly with the use of external information, such as geo-demographic ratings and macro-economic indicators which are becoming much more common.

iii) As a further development the "rules" system could also be extended to drive the underwriting and claims system (and already is in some companies). This would then give greater flexibility to the underwriters in designing products, and to claims handlers in handling claims, but without damaging the integrity of the core data which is maintained by the data warehouse and dictionary.

4. Conclusion

We believe that a "rules" based management information system can provide a flexible, easy to use method for ad-hoc management reporting. It has many advantages over existing methods, and can potentially be significantly less expensive in the long run.

In addition the culture implied by the method can be extended to other areas of operation leading to a more flexible productive organisation.