Studies and Research

African Universities

Review of Information Systems

by David Mason

**A Study undertaken within the framework of the
UNESCO/ACU-CHEMS Joint Action Plan in
Higher Education Management**

FOREWORD

Since the inception of the UNITWIN/UNESCO Chairs Programme in 1991, one main aim has been to foster the involvement of the NGO community specialized in higher education. Their experience brings a most valuable contribution to the conception and implementation of inter-institutional co-operation projects to benefit universities in the developing world. The NGOs of the Collective Consultation on Higher Education have responded wholeheartedly to this call for enhanced collaboration with the result that a number of dynamic joint projects have been established with UNESCO.

The UNESCO/ACU-CHEMS Programme for Institutional Development is an excellent example. The promotion of higher education management capacities is a cornerstone of the UNITWIN/UNESCO Chairs Programme and thus stands to gain much from the extensive expertise of the ACU-CHEMS Programme in this regard. In 1994-1995, the joint programme undertook research and training activities around five major themes:

- Strategic Planning (including Strategic Planning Guidelines)
- Higher Education Management Information Systems (HEIMS)
- the Middle Management Development and Training Needs
- the Management of International Co-operation in Higher Education
- Private Post-Secondary Education

The present report surveys the situation in a number of African universities with regard to the use and efficiency of Higher Education Management Information Systems. HEMIS has long been identified as an essential instrument for the successful reform of these institutions which affects their contribution to African society. As well, experiences of other regions are described, thus ensuring a broader picture of current practice in this important domain.

An approach for African universities has thus been elaborated, taking due account of the challenges faced and the principal human, material and financial resources required. These needs must be satisfied if real progress is to be made in the areas of HEMIS which is a sine qua non of institutional effectiveness for universities everywhere.

UNESCO wishes to thank ACU-CHEMS for its intellectual and practical co-operation in this useful project designed to strengthen management capacities in higher education institutions.

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CONTENTS

REPORT SUMMARY

1   Following a brief introduction, the report highlights the survey results, draws out key threads and common experiences of collaborative and package developments for universities and identifies some of the critical success factors which have been found in successful implementations. It identifies the key issues this poses for funding bodies at both a national and international level (where aid funding is concerned) and finally poses a suggested approach for the universities who as yet have struggled to develop adequate systems to support their operations. In summary the principal findings of the report are as follows.

Survey results - Universities (paragraphs 17 to 42)

2   It is clear that although there is a significant demand for improved computerised management systems the universities in Africa are starting from a very low base and the existing systems are limited in function. Very few institutions considered that they have adequate current systems and by far the vast majority considered new systems a high priority.

3   The survey examined the computer hardware and software in use. Overall there is no dominant supplier and the majority of systems currently in place are based on micro computer, IBM compatible PCs. Based on the survey there appear to be two main obstacles to improving the current systems. These are:

    (1)   A lack of funding for the projects which some universities complained extended into difficulties in core activities such as teaching and research. Without adequate funding it is very difficult to get any project under way.

    (2)   A "brain drain" where qualified university personnel who have adequate experience in computing migrate to higher paid jobs in other sectors of the economy or in some cases foreign countries where employment prospects and career development opportunities are greater.

Survey results - experiences from other Countries/Continents (paragraphs 43 to 67)

4   The report examines some collaborative developments which were undertaken in other countries both by individual universities and by groups of universities on a collaborative basis. The report highlights some of the success factors from these experiences. Among them are:

    (1)   The importance of the backing and involvement of senior management.
    (2)   Being clear about the specification of what is needed and having a clear action plan to implement it.
    (3)   Good project management and systems development methods.
    (4)   Keeping the project simple so that benefits are achieved quickly.

(5)   An emphasis on devoting effort to the implementation and training as well as developing the software.

Suggested approach for African Universities (paragraphs 68 to 85)

5   The report highlights four possible approaches for the development of improved management and administrative systems. These are:

(1)   Developing all the systems in-house but incorporating packages if relevant.
(2)   Using externally produced packages but with minor modifications.
(3)   Collaboration between universities in either (1) or (2).
(4)   The exchange of software between universities.

6   The report suggests that the first option is unrealistic in view of the years of effort (at least 100 years of effort would be required which could be completed by a team of staff in say three to five years) to produce an integrated set of packages. The report also highlights the costs of bought in commercial packages can also be significant between $500,000 and $1,000,000. To the system development effort and the package purchase price a generous provision for project management for the implementation and training should be added. The report concludes that some form of collaboration is essential based on swopping or exchange of software, some of which might be bought collaboratively.

7   Whichever common approach is adopted the report stresses that it will need to start from a common specification and a common technical strategy if it is to be effective. This presupposes a co-ordinated overall management of some kind. The human resource problem is also crucial and a way needs to be found of avoiding the "brain drain" of skilled computer staff. The report suggests investigating the feasibility of creating national training programmes in conjunction with private sector organisations to see if this could in some way improve the situation.

The way forward

8   Given the current situation, the experiences from the other countries and the options for future development the report suggests that a workshop should be held to explore these options and possible next steps. This should draw together university staff and interested parties from governments and funding agencies to discuss the issues which have arisen and the sort of approach which could be taken for either the universities as a whole or, more likely, for groups of universities within Africa who could agree to collaborate on future improvement in management and administrative computing.

INTRODUCTION

Background

9   The lack of appropriately organised and accessible information was acknowledged by William Saint[1] to be one of the main constraints on decision making in African universities. Sanyal[2] (1991 p2) attributed the economic crisis partly to the lack of adequate management "it seems that the present economic crisis, especially in Africa, is partly due to management problems...and the symptoms are .... most prominent in the area of higher education." If management is to improve its effectiveness in the HE sector then it must have available computer based management information systems to support its decision making and operations.

10   This project, which was announced at the Association of African Universities and DAE colloquium in January 1995 in Lesotho, was launched to address these issues. The primary objective was to provide strategic direction to African Commonwealth Universities in their quest to improve their management systems.

11   The report summarises the findings from a survey of universities and other organisations which were contacted during the project, and drawing upon the findings, provides a suggested strategy for African Commonwealth Universities.

The survey

12   The survey covered three areas:

(1) Commonwealth Universities throughout Africa - A questionnaire, listed in Appendix I, was distributed to 64 Universities and a total of 30 replies were received by the time of writing the report.

(2) Collaborative projects - A review of collaborative projects in countries such as the United Kingdom, and Australia to identify the progress made and the lessons to be learnt from other countries and situations.

(3) Software suppliers - A review of organisations who had been involved in collaborative developments between universities to develop software and specialist supplies of administrative software to higher education establishments.

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[1]   Saint W (1992).   Universities in Africa: Strategies for Stabilisation and Revitalisation Technical Department Africa Region World Bank

[2]   Sanyal, Bikas C in association with M Martin. Staff Management in African Universities. Presented to DAE Working Group in Higher Education in Dakar, Senegal June 1991

13   We also held discussions on an informal basis with a number of universities and collected a limited amount of anecdotal information from these sources.

14   The questionnaire sent to universities was divided into two. The first section covered a survey of the senior university staff's opinion of the importance of the computer applications and an overview of their new or planned projects. The second half of the questionnaire covered a technical review of the systems in place which was intended to have been completed by the head of the computer department or individual responsible for the applications. In summary the detailed questions covered:-

      (1)   The importance of administrative computer applications
      (2)   New/planned projects
      (3)   Technical details of existing applications
      (4)   Existing computer hardware used
      (5)   Existing organisation and staffing of the computer department

15   The reason for dividing the questionnaire was to seek views from both a technical and senior management perspective. Whilst systems might be very reliable technically, they can easily fall short of senior management needs. Whilst most of the responses were compiled in this way it was clear that some had been completed by the technical staff only and care had to be taken over some of the claims made.

16   A full list of the universities contacted has been included in Appendix II. In addition we have contacted the following individuals/organisations:-

      •   The UK Management and Administrative Computing (MAC) initiative
      •   Participants in the Core Australian Specification for Management and Administrative Computing (CASMAC)
      •   The German Hochschul Information System GMBH
      •   Seven specialist software houses

17   This section provides an analysis of the results and the key issues facing the universities. The charts are supported by further details of the institutions responding in the Appendix.

Assessment of existing systems

18   The figure opposite shows how the senior university staff responding to the survey assessed their existing systems. Few institutions rated their current systems highly. Five of the institutions had no systems other than very elementary PC applications. None of the universities responding had a full range of applications. As can be seen from the figure the best served area was payroll where 12 of the institutions rated their systems at nine or more (10 being a perfect score). Conversely few had anywhere near adequate coverage in Physical resource management, Library or Research and consultancy management systems.

Number of universities rating their systems very highly
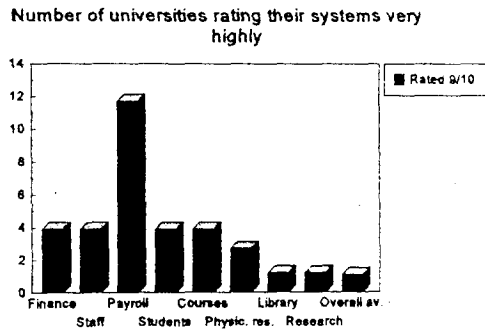

Figure 1

19   There were significantly more institutions which had partial coverage of systems as detailed in figure 2. (We made the assumption that any systems rated below 5 would not be capable of offering any more than basic facilities to support clerical as opposed to management operations.)
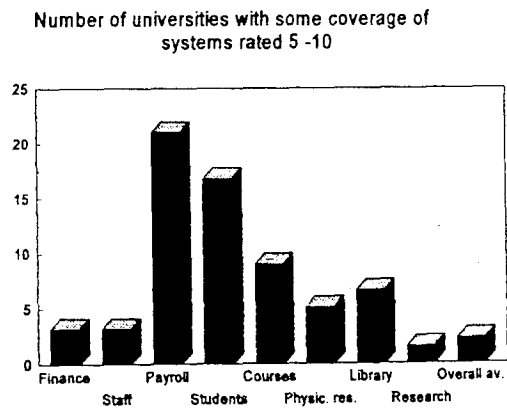
Number of universities with some coverage of systems rated 5 -10

Figure 2

5

20   There were several partial systems
      covering the student, courses
      financial and staff/personnel areas.
      Even so only payroll systems
      seemed to provide anywhere near
      adequate coverage.

21   Given this situation it is not surprising
      that 18 of the universities responding
      to the survey were actively seeking
      to replace or introduce new systems.
      Figure 3 illustrates the priorities
      placed on the various systems by the
      senior staff participating in the study.
      However, even though there are
      some areas with little or no coverage

Figure 3

such as physical resource management, they are not considered a high priority for
new systems.
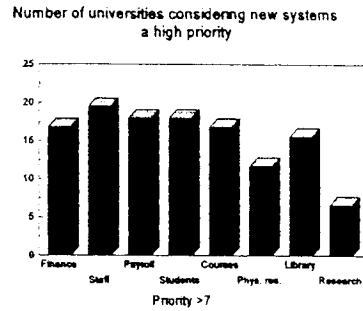
22   It is interesting to note that whilst payroll is currently well served by systems (20 of
      universities have at least partial systems in place) 18 universities consider a new
      system a high priority. The pattern is similar for the student records area reflecting
      that even though systems are being used at present they need to be improved or
      replaced. The survey did not seek to identify exactly what the reasons were for this,
      but if the African Universities are similar to those in other countries it probably
      reflects a basic lack of information available from the existing systems. Often, early
      systems are designed simply to replace clerical functions and not to provide
      management information. Furthermore
      when systems have been developed
      'piecemeal' there can be an absence of
      integration between modules. New
      integrated systems are required to
      support the operation of the institution.

Software languages & relational databases

Existing systems - software

23   By far the most popular language used
      by the universities which responded to
      our survey was DBASE in a variety of
      its releases/versions. COBOL is also
      used but the systems written in COBOL
      are generally being replaced. One
      university still had an apparently very
      old system written in FORTRAN.

Figure 4

6

24   In our experience DBase is an excellent tool for building small scale applications very quickly and effectively. These are particularly effective on micro based computers and small networks. The majority of the Nigerian Universities responding use DBase. Their national project - Nigerian Universities Management Information Systems (NUMIS) has been developed using this tool. However, a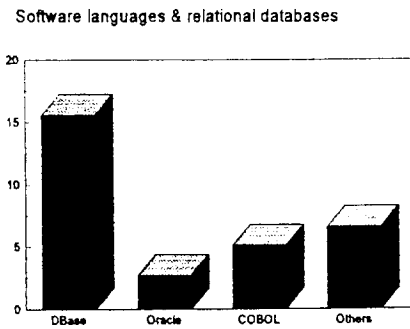s demand increases, DBase can have difficulty coping with the higher processing volumes. Larger campus wide systems are (in our experience) more effective if they are built using larger more sophisticated relational database products such as Oracle or Ingres.

25   Most institutions seem to be using office based systems - such as spreadsheets, word processors and simple databases such as DBase. Some of them seemed to be using these very creatively and without specialised staff. In general these products had been used to automate some of the more tedious clerical functions and assist with mailing lists, budget calculations and similar procedures.

26   Few of the universities were using packaged software outside of the basic financial and payroll area. Two of the universities replying however were using the ORACLE relational database and tool set with a package supplied by a South African firm Integrated Tertiary Software (ITS). Details from ITS have been included in section 4. The universities who had purchased and implemented packages supplied by ITS were very positive about the software and level of support from the package supplier. They rated them at 8 or above for all aspects of the systems. ITS detail a large number of universities in South Africa on their client list and a growing base internationally. We have also been informed outside the context of this survey of universities in South Africa using an American package - Banner - supplied by SCT in Philadelphia. Details of SCT have also been enclosed in section 4.

Existing systems - hardware

Hardware

27   Figure 5 provides an analysis of the computer hardware being used within the universities responding. As can be seen from the figure a large percentage of universities are using PC compatible computers but no one manufacture of hardware is predominant. Unlike the UK there is far less use of Apple computers and hence less problems in sharing software for the PCs. The computers from specific manufacturers (ICL, IBM, HP and NCR) are mid range computers, only some of which are compatible with UNIX and 'open systems'.
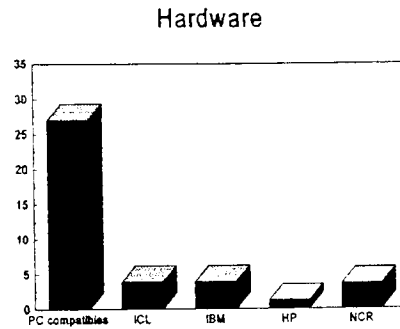

Figure 5

7

28   The use of PCs and UNIX based equipment mirrors developments in open systems throughout the world with computers becoming a commodity rather than being sharply differentiated in the market. This also augurs well for any future project. As much of the hardware can use a variety of the commonly available software products it should be possible to preserve some of the existing investments. Care will have to be taken however as some of the new software places high demands on processing capacity. Universities planning to upgrade their systems might consider using the existing hardware in other areas such as teaching and buying new equipment for administration even though existing computer hardware could be upgraded. Buying new equipment might be simpler than upgrading and would also then enable them to ensure that adequate response and service levels are obtained from the new systems.

29   Several of the universities responding had made significant strides concerning the introduction of campus Local Area Networks (LANs) and were also investigating the possibilities of linking into the worldwide INTERNET. The Association of African Universities (AAU) and the American Association for the Advancement of Science (AAAS) have undertaken a special study into the use and development of networking within West African universities.[3]

30   This study highlighted that West African universities have had a relatively late start in the transition to networked computers. The report highlighted significant strides, particularly in the area of collaboration between universities which they considered would accelerate the further development and enhancement of networks already in place. Our survey reinforced these findings. Networking is not however without difficulty as within some countries the telecommunications infrastructure is not adequate to support good quality data communications over the telephone lines.

Staffing

31   We used the following broad groupings of staff for analysis purposes:

(1)   Managers - at director level or with a reasonable senior description of the post.
(2)   Programmer analysts - including any technical staff concerned with systems programming
(3)   Operators and data entry staff

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[3]   Electronic Networking for West African Universities - Report from a Workshop - December 1993 AAU/AAAS

(4)   Installation support staff -
      concerned mainly with user
      training and implementation
      issues rather than technical
      computing issues.

32   We fitted the details of the posts
      provided by the universities in the
      survey into these groups/categories.
      Figure 6 correlates the numbers of
      institutions with a range of staffing
      levels for administrative computing.
      Figure 7 provides an overall analysis of
      the proportion of staff in the various
      groups.

IT Staffing levels

Managers   Prog/Analysts

Ops/Data Entry   Installation

■ 0 □ 1 to 4 ▨ 5 to 10 □ 10 to 20 ■ >20
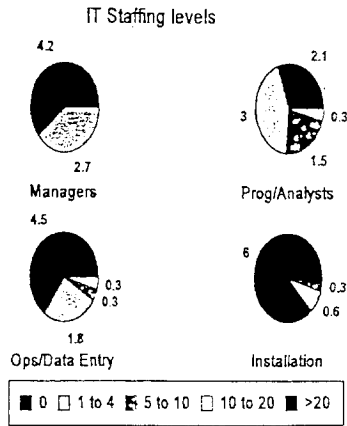
Figure 6

33   Three institutions had no administrative
      computing staff at all One of these
      however was relying on the support of
      their package supplier ITS and an aid
      funded project team for implementation. Few of the universities had more than five
      people involved in supporting their systems and most of these were either technical
      staff or data entry personnel. The overall average for each institution was just over
      4½.

34   As can be seen in Figure 7 there
      were very few system
      implementors and trainers. This
      causes serious concern. World
      Bank studies have shown that
      projects which not only provide
      the basic systems but also have a
      significant element of training
      stand a far better chance of
      success than those with simply a
      technical content. There are
      however difficulties in training
      university staff responsible for
      administrative computing to a
      high-level of competence - they
      have a tendency to move to
      further their career.

Number of IT staff in each group

Programmers/analysts 20.4

Managers 3.3

Installation 3.3

Ops/Data entry 12.3

Figure 7

35   This very major problem was expressed to us verbally during the course of the
      study and concerns the issue of competitive salaries. Most of the universities are
      tied to national public sector pay scales. Technical computing staff are in short

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supply and many of the commercial firms will pay far higher than a university can afford to pay its staff. Staff retention is therefore a persistent problem as individuals are trained and gain experience in the university they are 'poached' by commercial firms or in extreme cases leave the country for better paid positions elsewhere. We return to this issue in Section 5 where we discuss possible ways forward for the universities.

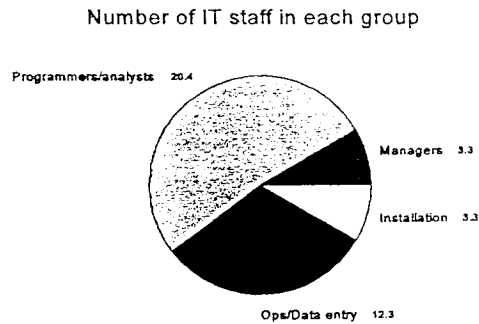## Overall development approach

Package 3
National development 6
In house 2
Limited projects 12
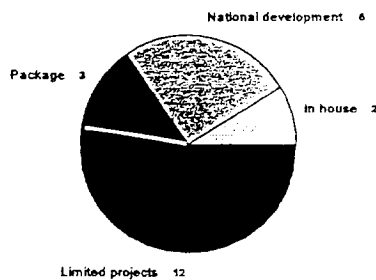
Figure 8

New projects

36   Figure 8 provides an analysis of the projects currently being undertaken/actively planned. Fifteen of the universities responding have limited or no projects in the administrative computing area at all. The largest group are the Nigerian universities who are actively implementing NUMIS and also developing additional software in house using their own computing staff. (We have split NUMIS out from the in-house developments as it is an example of a national collaborative development.) Only two universities are seemingly 'going it alone' and developing the majority of their new systems in house. These are however fairly limited developments due to the lack of internal resources and people to undertake the work. Three institutions are basing their new developments on packages.

37   Figure 9 details the projects actually being undertaken. Of the projects by far the majority are in the areas of Finance and Courses. This seems to be at odds with the priorities set by the senior management as detailed in paragraph 21. However, it should be remembered that these projects only cover the 15 institutions who are able to proceed with them. The majority of the others have urgent need for the new systems but limited or no resources available to start.

Number of new projects in each application area

Finance   Students & courses   Library
Staff & payroll   Physic. res.   Research

Figure 9

10

Conclusion on the results of the universities surveyed

38   Clearly there is a significant demand for improved computerised management and administrative systems in the African Universities responding to the survey. This demand has been met in part by existing systems but these, on the whole appear unsatisfactory. There are no dominant suppliers to the sector in terms of either hardware or software with the exception of DBase which seems to be very popular with the institutions surveyed and also ITS with their large South African user base.
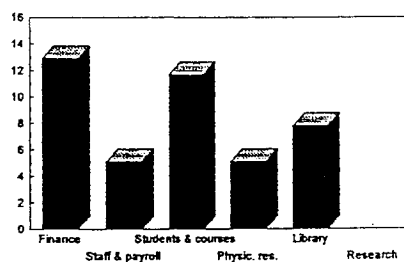
39   Perhaps the most disturbing factor in relation to the African Universities who responded is the very low base from which the institutions are starting. Whilst all of them had some systems, many were very limited in function and in some cases only covered basic office systems such as word processing, spreadsheets, elementary E-mail and networks. Human resources were also lacking, particularly in the area of training and systems implementation.

40   This lack of systems was not confined to the administrative area. As one institution put it in their covering letter to us:

"There is a serious scarcity of computer hardware and software in the .... university. As many as 300 students qualify to register for courses in computer programming and application, but due to the lack of hardware facilities the University can accept only 120 students per course and not without serious problems. Teaching a course in computer application to 120 students on two PC's only can be frustrating to both the students and the lecturer."

41   Clearly in a situation where there is a lack of the basic facilities for the primary aims of teaching and research it is difficult for an institution to consider spending scarce resources on administration. It is to the credit of the institution cited above that they rated the need for new administrative systems very highly with funding being the major obstacle to their implementation.

42   Set against this one has to remember that not all of the institutions written to responded. This does limit the conclusions that can be drawn from the survey but, even taking this into account, the universities which did respond have clearly demonstrated that they would like to improve their management information systems and are actively seeking advice, guidance and funding for these projects. Based on separate anecdotal evidence we believe that the universities who did respond are typical of all the African Commonwealth Universities.

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SURVEY RESULTS - EXPERIENCES FROM OTHER COUNTRIES/CONTINENTS

43   This section firstly lists some of the developments in other countries/continents and then draws out some of the key factors for success in the implementation of computerised management information systems.

Collaborative projects and software suppliers for Higher Education

44   Internationally a large number of collaborative developments have been implemented. These include the UK's Management and Administrative Computing (MAC) initiative, the Core Australian Specification for Management and Administrative Computing (CASMAC), the German HIS initiative and several smaller collaborative projects including the implementation of common software for the directly funded institutions for the Scottish Education Department, the development and implementation of common systems for Further Education Colleges in Northern Ireland, and more recently the pooling of resources in the Republic of Ireland to develop and install systems for the Regional Technology Colleges. Appendix 4a focuses on three of the largest initiatives, MAC, CASMAC and the German HIS project and provides details of their approach and development.

45   During the course of this review we also contacted seven of the major software suppliers who are known to be specialists in the development of educational software for universities and colleges of higher education. Internationally there are a limited number of suppliers and those contacted were:-

    (1)   CHA Computer Solutions plc, UK & Australia
    (2)   Dolphin Computer Services, UK
    (3)   EMIS, UK
    (4)   Fretwell Downing, UK
    (5)   Integrated Tertiary Software, South Africa
    (6)   Oracle Corporation UK Ltd, Oracle
    (7)   SCT, USA

46   Only three suppliers (EMIS, ITS and SCT) indicated they were interested In supplying systems to African Universities. We have included their responses in Appendix 4b. This covers a brief description of their products and the experience they have in implementing systems both in African and other countries. We stress that this information was provided by the suppliers and has been included without validation by ourselves. However we have no reason to doubt that it is true and have some direct personal experience of their performance in individual institutions. In summary all of the software houses which responded can offer a full range of applications aimed at management and administrative software.

Common factors critical to the success of projects

47   Based on the experiences of universities collaborating or 'going it alone' there appear to be a number of factors which are critical in the successful implementation of computer projects within universities. The remainder of this section looks at the lessons which can be learnt from the collaborative developments and also the opportunity for using package software. As far as possible we have written this section without attributing any of the successes or failures to individual universities, collaborative developments or package supplies to save embarrassment.

48   Based on past experience there are five essential elements of good quality system development and implementation projects:

(1)   Senior management involvement.
(2)   A good specification and systems action plan.
(3)   The KIS principle - keep it simple.
(4)   Good quality project management and systems development methods.
(5)   Paying as much to implementation as development

49   The following paragraphs describe each of these factors in more detail.

Senior management involvement

50   Many senior university staff pass over computer development and implementation projects to their technical computing staff. Whilst these technical staff are key for success it is essential that senior managers remain closely involved with the project. Computerised systems bring changes to the way tasks are undertaken. Whilst technical staff may appreciate this they do not have the overall perspective of senior managers.

51   In undertaking implementations it is essential that the senior management do not loose interest or hands on control of the progress of the work. Computing projects should be controlled in the same way as any other type of capital developments. In particular the senior team should have tight control over requested changes which can be both costly and time-consuming. It is essential to have at least three types of interest represented at the highest project control level. These are:

(1)   **Finance** - Someone who is responsible for the overall budget of the implementation and who can authorise or otherwise requests for additional expenditure.

(2)   **Users** - Someone who knows the user requirements well and will be responsible for accepting the system when it is completed. In some cases this is the same as the one responsible for Finance.

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(3)   **Technical** - Someone who is responsible for the technical delivery of the project. This can sometimes be a consultant from the software supplier and/or the university technical staff.

52   In addition it is also useful to have a senior staff member -Vice Chancellor or Pro Vice Chancellor - to chair the project management team if it is a large project . Consultants can be used to advise the team but not to replace the senior management. Where the university does not have a great deal of experience of implementing systems a seconded Project Manager can be very useful but it is essential that these staff are 'shadowed' by university personnel so that they can take over when the system is to be installed.

A specification and action plan

53   A good specification of the systems required, the facilities they will cover and the benefits that will be generated are an essential first step. Both the MAC and CASMAC initiatives commenced with this essential first stage in the development process.

54   The specification should initially cover a set of functional requirements written in terms the senior university staff can easily understand. As the project progresses the specification should be further refined and translated into technical computer development terminology.

55   If a package is being used for large areas of the systems then the specification does not have to be quite so technical but for specially written programmes a full specification covering a data model, data flow diagrams and process definitions will be essential if the systems are to deliver what is required.

56   Without a specification any systems development project which does not use over 90% of packaged facilities is almost bound to fail.

Keep it simple - KIS

57   One of the criticisms levelled at collaborative developments is that they take a long time to complete and are then too cumbersome to implement. This is a sign that they have been over-complicated at the design stage. Very often the group has to work at the speed of its slowest member if it is to remain a cohesive unit. There can also be a tendency to 'over complicate' the systems and build in as many facilities as possible. Every partner wishes to see their own requirements being met fully with the result that the software becomes more complex, and consequently takes longer to develop and costs far more than originally planned.

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58   This trait (to over complicate) is not limited to collaborative developments. All organisations have a tendency to expect far more from their systems than can often reasonably be delivered. In collaborative developments the problem is accentuated by the number of the partners involved.

59   Instead of over complicating the systems try to keep them as simple as possible. Consider changes to your internal working arrangements to fit in better with a joint computerised manual operation rather than trying to get the system to fit your current office procedures exactly. Implement the systems as quickly as possible, gain the benefits and then consider enhancements.

60   Good quality project management and systems development methods

61   In our experience there is no substitute for a good quality project manager on these types of projects. It is essential to have a clear plan of action and regular reviews of progress if the systems are to be implemented on time. In addition the development approach should be sound.

62   The systems can be developed in one of three main ways. These are:

        (1)   Specially written software for use by the university and developed either by their own in-house teams or by specialist software houses.

        (2)   The purchase of a package with suitable modifications to meet the exact needs of the institution.

        (3)   A collaborative development where resources are pooled either to develop the software or to purchase a common package.

63   The development of software for the full range of administrative applications was estimated at over 100 years of effort in the UK MAC Blueprint. The use of fourth generation computer languages and packages for areas such as finance can reduce this effort but in practice, as the families of universities found in the UK initiative, significant effort is still required. The development of new software should be done using one of the internationally recognised methodologies which incorporate data analysis and formal information engineering techniques. These methodologies, if used properly, provide greater assurance that the systems will be developed on time, in an orderly way and conform to specification. However, there are always risks of project overruns and escalating costs.

64   The purchase of packages reduces the development time and risks considerably. However, the costs of the packages can be high. Typically a student records and course administration system would cost in the order of US$100,000 simply for the software and the full set of administrative software could easily cost in excess of US $½million with further charges being necessary for computer hardware, networks and implementation support.

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65   Collaborative developments can help to reduce costs significantly. With a number of institutions sharing the development costs, or alternatively negotiating a bulk discount with a software supplier, the costs can be reduced to the individual universities. Furthermore the risks of the developments and good practice can be shared.

Pay as much attention to implementation as development

66   Major computer systems change the way an organisation operates considerably. In order to ensure that this change is made effectively staff need training and the non computerised manual procedures need to be integrated with the new facilities.

67   Even well developed systems and good quality packages can fail at implementation if enough care is not taken. As well as installing and testing the systems it is important to consider:

•   Changes to the manual/clerical procedures

•   Training

•   Benefits realisation

(1)   Changes to clerical manual procedures

Systems always involve changes to clerical procedures and usually some organisational change. It is therefore important to consider the changes in policies and procedures which will occur when implementing the new systems This requires careful thought and planning. Specific issues which need to be addressed are:

•   The distribution of work between departments - some workloads will increase particularly where information is entered into the systems. In addition some redistribution of work between academic departments and administration may also be necessary

•   Forms and procedures will also require review and possible change to fit in with the new facilities. It may be possible to remove old processes which involve high levels of clerical effort and hence achieve benefits

•   Coding - changes to the current coding systems will be needed for automating reports and management information

•   The management information requirements will also have to be clearly thought through and in particular what measures/information will be needed to monitor departmental and university wide performance.

(2)   Training

Training is also extremely important. In the UK's MAC initiative perhaps the best implementation results were obtained by universities devoting time to this area. According to World Bank evaluation reports many projects fail because the staff, (user as well as technical) have not been adequately trained in using the facilities offered. Good quality implementation support can costs as much as the initial software and often considerably more. Short cutting on training can lead to disappointing results and a poor quality implementation.

The training aspect is particularly important for technical staff when changing the approach to systems development. If existing systems were developed in-house and the new approach is to use packages it is inevitable that the technical staff will have to change their roles in the organisation from developers to implementors. Changing job functions can be a highly traumatic experience as a new skill set may have to be learnt / acquired which the technical staff may not have recognised was needed.

(3)   Benefits realisation

Finally for the benefits to be achieved from computer systems they need to be planned into the project management and implementation process. In some departments work levels will increase and in others decrease. The actual change in work patterns is predictable and should be planned. Management information also needs to be well targeted and relevant to assist in the running of the organisation and to fit in with the overall management structure.

SUGGESTED APPROACH FOR AFRICAN UNIVERSITIES

68   Given the results of the survey and the factors which are key to success in
      university systems development and implementation projects we develop in this
      section an approach which could be adopted by the African Commonwealth
      Universities. In doing so it is important that any approach addresses the specific
      challenges presented by the current situation and existing problems. The section
      first covers these challenges and then develops alternative approaches for the
      universities in Africa.

Challenges

69   There are a number of major challenges which have to be overcome if further
      computer systems are to be successfully implemented for administration within the
      African Commonwealth Universities. One of these is lack of funding. Almost all of
      the institutions responding to the survey highlighted funding as a major difficulty.
      However funding is only one of the challenges. Even with comparatively high levels
      of funds many computerisation projects have failed. Furthermore as detailed in the
      survey there are several effective, albeit simplistic, systems which have been
      developed by individual institutions with very limited funding.

70   The evidence suggests that one of the greatest challenges to the universities in the
      survey is the lack of experience of administrative computing and their difficulty in
      retaining staff who become competent in these areas. With the lack of expertise,
      even if funding were available and systems implemented successfully, it would be
      difficult for institutions to maintain them over their full lifetime.

71   In addition there are significant technical challenges in some countries such as poor
      communications, erratic power supplies and the wide geographic spread of
      institutions. This makes collaboration and the spread of good practice difficult and
      only exacerbates the existing problems. Any development approach must respond
      to the challenges and provide a clear way forward for institutions.

Alternative approaches

72   Examining the experiences in other countries there are four general models for the
      development of systems:

      (1)   The in house development of most systems but using some packages for the
             standard applications (such as finance).

      (2)   The extensive purchase of packages with minimal modification by individual
             universities.

      (3)   Universities collaborating on (1) or (2). Instead of 'going it alone' they can
             share the costs and risks.

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(4)   A less formal method of collaboration based on 'swopping' software written against a common specification for specific aspects of the systems.

73   Given these challenges we do not believe that it would be appropriate for universities either individually or collaboratively on a national or international basis to undertake development of one common system for administration (as in (1) and (3) above). There are simply not enough resources with adequate experience to mount such a large scale project of this kind in the universities surveyed. In the United Kingdom, where the skills do exist, communications are better and the geographic spread of institutions is far less, it took over five years to develop systems for management and administrative computing.

74   If these options are ruled out it leaves the possibility of using packages or developing a 'swop shop' for software. Packages are available as detailed in Section 4. A full range of packages could cost in the order of US$1 million. In addition, as their software is very sophisticated significant effort is required to implement it within an institution.

75   Although a packaged approach is feasible, universities wishing to adopt this route must have sufficient funding to make it a workable solution. Bulk discounts could be available for several institutions purchasing the software together but this is by no means certain. In addition, in our experience, the majority of the costs of a successful implementation are usually incurred in training the staff within an institution. Whilst this may seem a pessimistic view on the use of packages, it should be remembered that some of the universities in our survey were already using them with excellent results.

76   If budgets are limited there may be more benefit in setting up a 'swop shop' arrangement for software which has been developed within institutions so that it can be transferred to other universities easily. Even though a full range of sophisticated software might not be available some limited functional systems can be developed which could be of benefit. There are now a fairly large number of DBase applications for example which appear to be highly effective. Although these will not be as sophisticated as the large international packages, they could form good 'starter' systems. They would allow universities an entry into administrative computing, at a relatively low cost. As experience and funding is gained the systems could be replaced with more sophisticated systems.

77   A prerequisite for the purchase of packages or the creation of a 'swop shop' would be to develop a common specification for the African Commonwealth countries similar to the UK's MAC blueprint and the Australian CASMAC specification. This common specification could then be used either by individual universities, by national groupings of universitities or international groupings of universities within Africa for the collaborative development of specific systems or the purchase of packages to meet specific areas of requirement. Any systems developed by individual institutions could then be defined against this common specification to

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facilitate easier transfer between institutions. Without such a specification it is doubtful if software prepared in several universities could be used together easily. Exchanging experience in this way might prove very beneficial and provide some early short term gains which would require little funding.

78   In addition, for universities to share software on a 'swop shop' basis, they would also have to agree on a common technical strategy and in particular a common programming language and database administration system. DBase could be used, providing the systems developed remain relatively small. Alternatively, one of the larger more sophisticated relational data bases such as Oracle or Ingres could be used.

Retention of technical staff

79   Irrespective of the development method it will be essential to retain good quality technical computing staff. This has been a consistent problem for many of the universities participating in the survey. As the staff become trained they become more marketable and can leave to further their careers with private sector organisations nationally or in extreme cases are able to leave the country for higher paid jobs abroad.

80   In our view technical staff retention is a symptom of a much larger national problem for most of the countries involved in the survey. The underlying problem is the lack of good quality skills for systems development and implementation. This absence of skills in the labour market leads to a premium being paid for them, particularly by private sector organisations who can afford to buy in people from the less well off public sector.

81   In talking to a number of these national and international companies they not only find difficulty in recruiting technical staff but also have difficulty obtaining good quality training for them. Whilst the universities are providing basic theoretical knowledge they consider that their graduates have limited practical experience and need considerable further training once out in industry.

82   There appears to be a need both within the universities and also within commercial organisations for additional well trained computing staff. Rather than see this as a 'threat' the universities could investigate the possibility of collaborating with the private sector on a joint academic and vocational training programme. If necessary this could be validated initially from one of the professional institutions (such as the British Computer Society) in the UK to add credibility. The objective of the programme would be to add a vocational element to the degree course. Graduates would gain experience of administrative computing as an 'add on' vocational qualification to their degree. Whilst they would still be likely to leave at the end of their training the university would benefit from their work during the period where they gain practical vocational experience.

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The way forward

83   In the previous sections we have identified a chronic shortage of good quality computerised management information systems in African Universities coupled with a major demand for new systems. The main obstacles preventing the universities developing and installing their own systems appears to be a lack of funding and experience. Collaborative projects can help but, as seen from other international developments they are difficult to manage and can take considerably longer to implement than universities 'going it alone'.

84   Whilst there are a number of alternative approaches which could be followed, it is doubtful if any one would be a panacea and appropriate for all the universities involved. Some combination of approaches, providing a series of solutions for groups of universities may be more appropriate.

85   In order to progress the options for the development and staffing of the systems we suggest that interested parties from the universities and funding agencies discuss the way forward in a workshop. This would enable the universities to express their views directly and to formulate an acceptable approach/set of approaches for the universities involved. The workshop could be held in one of the West African capital cities such as Accra. As well as providing an opportunity for the spread of experiences and good practice, the main objectives of the workshop would be to:

(1)   Review and discuss the problems, alternative solutions and test their feasibility.

(2)   Assess the support for collaborative or other types of developments

(3)   Set direction for any future collaborative developments and the tasks to be performed

(4)   Review the training and staffing options.

(5)   Agree any further preliminary projects which would need to be completed prior to any further developments

(6)   Recommend a way forward for the African Commonwealth Universities.

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APPENDIX 1

LETTER TO AFRICAN UNIVERSITIES AND FORMS FOR COMPLETION

APPENDIX 1 - LETTER TO AFRICAN UNIVERSITIES AND FORMS FOR
COMPLETION

6 February 1995

Dear Vice Chancellor

Review of Information Systems

At our meeting at the AAU/DAE colloquium in January in Lesotho I announced that
UNESCO had asked CHEMS to undertake a review of administrative information
systems within African Universities. This project, if you wish, is intended to help you
and other African Universities to collaborate on the improvement of your
administrative computer systems.

The first step is to identify the systems which are currently in place within African
universities, the plans you have for the development of new administrative systems
and the staff you might have to help with any future developments. By sending the
results of this survey back to you we can then help to put you in touch with
developments in other African countries in administrative computing. We will also
provide outline details of some of the systems in use in the UK and other
Commonwealth countries.

We have enclosed with this letter two sets of forms. The first set covers your
assessment of priorities, the systems you currently have and any plans you have
for change/improvement to your administrative systems. The second set covers the
technical details of the systems. The first set of forms should be completed by you
or one of your senior managers as they are intended to obtain your perceptions of
the systems. The second set should be completed by the individual(s) responsible
for administrative computing in your university.

It would help considerably if you could arrange to return the forms by the end of April 1995. It will be difficult to ensure that information received after this can be included in our report on administrative information systems. Should you have any questions please contact me, or David Mason the consultant undertaking the review, at the above address.

Yours sincerely,

John Fielden

Forms to be completed by SENIOR UNIVERSITY STAFF

CONTENTS:

• Introduction

• Summary of importance of administrative computer applications

• Overview of new/planned projects

Please return completed forms to:

David Mason
CHEMS
John Foster House
36 Gordon Square
London WC1H OPF
United Kingdom

by   30 April 1995

INTRODUCTION

This survey is being conducted by the Commonwealth Higher Education Management Service (CHEMS) which is a part of the Association of Commonwealth Universities. We are also sharing our results with the Association of African Universities who are conducting a parallel study into the use of electronic mail.

This project is being sponsored by UNESCO and will assist African Commonwealth Universities to improve their computerised management information systems. Reliable information is key to decision making and, according to Saint[4],the lack of organised and accessible information is one of the main constraints on effective decision making in African Universities. Computerised Management Information Systems (CMIS) are one way of improving the availability of information. **The main objective of this project·is to develop a strategy for helping African Universities to develop information systems cost effectively.** This is important as:

(1)   CMIS are costly - a campus wide information system can easily run to several $million for both hardware and software

(2)   Few reliable systems are available worldwide which are specially designed for university management

(3)   The time taken to implement the systems can be spread over several years

(4)   The staff required to develop, install and maintain the systems are highly skilled and difficult to retain on university salary scales

(5)   In some African countries the problems are exacerbated by poor telecommunications and infrastructures making the implementation of such systems even more difficult.

This project addresses these issues through an initial survey of the information systems in place and planned in African Universities. **One of the key objectives of the project is to identify from among the universities some African specialists who can carry on a networking, advisory role and can be available to help institutions throughout Africa.**

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[4]   Saint W (1992) Universities in Africa: Strategies for Stabilization and Revitalization. Technical Department, African Region, World Bank.

WHAT WE WANT YOU TO DO

As a first step in this project we need you to describe your priorities for CMIS and your plans and attitudes to sharing in the modification or development of packaged software. We are also interested in any existing collaborative arrangements or networks possibly arranged via hardware/software suppliers. We should also like information on your current staffing levels for the management/development of CMIS and if you have any individuals who should be considered preeminent in administrative systems.

Following on from the survey we will prepare a report on our findings which will be published and distributed to you and all other Commonwealth African Universities. The report will contain a range of options for the development of systems and a register of the current developments for those institutions responding.

The remainder of this document contains a set of forms which we would like you to complete and notes on their completion. The first two forms are for senior managers to complete. They ask for your priorities in the development of information systems. The remaining forms cover the technical aspects of the computer systems you currently have installed and any development projects you have underway.

We have kept the forms as simple as possible and they should be self explanatory. If you require any points of clarification please contact David Mason at CHEMS Fax number +44 71 387 2655.

Thank you for your help and cooperation

J Fielden
Director

TO BE COMPLETED BY SENIOR UNIVERSITY STAFF

UNIVERSITY OF:		
SUMMARY OF IMPORTANCE OF ADMIN COMPUTERISED APPLICATIONS		
Application Area	Priority for Implementation of New Computerised Systems	How Good are Current Computer Systems?
Finance		
Staff/Personnel Systems		
Payroll		
Student Administration		
Course Management		
Physical Resource Management		
Library		
Research and Consultancy Management		
Others (please specify)		
Notes:	1 = Low 10 = High	0 = No System 10 = Supports Our Needs

TO BE COMPLETED BY SENIOR UNIVERSITY STAFF

Please complete one sheet per project

UNIVERSITY OF:	
OVERVIEW OF NEW/PLANNED PROJECTS	
Project	
Product Description	
Project Type eg package purchase/in-house development	
Status: in progress, planned, would like to	
Priority: 0 low to 10 essential priority	
Planned Start and Finish Dates	
Details of any collaborative developments (eg work with other universities, packages, collaborative developments etc):	

TO BE COMPLETED BY COMPUTER STAFF RESPONSIBLE FOR THE SYSTEMS

Please complete one form for each application, eg finance or students.

UNIVERSITY OF:	
REVIEW OF EXISTING APPLICATION	
Application: (provide details on a separate sheet if necessary)	
Development Approach: eg package, written by university etc	
Date First Installed	
Software used eg COBOL, ORACLE, DBASE etc	
Hardware Used to Run the System	
Number of On-Line Users	
Size of System in Number of Programmes/Disk Space Needed	
Data Storage	
Reliability of the System: 0 = Low 10 = High	
Quality of User Documentation: 0 = None 10 = High	
Technical Documentation: 0 = None 10 = Good	
Support Effort - number of days spent each year maintaining the system - or cost of software house	

TO BE COMPLETED BY COMPUTER STAFF

Please complete one sheet for each main computer system.

UNIVERSITY OF:	
REVIEW OF EXISTING COMPUTER HARDWARE	
System Name, Make and Model	
Age	
Planned Replacement Date	
Purchase Costs	
Recurring Cost	
Support Available from Supplier: 0 = None 10 = Good	
Assessment of Reliability: 0 = Poor 10 = Never Breaks Down	
Location eg computer centre or user department	
Network Attached/Number of Terminals Supported	
Applications Supported	

TO BE COMPLETED BY THE HEAD OF THE COMPUTER DEPARTMENT

Please complete one form for each grade of computer support staff employed eg analyst programmer working on administrative applications.

UNIVERSITY OF:	
REVIEW OF EXISTING ORGANISATION AND STAFF OF COMPUTER DEPARTMENT	
Position Name	
Number of Such Staff	
Average Length of Service	
Familiarity with Structured Techniques: 0 = No knowledge 10 = Very experienced	
Brief Description of Duties for the Job/Grade	
Comments and details of any staff with significant experience/knowledge who could be available to support/advise other African universities:	

APPENDIX 2

LIST OF UNIVERSITIES CONTACTED

APPENDIX 2 - LIST OF UNIVERSITIES CONTACTED

Name of University	Completed Questionnaire Received ✓
Usmanu Danfodiyo University	
University of Agriculture, Abeokuta	✓
Federal University of Technology, Yola	✓
University of Cape Coast	✓
Rivers State University of Science and Technology	
University of Lagos	
University of Science and Technology, Kumasi	
Lagos State University	
Abubakar Tafawa Balewa University of Technology	
Ogun State University	
University of Ghana	
Ondo State University	✓
University of Zimbabwe	✓
University of Sierra Leone	
University of Malawi	
Kenyatta University	
University of Port Harcourt	✓
University of Nairobi	✓
University of Agriculture, Makurdi	
Federal University of Technology, Akure	✓
University of Namibia	✓
Mbarara University of Science and Technology	✓
Moi University	
Egerton University	
Islamic University of Uganda	✓
University of Uyo	
University of Dar es Salaam	✓
Sokoine University of Agriculture	✓
University of Swaziland	
National University of Science and Technology, Bulawayo	✓
University of Jos	
Catholic University of Eastern Africa	✓
Open University of Tanzania	✓
University of Abuja	✓
Nnamdi Azikiwe University	✓
Federal University of Technology, Owerri	
Ladoke Akintola University of Technology	✓
Obafemi Awolowo University	✓
Enugu State University of Science and Technology	✓

Name of University	Completed Questionnaire Received ✓
University of Benin	✓
Edo State University	
University of Ibadan	✓
University of Llorin	
Ahmadu Bello University	
University of Maiduguri	
Copperbelt University	✓
University of Zambia	✓
Makerere University	
Federal University of Technology	
University of Botswana	✓
University of Nigeria	✓
Abia State University	
University of Calabar	
Baayero University	
University for Development Studies	✓
University College of Education of Winneba	✓
University of Eastern Africa	
Jomo Kenyatta University College of Agriculture and Technology	
Maseno University College	
Bagauda University of Science and Technology	
Delta State University	
Federal University of Agriculture, Umudike	
Nigerian Defence Academy	
Africa University, Mutare	✓

APPENDIX 3

LETTER TO SOFTWARE SUPPLIERS

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16 July 1996

Dear

I am writing to you to request information on your management and administrative software used in universities. This information is for inclusion in a report which will go to all African Commonwealth universities advising them of the systems and facilities being offered to the sector. I stress that your inclusion in the document will be free of charge and that this will be a good opportunity for you to promote your software and services to a wide range of African institutions. The following paragraphs describe a little more about the origins of the report, the organisation publishing the document and the funding body who is sponsoring its production. I have also provided brief details of the areas you should cover in your response should you wish to be included in the document.

I am working under contract to the Commonwealth Higher Education Management Service (CHEMS) which is part of the Association of Commonwealth Universities. The work is on one of their projects which is being funded by UNESCO. This project is undertaking a research programme into the software and hardware in place within African universities which is being used for management and administrative computing. Our final report will be distributed to all African Commonwealth universities participating in the survey.

The report will contain details of the existing software and hardware in place within the African Commonwealth universities responding to the survey and any planned developments they may have for improving their systems over the next few years. It will also contain details of software commercially available for universities and examples of initiatives which have taken place at a national level to develop software on a collaborative basis. Many of the universities in these developing countries are being funded by international aid agencies such as World Bank and central governments under their foreign aid programmes.. Whilst they may have limited resources in their own right to purchase and implement such software they can have access to significant funds through these aid agencies.

If you wish to be included in our report I should be obliged if you could provide me with the following information:-

1   A statement confirming that you are interested in being included in the report and whether or not you would be interested in supplying software to African Commonwealth universities.

2   A summary of not more than two pages of the software which you offer, its functionality and applicability to university management and administration.

3   A relevant user list from your own country and also any experience you have in installing such software in developing countries.

4   A contact name to be included in the report where universities could write for further details.

5   Any brochures/background information which you might feel appropriate - this will not be included in the report but will aid us in assessing your software.

The two page summary will be included within our report. We expect you to take every effort to ensure the summary is a true and fair representation of your software as we expect that it will be used by universities in formulating lists of suppliers asked to tender for the provision of such systems.

Please feel free to contact me should you have any questions or wish to raise any points of clarification regarding this letter. I can be contacted on the above number or alternatively through John Fielden at CHEMS on +44 171 387 8572, fax +44 171 387 2655.

Finally I should be obliged if you could respond by the end of July 1995 if you wish to be included in this report.

Yours sincerely

David Mason

APPENDIX **4a**

COLLABORATIVE INITIATIVES

APPENDIX 4a - COLLABORATIVE INITIATIVES

UK - Management and Administrative Computing (MAC) Initiative

The MAC initiative was created by the Universities Grants Committee (UGC) in 1988. At that time most of the old universities in the UK had limited facilities for management and administrative systems. Few universities had invested the substantial sums required to develop software and whilst there were some very good systems available (particularly within a group of universities using Hewlett Packard equipment) these systems lacked integration and had been developed on third generation computer software which did not contain the facilities and ease of use of the modern fourth generation software tools available.

The UGC launched the MAC initiative to assist universities redevelop their software and prepare new systems using relational databases and fourth generation languages. In 1988 Price Waterhouse were commissioned to prepare a common specification of requirements for all universities. David Mason the CHEMS consultant who was the author of this report led this initial project and produced in early 1989 a "blueprint" for management and administrative computing in universities. This blueprint covered a specification for: student records, course structures and modularisation, staff and personnel, research and consultancy management, physical resource management and general management information.

Following on from the preparation of this initial specification the UGC, then known as the University Funding Council in consultation with the universities created four "families" of universities who had common interests in developing the software. The families each developed a series of integrated modules specifically designed to provide complete operational and administrative support. They include modules for: Students, Accounting, Staff, Payroll, Physical resources, Research and general query languages. The families are (in alphabetic order):-

(1)   Delphic - this family is composed of over 20 universities. The universities decided to build their applications using the Oracle RDBMS and tools. They commissioned Oracle UK to develop the software for them for implementation in each of the universities in the family.

(2)   Ingres - this family used the Ingres relational database and tools. They used a different approach from the Delphic group deciding to write the software using university personnel and a limited range of packages. Each institution in the family developed one of the applications and this was then made available to the other institutions in the group to develop, modify or extend as they saw fit.

(3)   Powerhouse - this family decided to develop their software using the fourth generation language Powerhouse supplied by Cognos. They commissioned a software house - CHA - to develop the applications in Powerhouse for the family. In many respects they operated in a similar way to the Delphic family. However CHA had already gained significant experience of higher education and already had basic packages for student records and course administration.

(4)   SEQUS - this family used the Oracle relational RDBMS but decided to develop their software in individual universities and exchange good practice and systems between institutions. In many respects they operated on a similar basis to the Ingress group.

In the five years since their formation, the families have developed the software at varying speeds. Probably the fastest implementation was achieved by the Powerhouse family particularly for the software that was based on Digital Equipment Corporation equipment. CHA - their software supplier - had already a number of packages for student records available at the start of the development and were hence able to ensure a speedy initial implementation. The other families have also had considerable success in developing applications and making these available to other institutions in the group with many implementations planned for 1995.

 Overall the MAC initiative has achieved its original objectives of creating an environment where improved management and administrative computing facilities were available to institutions but where the costs could be shared between them. In addition it has also stimulated the development of a number of packages which are now available commercially to other institutions outside of the group.

Australia - CASMAC

The following paragraphs are an abridged version of a paper compiled by George McLaughlin, 6 March 1995 entitled "Information on CASMAC".

CASMAC is intended to meet four objectives:

(1)   Specify and maintain the core functional requirements necessary to support the business and management function of Australian Universities.

(2)   Encourage and provide the basis for cost effective collaborative development and acquisition of adaptable and integrated administrative computing applications.

(3)   Maximise the ability to respond to external reporting requirements, particularly those of government, in a cost effective and timely manner.

(4)   Allow for the flexible adoption and/or exploration of new and evolving technology and facilitate the implementation of innovative approaches for management and administrative systems.

CASMAC was based on the premise that there was a high degree of commonality in the core functionality needed to support the administrative and management functions of universities and that there were benefits to be obtained by specifying these requirements and sharing the development and ongoing costs of the resulting systems.

A short history of the project follows:

1989: A group of Australian University administrators became aware of the UK's MAC initiative and this led to a similar initiative (the National Approach to Management and Administrative Computing) for Australian Universities. A Steering Committee was formed to oversee and direct a national approach under the auspices of the Australian Vice-Chancellors' Committee.

1990: The Steering Committee was successful in its bid to DEET for funds to undertake a feasibility study to determine if a similar approach could be applicable in Australia. They asked David Mason, who had worked on the UK MAC initiative, to complete this work. As a result of the feasibility study, it was agreed to proceed with the preparation of the Core Australian Specification for Management and Administrative Computing.

April 1991 - July 1991: A small technical specification team used the MAC blueprint as a base to develop a Core Australian Specification for Management and Administrative Computing. The acronym 'CASMAC' was coined.

August 1991 - November 1991: Version 1 of CASMAC was distributed to Application Reference Groups in universities throughout Australia for comment.

December 1991 - May 1992: Progressive revisions were made to the specification.

July 1992: A Request for Information (RFI) was issued to potential suppliers of systems which would meet the requirements specified in CASMAC. This RFI required suppliers to indicate how they might deliver CASMAC-compliant applications to universities and to address a range of specified issues. Nineteen responses were received.

October 1992: CASMAC Version 2.1 was published.

A Request for Tender (RFT) was issued to five potential suppliers short listed from the evaluation of the RFI. The responses received were evaluated against the following criteria:

> CASMAC compliance
> Cost
> Company/consortium profile
> Technology platform
> Time frame and delivery schedule
> Control/ownership/support
> Adaptability and customisation capability

December 1992: The results of the RFT evaluation were announced at the Third National CASMAC conference.

January 1993 - March 1993: Universities were invited and encouraged to commit to a collaborative group project based on one of the suppliers responding to the RFT. Such a commitment would involve:

Agreement to meet a share of the total cost of achieving the CASMAC objective through a joint venture with that supplier.

Representation on the Management Committee established to oversee the project; commitment to the provision of resources in the form of staff time and expertise for systems development, testing and implementation.

No commitment for an institution to take any of the applications with timing of implementation at the discretion of the institutions.

April 1993: Based on the responses to this invitation the Steering Committee recommended to the AVCC that an agreement be signed with two selected suppliers (Oracle and Coulson Heron Associates) and that Management Committees for each project be established reporting to the CASMAC Steering Committee.

Nineteen universities committed to forming a consortium based on the CHA proposal and using the PowerHouse fourth generation development language. This consortium was subsequently called UniPower. Eleven other universities committed to forming a consortium which would use the Oracle relational database management system. This consortium was subsequently called the UniOn Group. Later in 1993, three of the remaining universities agreed on a Memorandum of Understanding for the joint development, acquisition and exchange of CASMAC compliant software based on the 'Natural' fourth generation language. These institutions are known as the Natural Group. The four other Australian universities

are either developing software in-house or have acquired software from other vendors.

Other Collaborative Issues

The German HIS initiative

Collaborative initiatives are not only the province of the English speaking nations. In Germany there has been a national body which serves as a software house for higher education administration. This is called the HIS Hochschul-Informations-System GMBH. This company was created in the late sixties when the German HE sector was in a mode of considerable expansion. The reasons for its creation were similar to the UK's MAC initiative. However in this case the company was financed by the Volkswagen Foundation for an initial start up period of five years.

Initially the company focused on the provision of information at a national level but as management information is a natural by product of good quality operational systems the HIS initiative evolved naturally to supporting individual institutions with their computerised systems. The current aims and objectives of the company are to:

- Provide HE establishments in Germany with administrative computing software.

- Provide national statistical information on HE.

- Support the planning of HE in Germany.

Their administrative computing software covers: student administration, accounting, personnel, space administration, equipment administration and stock/commodities control.

APPENDIX 4b

RESPONSES FROM SOFTWARE SUPPLIERS

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APPENDIX 4b - RESPONSES FROM SOFTWARE SUPPLIERS

This Appendix covers the responses we obtained from the software suppliers. These paragraphs were written by the suppliers and have been enclosed, unabridged, in this Appendix. We have not verified the statements or claims made and hence cannot be held responsible for any inaccuracies.

HEMIS FROM EMIS LIMITED

EMIS Limited has been involved in producing Management Information Systems for the Education sectors since 1979, arising originally from a UK Department of Education need for improved management information within Higher Education. The current offering from EMIS for the Higher Education sector is the HEMIS Student Record which has been developed in conjunction with a group of Higher Education Colleges and Universities and has now been in use at Institutions since Autumn 1993.

The Student Record currently consists of:

- Enrolments - Study Provision, Registration
- Fees and Invoices
- Assessments
- Work Experience

EMIS can also offer Human Resource Management, Timetable Scheduling and Accounting interface software, together with PC tools for management data extraction and queries.

EMIS utilises the Oracle Relational Database and has been developed using Oracle Forms 3. Current developments including the HEMIS UCAS and Admissions system due for release early spring 1996 are being developed in Visual Basic to give a true client-server environment. HEMIS runs on a number of mini-computer platforms.

EMIS provides its users with the source code for the HEMIS database and full documentation such as tables, books and entity diagrams; this means that the University has access to a truly open system that they can access to create their own reports, front-ends or additions as required. As the system is created using the world's leading relational database Oracle, features such as security, database integrity and multi-user access are present as standard.

The fundamental principle that was taken when HEMIS was designed was to provide a system that could model all types of degree and course structure and to handle the increasingly student-centred approach to opportunities for study. HEMIS has replaced the concept of a course with that of a Study Block. Study Blocks can be flexibly linked together to describe both traditional and modular programmes.

The Study Block can be a complete degree course, a field of study, a course, module, unit, assignment or even a named award or qualification aim. The database imposes no limits on the modelling of student programmes, therefore HEMIS is flexible enough to cope with expected or unexpected change or growth.

HEMIS is a complete student records system, it contains a comprehensive fees recording and invoicing system. The flexible system of standard fees means that in many cases the system can select the appropriate fee for the student; fees can be associated with individual enrolments or with the overall programme. Invoices can be generated and printed; payments, refunds and credit notes can be handled.

Another feature is the monitoring of students' academic progress. Assessments may be recorded against an assignment, module, course-year or course. Different types of assessments also allow the recording of credits and exemptions, and results may be entered in different ways.

HEMIS offers a sophisticated structure which is well suited to modular and fast changing environments, it has impressive functionality, and has been developed by a company steeped in the ways and needs of education.

EMIS, the company, offers unparalleled, in-depth expertise for Computerised Management Information Systems within the education sector. A staff of around 80, based near Bristol in the West of England, deal solely with the Post School educational CMIS systems. A full range of services are available for implementation, customisation, support, training and consultancy, for all levels within the customer institutions from senior management to key board entry staff. EMIS have over 220 customers in the UK, Europe and Africa and develop a long term relationship with their customers to ensure their systems are in line with the latest technology and CMIS issues are quickly resolved to ensure continued smooth operation within their customer base.

EMIS are registered Microsoft Solution Providers, Oracle Partners and have quality systems certified to ISO 9000/BS5750 standards.

EMIS can be contacted on:

Telephone 44 (0)1761 461100
Fax   44 (0)1761 461100

EXTRACT OF EMIS CUSTOMER LIST

UK

University of Portsmouth
Bournemouth University
University of Wolverhampton
Thames Valley University
University of Luton
Nene College
Edge Hill College of Higher Education
Buckinghamshire College of Higher Education
College of St Mark & St John
Writtle College
Kent Institute of Art & Design
Norwich School of Art & Design
Gwent College of HE

Eire

Galway Regional Technical College

Ghana

University of Ghana, Accra
University of Science & Technology, Kumasi
University of Cape Cost

ITS - THE COMPANY

ITS is a private company which is wholly owned by its directors and staff. The company specialises in the provision of software for the administrative applications and services within tertiary education.

SYSTEMS

The ITS systems have been designed to cater for the full spectrum of administrative applications within tertiary institutions. The systems have, over the years, also been enhanced by additions and added features that have been added at the request of our clients. The systems are very comprehensive, and provide an extensive database in which virtually all the administrative data is available in an accessible and structured environment. Because of the normalised design of the database it is, however, also easy to add new features to the systems.

Design Approach

ITS is convinced that the information needs can best be served if all the systems are fully integrated. Management information only becomes useful when it is based on data drawn from a number of systems (implying resources allocated). At present this integrated database comprises of more than 7750 different database fields, some 2823 objects and a total of 1032 tables.

Unique Needs

Because our clients are likely to have unique requirements that could not be covered by any "standard" package, we supply full source code and documentation.

Users Group and New Releases

ITS is committed to keeping its products up to date and relevant to the needs of its clients. The Users Group is playing a constructive role in communicating the needs and priorities of users resulting in user-driven enhancements.

The Systems consist of:

- The **Student Information System** is a key administrative system. The system provides extensive information and statistics on students and the academic offerings they are following. It provides on-line input and query facilities on applications, selection, admissions, student registration, student academic and other records, student fees, bursaries and loans, residence placing and fees, test and examination marks, examination results and grades, and graduation. The **Timetable Module** can be regarded as the "heartbeat" of the institution, and having it available in the corporate database creates opportunities for optimising both space and time allocation of students

and staff. A similar structure is also provided for the planning of the examination timetable.

- The **Personnel Information System** is closely linked to the ITS Salary system and all the other relevant systems in the suite. Extensive detail can be kept in respect of posts and personnel. This includes personal details from the time of recruitment to retirement and also detail in respect of qualifications, publications, membership of societies and professional bodies, dependents and similar aspects. It also includes a Leave Subsystem and allows for "time sheets" and human resources management.

- Included in the **Financial Systems** are the Code Structure, General Ledger, Accounts Payable, Purchase Ordering, Accounts Receivable, Payroll, Stores, Student Accounting, Cash Book, Job Costing, Vehicle Tracking and Print Costing. Access control are user defined. Features included are flexible nominal coding with multiple hierarchies, full commitment accounting, budgets on summary or detailed level, VAT/GST reporting/partial exemption handling, purchase order/requisition processing, automated supplier payment with manual override, maximisation of supplier discounts, multi-currency handling, drill-down enquiries, accurate cash flow control, etc.

- The **Physical Resources Management Systems** include a Space Inventory and Asset Register. It caters for full inventory, management and control of all types of assets.

- The **Library System** is designed to operate in isolation, but it can integrate with and complement the facilities of other ITS systems. The Library System handles the following main areas of library operation, namely: Circulation of library materials, a Short Term Loan facility, full cataloguing, a facility for bar-coded labels for items, information retrieval by both lay users (OPAC) and library staff, a backup system for lending activities, acquisitions integrated to Finance, etc. Details of student and personnel users of the library need not be entered into this system if they are already defined in the applicable systems.

OTHER SERVICES

Training and Support

ITS is committed to making a success of each of its installations, and to ensure this there is a substantial ITS involvement during the whole process. Advice in setting up implementation committees, training of users in the operation, advice in designing new procedures and flow of work, assistance in transferring data, etc is offered.

User Manuals

A comprehensive set of manuals are available on-line and on paper. The Manuals not only cover the operation of the systems in detail, but also include a copy of each report, as well as discussions on implementation and procedures.

Maintenance Contract

A maintenance contract in terms of which the institution would receive the latest updates of the programmes, is offered. It also includes on-site visits and telephonic assistance. Remote maintenance is offered by way of modem connections.

Technical Support

The persons that were involved in the initial design, programming and documentation of the systems are the same persons that now provide technical support to clients. It is therefore possible to maintain a very high level of technical support. This support consists of trouble shooting on behalf of clients, rectification of program errors, analysing and programming of specific unique needs that are not addressed by the standard systems.

Database Administration

To ensure smooth and efficient performance of the ORACLE database it must continuously be monitored. ITS is in an excellent position to perform this database administration function. The level of support contracted is determined by the needs of the user.

WHY ITS?

The main advantage of using the ITS systems is the cost savings that can be achieved in the administrative functions of the institution. The initial expenditure on the ITS systems should be weighed up against savings that arise in the following areas:

- The number of people needed to develop new systems will be much reduced.

- They can replace old outmoded systems and cater for applications which have been in backlog for many years. The non-existence of such systems restrict the exploitation of management information.

- The increase in administrative efficiency due to the reduction in paperwork and the elimination of labour intensive hand systems will also result in a reduction in the need for administrative staff.

- The availability of accurate and up to date information will allow decision makers to function more efficiently. The cost benefits of this can be substantial.

- The maintenance agreement ensures that the systems will be maintained, supported and upgraded at a cost far below what it would cost to provide these services with own staff.

CONCLUSION

"OUR MISSION IS TO CREATE PRODUCTS AND PROVIDE SERVICES THAT FUNDAMENTALLY IMPROVE THE EFFECTIVENESS OF PEOPLE AND ORGANISATIONS."

CURRENT CLIENT LIST

South African Institutions

Border Technikon
Cape Technikon
Mangosuthu Technikon
Natal Technikon
Northern Transvaal Technikon
Orange Free State Technikon
Peninsula Technikon
Port Elizabeth Technikon
Setlogelo Technikon
Transkei Technikon
Technikon SA
Technikon Witwatersrand
Vaal Triangle Technikon

University of Durban Westville
University of Fort Hare
Medical University of South Africa
University of Natal
University of the North
University of the North: QwaQwa branch
University of Port Elizabeth
University of Transkei
Rand Afrikaans University
University of Venda

Foreign Institutions

University of Botswana
University of Namibia
University of Eduardo Mondlane
Speciss Group or Colleges
National University of Lesotho

SCT - BANNER ADMINISTRATIVE SOFTWARE

INTRODUCTION

SCT's BANNER Series uses the fourth generation language PL/SQL-based ORACLE Relational Database Management System and represents a new standard for administrative software for higher education. BANNER meets the specific information needs of managers, administrators, and departmental users, giving decision makers at all levels the ability to access the right data at the right time and combine it in the appropriate format to make informed choices. BANNER's flexibility is critical in this era of rising costs and in creasing demand for services in all areas of administration. The following paragraphs briefly introduce the BANNER Series Systems available to institutions for improving their service delivery capabilities.

Student Systems

The BANNER Student Systems's wealth of features can help institutions accomplish their critical missions in today's rapidly changing educational environment including enrolment management, high-quality targeted curricula, and improved administrative services such as cost-effective recruiting, flexible registration, easier class scheduling, degree auditing, and timely billing. From recruitment to graduation, the BANNER Student System helps an institution track and record a student's progress, providing better overall student services. Recruiting and admissions letter generation and requirements tracking processes help ensure timely and accurate communications with prospects and applicants. On-line registration and tuition and fee assessment calculations provide immediate printing of schedules and bills supporting "one-step" registration. Transfer articulation, on-line transcripts, and "what if" compliance verification support the important advising and graduation processes. Faculty workload analysis supports the monitoring, tracking, and analysis of faculty instructional and non-instructional assignments, all done on-line and integrated with BANNER Human Resources. In addition, IPEDS reporting and Student Right to Know reporting are fully supported as federal regulatory updates. In addition, the BANNER Student System is fully integrated with the BANNER Financial Aid System which is described below.

Financial Aid System

The BANNER Financial Aid System provides the strategic information a financial aid office must have to make informed decisions such as the task of responding to the effects of proposed and final regulations. With its wealth of features and advanced technology, BANNER Financial Aid helps the financial and office effectively perform daily application processing and management functions with the following comprehensive components: record creation, budgeting, requirements tracking, need analysis, Electronic Data Exchange (EDE), verification, packaging, funds management, disbursement, award history, financial aid transcripts, loan processing

and loan check tracking, student employment assignments and earnings tracking, reporting and letter generation.

BANNER Financial Aid is the first comprehensive financial and management system which utilises fourth generation rule-based technology. This allows the financial aid office professionals to define processing rules on-line without computer centre intervention. The system is integrated with the other BANNER Series products. This allows the Financial Aid System to utilise student-related data such as admissions, registration, academic history, and student billing in the definition of processing rules.

Alumni/Development System

The BANNER Alumni/Development System is a comprehensive information management system for institutional advancement. Its features provide alumni and development professionals with the information they need to compete successfully for support from individuals and organisations. Using the system's 10 integrated components, managers control and evaluate the diverse activities critical to the advancement program, including: alumni cultivation, donor relations, prospect tracking, membership management, event membership, campaign solicitation, fund accounting, pledge tracking, and gift processing. Administrators have access to key facts through easy to understand, on-line summaries and dynamic inquiries. On-line processing keeps biographic records and financial histories continually updated. User-defined defaults make routine data entry efficient and accurate. An interface with the BANNER Student System provides the BANNER Alumni/Development System with valuable information on new graduates. Employee contributions via payroll deduction are integrated with BANNER Human Resources processing. Similarly, financial data from the Alumni/Development System are transferred to BANNER Finance. Over 30 standard reports accompany the system, including: telefund cards, prospect profiles, CFAE surveys, LYBUNT/SYBUNT analysis, gift society membership lists, gift acknowledgements, and pledge reminders. BANNER Alumni/Development greatly enhances an advancement operation's productivity and responsiveness to the rapidly changing fund-raising environment.

Finance System

The BANNER Finance System's nine fully integrated modules - General Ledger, Purchasing and Receiving, Accounts Payable, Accounts Receivable, Fixed Assets, Budget Development, Cost Accounting, Stores Inventory, and Investment Management (optional) - help ensure that institutional users will be able to provide the highest quality financial services within the institution. The core of BANNER's Finance System, the General Ledger, is fully integrated with all other finance system areas and confirms to AICPA, FASB, GASB, GAAP and GAAFR principles supporting either cash or accrual accounting methods. Purchasing and Receiving supports purchasing agents in making both on-demand and long-term buying decisions, as well as in controlling both requests for and receipt of goods. Accounts

Payable helps to enhance cash flow and increase investment earnings, and establishes good vendor relations by automatically calculating discounts and payment schedules and automatically generating General Ledger transactions. Accounts Receivable maintains charge and payment information for various accounts, provides for both invoice and statement generation, and includes a complete cashiering function. Management of Fixed Assets can be improved with BANNER's full support of risk, insurance, custodial and capital asset monitoring. The Budget Development Module's top-down approach permits establishment of major divisional guidelines and easily monitors department budget requests including forecasting, modelling, and inflation applications. The Cost Accounting Module automates the process of charging customers for services rendered or products delivered. The Stores Inventory Module provides the tools necessary to management consumable inventory warehouses. It is integrated with the Purchasing and General Ledger Modules of BANNER Finance. The optional Investment Management Module enables a financial entity to successfully monitor invested funds on-line with or without the use of investment pools and provide for equitable distributions of earnings.

Human Resources System

The BANNER Human Resources System provides institutions with the means to collect and manage vital information about their most important asset - people. The Applicant Tracking Module provides for the capture of a comprehensive applicant profile including biographic and demographic information, as well as significant credentials, qualifications, and publications - in effect, an on-line copy of the applicant's curriculum vitae. Applicants can be administered and tracked through an unlimited number of user-defined statuses, requisitions, or competitions, and users can produce standard correspondence. The Employment Administration Module provides for the capture and maintenance of employee information. Faculty have additional capabilities for tenure, reappointment, sabbatical, and workload tracking. Leave administration supports current and grand fathered leave plans. A complete history of all key data are maintained in order to produce required regulatory reports. The Compensation Administration Module provides for the classification of positions, job families, salaries, and salary structures, and an unlimited number of earnings, rates, and differentials. Employees' salaries and fringe benefits are automatically encumbered according to user-defined rules. The Employee Relations Administration Module tracks bargaining unit membership, grievances, and disciplinary actions. The Health and Safety Administration Module supports the tracking of workplace accidents and OSHA reporting. The Benefits Administration Module provides for the definition and administration of employee and retiree benefits programs. Dependents and beneficiaries can be associated with specific benefits and benefits plans. A full range of benefits programs, including unlimited flexible spending accounts, is supported. The Position Management Module provides for the definition of positions and position characteristics, job descriptions, minimum qualifications, and the control of hiring by position status and effective dates. Budget and available full-time equivalents

(FTEs) are checked on every employment and salary action to ensure that funds and positions are available. The Personnel Services Budgeting Module provides for the definition and monitoring of salary and fringe benefits budgets. An unlimited number of "what if" budgeting scenarios are supported. The Time Reporting Module provides for the capture and reporting of time worked for salaried and hourly employees. Time sheets, rosters, and data entry screens can be tailored to meet the specific needs of colleges and universities. Employee attendance can be tracked and monitored to identify patterns or violations of leave or attendance policy. The Payroll Calculation Module provides for the definition and administration of an unlimited number of earnings, deductions and taxes, as well as the calculation of employees' pay, FLSA overtime, cheque printing, payroll reporting, account posting, and multiple direct deposits. The Payroll Adjustments and History Module provides the ability to produce manual cheques and standard post pay completion adjustments such as voids and labour redistributions. A comprehensive retroactive pay calculation is also provided. A complete history of all pay calculations and adjustments is maintained in order to produce the federal, state and local income and tax reports. The Tax Administration Module supports all United State federal, tax treaty, and state taxes, as well as Canadian federal tax calculations. Tax reporting is provided for 941, W-2 1099-R, 1042-S in the United States, and T4, T4A, and T4A-NR in Canada.

KEY BANNER SYSTEM FEATURES

Each institution is unique and has its own policies and procedures which must be accommodated by the information system used for administrative data processing. In addition, the system must be designed to allow the experienced user to quickly navigate, while aiding the occasional user to find the information required. BANNER provides the following functions to support these data processing requirements.

- **Menus** - menus are provided in BANNER to guide the occasional or experienced user through the system. The system also makes full use of pull-down menus. End users have the capability to navigate the system using the standard BANNER menu system and/or the pull down menus. Pull-down menus provide menu and form-to-form navigation, as well as standard ORACLE functions, as opposed to using the keyboard function key. The occasional user may be guided through the system by the menus one level at a time, referencing functions within a process. The more experienced user can indicate immediately the form required and proceed directly to that form. Menus are provided at the system, module, process, and detail levels.

- **Rule-Based Design and On-Line User Tables** - BANNER is designed to be rule-based, providing the user the opportunity to modify processing rules to meet the changing needs of an institution. The rules are maintained in on-line system tables, which are developed and maintained by the end user. To ensure consistency, the tables are also used to validate user input and

standardise data. The use of tables greatly reduces the amount of technical maintenance required, therefore freeing the institution's technical staff to support the end user in more productive ways.

- **System Security** - Security can be applied by form (screen) within the system or, using ORACLE capabilities, at the data element level. A feature of ORACLE maintains transaction logs of all activity detail for audit purposes. Security profiles are available on-line, and changes can be made to these profiles on-line whenever required by the institution.

- **HELP** - Help functions permeate the BANNER products to provide support and training to the end user, whether experienced or occasional. Help is available at the process (or form) level, function (or block) level, and field level, as well as through the pull-down menus. Help text, which is quickly and easily available to the user through function keys, us updatable by each institution to reflect the terminology and environment with which the user is most comfortable. All forms, blocks, and fields can be accessed from any location. Institutional Dynamic Help can be built for use in addition to the on-line Help provided with the system. Dynamic Help can be used for institutional procedures, documentation, etc.

- **Job Submission** - The BANNER Job Submission component is an on-line process designed to enable the end user to submit batch reports and processes from on-line forms. Parameters are defined for each job, either using system parameter values or parameter values specific to a particular end user. The parameters are all validated against the appropriate BANNER System validation tables; values enterable in the parameters are checked, where appropriate, to be in valid ranges; and the parameters are checked for consistency, greatly reducing errors in processing of batch jobs.

- **Letter Generation and Population Selection** - BANNER letter generation and population selection are on-line processes to develop personalised letters for populations of people or entities in BANNER. The letter generation component is where letters are built, constructed of individual paragraphs which may be used in many letters interchangeably, or only specifically for a particular person. Information from the BANNER database may be developed into variables which are then used within the context of the letter. Person-related information on any BANNER System may be used as variables in letters (ie addresses, preferred names, vendor information, employee salary and hire date, etc). On-line population selection provides a method for extracting a population of people from the BANNER database for use in generating personalised letters. This population may be selected using person or entity related information on the systems. Additionally, the system provides an option to download population selections and letter variable data to Microsoft Word and Word Perfect to generate the letters from your PC.

- **On-Line Messaging/Ticklers** - To facilitate communication within the institution, BANNER provides on-line Messaging for all BANNER users. Messages may be created and sent to any user, either as confidential between the user and the recipient or available to anyone. When signing on to BANNER, each user is informed of a message waiting, or that there are no current messages. The tickler function allows a BANNER user to be alerted of upcoming events, processes, or meetings on a date specified by the user. Both these functions, BANNER on-line Messaging and the accompanying ticklers, help facilitate information flow through improved communication within the BANNER Systems.

- **Event Management Module** - The Event Management Module enables an institution to plan and manage the wide assortment of functions and events which occur both on and off campus. Homecoming in the Fall, new student orientation, vendor conferences, new employee meetings, and financial aid exit interviews may be scheduled using this module. BANNER provides the ability to manage myriad details including the date, time, place, associated tasks, mailings, speakers and other program participants, invitations, RSVPs, and attendance. Summary financial information such as budget, fee structure, income, and expenses is provided. The Event Management Module supports the following major activities:

  - Maintains checklists of tasks, handles task assignments, and issues electronic ticklers to remind users of pending tasks.

  - Issues invitations, tracks replies, and prints attendance lists and name tags.

  - Associates speakers and other participants with events and evaluates their performance.

  - Supports the scheduling of campus facilities for events.

The features described above are available throughout all BANNER Systems to allow the user to view, add, change, delete, generate and manage information.

Other studies published in the series *Papers on Higher Education:* 1983-1989

1. *André Salifou*, Perspectives du développement de l'enseignement supérieur en Afrique dans les prochaines décennies (English & French versions). UNESCO 1983, ED-83/WS/76.
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7. *R. Goodridge, A. Layne*, A Digest of Unesco Studies and Documents on the Democratization of Higher Education. UNESCO 1984, ED-84/WS/52.
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9. *C. Rakowske-Jaillard, A. Rochegude, H. Acoca*, La problématique de la pédagogie de l'enseignement supérieur et de la recherche pédagogique dans la perspective de la réforme globale de l'éducation en Afrique francophone. UNESCO 1985, ED-84/WS/85.
10. *G. Berger, T.K. Thévenin, A. Coulon*, Évaluation des expériences novatrices sur la démocratisation dans l'enseignement supérieur. UNESCO 1985, ED-85/WS/1.
11. *Prof. Dr. M.L. Van Herreweghe*, Étude préliminaire sur la nature et l'importance de l'enseignement relatif aux sciences de l'éducation dans les établissements d'enseignement supérieur. UNESCO 1986, ED-86/WS/34.
12. *Mme E. Rakobolskaya, André Salifou, D. Lustin*, Trois études de cas sur la formation pédagogique des enseignants d'enseignement supérieur. UNESCO 1986.
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15. Annotated Bibliography of Selected Unesco Publications and Documents relative to Training and Research. UNESCO 1986.
16. Stocktaking of Needs and Resources relative to Training and Research : Volume 1 : Australia, Hungary, Kenya, Syrian Arab Republic. UNESCO 1987.
17. *César A. Aguiar*, Análisis de las Necesidades y Recursos relativos al Adiestramiento e Investigación.
    Formación Superior y Desarrollo Cientifico en América Latina : Indicaciones preliminares sobre la integración de sistemas. Volumen 2 : America Latina. UNESCO 1987.
18. Inventory of Educational Research on Higher Education Problems Undertaken by Higher Education Institutions (Preliminary Version). UNESCO 1987, ED-86/WS/122 Rev.

19. *Jagbans K. Balbir*, Aspects of Training and Research in Higher Education with Case Studies on India and Venezuela. UNESCO 1987.

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    Table ronde UNESCO-Association internationale de pédagogie universitaire (AIPU). UNESCO 1988, ED-88/WS/31.

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28. Higher Level Distance Education and the Needs of Developing Countries.
    Round Table UNESCO-International Council for Distance Education (ICDE). UNESCO 1988, ED-88/WS/46.

29. *The Challenge for the University : providing education and meeting economic requirements.*
    Round Table : UNESCO-International Union of Students (IUS). UNESCO.

30. Les Responsabilités internationales du professeur d'Université.
    Table ronde : UNESCO-IAUPL, UNESCO, 1988.

31. Higher Education : Problems and challenges for what future ? Final Report, UNESCO-NGO Collective Consultation 1988. (English & French versions), UNESCO 1988.

32. Project Copernicus : Co-operation Programme in Europe for Research on Nature and Industry through Co-ordinated University Study.
    Round Table : UNESCO-Standing Conference of Rectors, Presidents and Vice-Chancellors of the European Universities (CRE), UNESCO 1989.

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    Table ronde : UNESCO-Association des universités partiellement ou entièrement de langue française (AUPELF), UNESCO 1989.

34. *R. Aspeslagh, D. Chitoran, A. Nastase*, Educational and Research Programmes of Universities and Research Institutes in the Europe region devoted to international understanding, co-operation, peace and to respect for human rights. UNESCO 1989, ED-89/WS/76.

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