

INTEGRATION OF FACILITY MANAGEMENT INFORMATION SYSTEMS

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May 21st, 2001

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Introduction

Major changes were experienced in the facility management industry in the decade of the 1990's. One of the forces driving this change was the economic restructuring in most organizations. As a result, facility management departments were challenged to provide improved services on a more cost effective basis. One of the solutions was the application of technology such as facility management information systems (FMIS). In response to this need, software firms developed many new products that were specific to the industry.

The Campus Infrastructure Department at the University of Calgary experienced a significant downsizing in the mid-1990's. As a result the Department prepared a five year business plan for the complete revitalization of its existing information systems with new technology. This business plan not only defined the required new systems but also addressed the need to develop and operate these systems on an integrated basis.

The Department is just starting the fifth year of its business plan. This presentation is a case study of the implementation of this plan to date. From a strategic point of view, it is a study of how Campus Infrastructure successfully met the challenge of the 1990's and has positioned itself to be a leader in the 21st century.

Background

The main campus of the University of Calgary is located in the city of Calgary, Alberta. The campus is situated near the city centre and provides excellent views of the majestic Rocky Mountains to the west. The University also has several small satellite campuses located in other parts of Alberta and British Columbia.

The University commenced operation in 1966 and currently has a gross area of over 790,000 sq. m. (8,500,000 sq. ft.). It is a teaching and research institution and includes a major medical research centre. The University was also one of the venues for the 1988 Olympic Winter Games and has excellent sport and recreational facilities as a result. A new long term campus community plan has recently been completed and the gross building area is expected to increase to over 1,475,000 sq. m. (15,870,000 sq. ft.) by the year 2025.

The Campus Infrastructure Department is comprised of the Campus Planning and Facilities Management divisions. The Department is responsible for the planning, development and management of the campus physical infrastructure (sites, buildings, utilities and capital assets).

Restructuring in the 1990's

The University expanded significantly during the 1970's and 80's. As a result, many staff members were hired in the Campus Infrastructure Department (then called the Physical Plant Department) and remained with the University for the rest of their career. The Department was adequately funded to provide services to the campus community and relied heavily on its staff for their experience and knowledge of the facilities.

The Department had three major information systems:

- 1) A work order system was developed as a supplement to the campus financial reporting system in 1978 and ran on the University mainframe computers. This was mainly a financial system with minimal facility management capabilities.
- 2) A space inventory program that was developed in 1984 and also ran on the mainframe.
- 3) An Intergraph computer assisted design (CAD) system implemented in the mid-1980's for design and record drawings. This system ran on a mini-mainframe and local area network (LAN) in the Design unit.

In the early 1990's, the province of Alberta initiated an aggressive deficit and debt reduction plan and program expenditures were reduced by an average of 22%. As a result, the operating budget for the Campus Infrastructure Department was reduced by 25%. This necessitated a significant downsizing of the Department. Most of the managers and many of the experienced staff left the Department. This resulted in a major loss of manpower, experience and knowledge.

In order to continue to provide the required services, the Department attempted to make better use of its existing information systems. However, although they were sophisticated in their initial development, the work order and space inventory systems were now obsolete. They both required a great deal of administration and could not provide the required analysis and reports. In addition, all of the staff experienced with the Intergraph CAD system had left the Department and the record drawings were not being kept up to date. Also, AutoCAD had become the standard for design consultants in the local building industry.

Because of the limited value of these existing systems and the need for information, the work units in the Department began to accumulate more paper records and develop their own spreadsheets and databases. Also, other campus departments began to develop their own facilities databases because current and accurate information was not available from Campus Infrastructure. This resulted in a proliferation of small standalone systems for facilities information on campus.

The Need for Change

The management of the Department recognized the need for a transformation of its business practices and methods of service delivery. New technologies had to be implemented in order to support this change, specifically:

- Intelligent Building Systems (IBS) such as "hard wired" building automation, security and telecommunication systems for the improved management of facilities with less manpower
- FMIS to provide relevant information and automated tools to increase the productivity and effectiveness of the staff

The Department believed that it must successfully implement this new technology in order to provide the required services to the campus community. Therefore, it set the following goal for information systems in its 1997/98 to 1999/2000 business plan – *"to achieve the complete upgrading of the existing facility management information systems and/or implementation of new systems by March 2002"*. The visionary setting of this goal was the catalyst for the future preparation of a five year plan for an integrated FMIS.

FMIS Business Plan

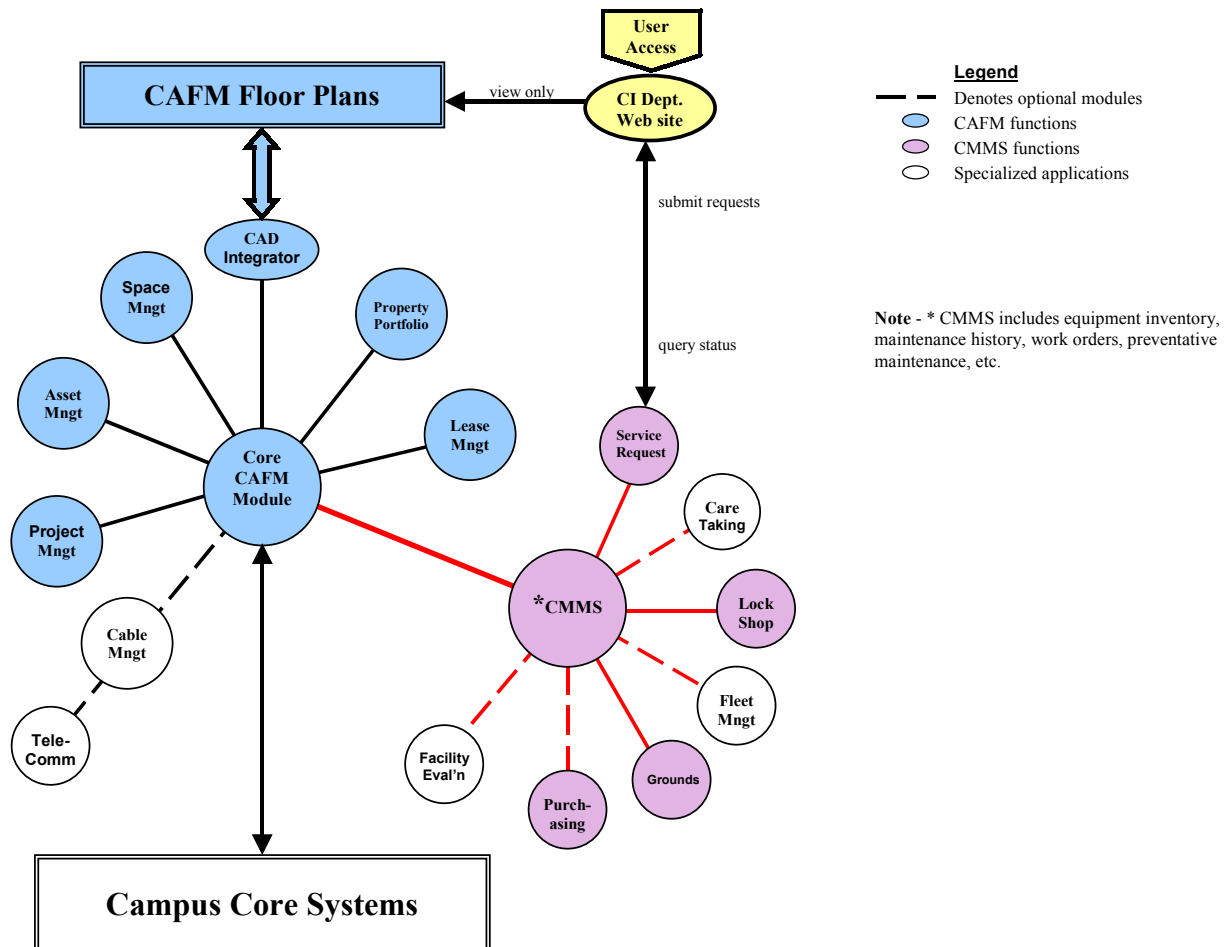
The systems upgrading project actually started in spring 1997 with the completion of a review of the CAD system. This was followed by the phasing out of the existing work order system in selected work units and the development of a new fleet management system. The business plan for the FMIS was not actually completed until November 1998.

The business plan summarized the situation in the Department and the need to develop a new FMIS. A five year plan commencing in the 1997/98 fiscal year was proposed and a detailed implementation schedule with cost estimates was prepared for each year. The specific objectives of the business plan were:

- 1) To provide more definition of the scope, cost, schedule and impacts of the project.
- 2) To build support for the project from the campus executive and other University groups.
- 3) To obtain approval for the required funding for the next year (year 3) of the project.

These objectives were met as the Department management and staff strengthened their understanding and support for the project. On a larger scale, the University had initiated a project to upgrade its core business systems and the prevailing thought was that the Campus Infrastructure systems requirements should be delayed until an enterprise resource product was implemented for the campus. However, after review of the business plan, the Department was allowed to proceed. In addition, funding was obtained to continue the project.

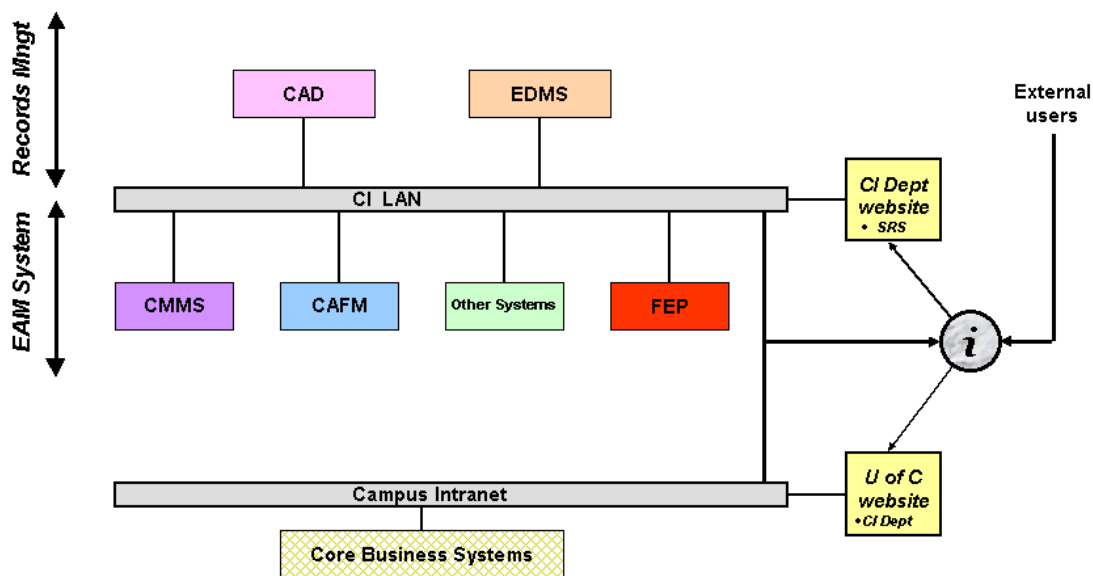
The business plan was based on the conceptual FMIS model as shown below.



This system model provided a vision for the development and integration of the CAD, computer aided facility management (CAFM), computerized maintenance management system (CMMS) and other systems. It also illustrated the required link to the campus core systems and the provision of web based access to the FMIS. For the staff in the Department, the model strengthened their understanding of the benefits of developing an integrated system rather than individual standalone systems.

Current FMIS Model

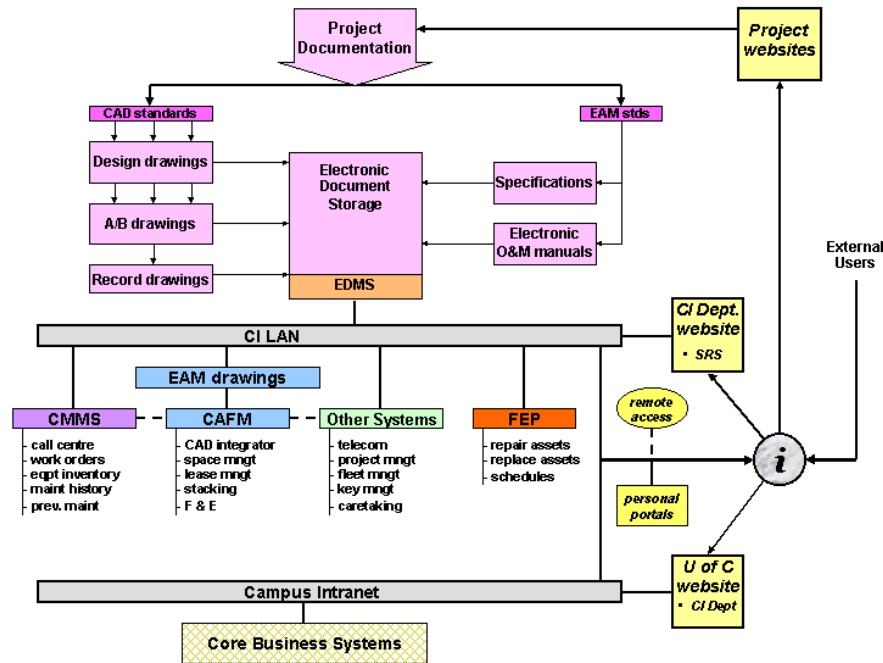
The FMIS project was initiated and is being managed by Steve Baldick, Associate Director of the Department. Don Dennis of FMT Consultants Ltd. prepared the business plan and has been the lead consultant for most of the system development. In September 1999, Steve Dantzer joined the Department as the Director of Facilities Management and has since also provided strong leadership for the project. Because the FMIS model was being used extensively, we decided to update it in late 1999.



This conceptual model was more representative of the five year plan due to the inclusion of:

- the campus intranet (wide area network) and the LAN in the Department
- an electronic document management system (EDMS) for records management
- recognition that the facility evaluation program (FEP) was a major system for tactical and strategic planning purposes
- web based access via the University or Department website
- The grouping of the component systems into two major areas. The CAD and EDMS are mainly used for the creation and management of records information in the project design and construction stages. The CMMS, CAFM, FEP and other systems are mainly used for enterprise asset management (EAM) of the facilities once they are occupied. Therefore, the FMIS is comprised of the records management and EAM systems, plus the web based access and the links to the core business systems.

The current detailed version of the model is as shown below.



Component Systems

Now that the vision for the FMIS development has been outlined, we can discuss the implementation of the various component systems.

- An extensive review of the existing CAD design and record drawing system was completed in April 1997. A strategic plan was prepared for the upgrading of the system in accordance with a model for creating record drawings from the as built (A/B) drawing files. A cost/benefit analysis was provided for the system upgrading using Intergraph or AutoCAD. The staff in the Design unit chose AutoCAD for the new system and have subsequently:
 - created a new set of CAD standards
 - audited the existing Intergraph drawing files and converted the true legacy files into AutoCAD
 - scanned hard copies of as-built and record drawings into an electronic format
 - adopted the National Master Specification (NMS) as its standard for the creation of specifications in an electronic format
- In 1999, an EDMS was implemented using the Kruse Control product from Kruse Inc. The EDMS is used for management and access to the electronic drawing files and specifications by multiple users. This system is now accessible by up to 20 concurrent users on the LAN.

- In the autumn of 1999, an RFP was prepared for software for a CAFM system. The RFP was issued to suppliers that offered a comprehensive software package that could provide for other future needs and operate with an Oracle database. Archibus was selected for the CAFM system in December 1999. By September 2000, the staff in the Planning unit had:
 - identified the legacy data in the existing space inventory system and imported it into the CAFM database
 - field verified the new AutoCAD architectural record drawings
 - revised its space taxonomy system
 - field verified the room number, function and assignment of all rooms on campus
 - linked over 22,000 rooms in the CAFM database to the AutoCAD floor plans
- The RECAPP software product from Physical Planning Technologies Inc. was selected for the facility evaluation program (FEP) in the summer of 1999. Over the next 12 months, a “cursory audit” of selected buildings representing one-third of the campus building area was completed and entered into the system. The results were then extrapolated to produce estimates and reports on capital renewal needs for the entire campus. This system was developed on a standalone basis with an Access database. It will be converted to an Oracle database and integrated with the other EAM components.
- Archibus was selected for the new computerized maintenance management system (CMMS) in the spring of 2000. The initial implementation of the system was completed in April 2001 and included:
 - bar coding and data entry for approximately 10,000 physical assets
 - a work order system for use by all units in the Department
 - shared databases and validation of data with the CAFM system
 - financial coding in the work order for operating cost reports by zone, amortization of capital assets and customer billings
 - the time card system was re-engineered and a new time tracking system was developed to download time data to the CMMS and the campus payroll system
- A Customer Service Centre was established in April 2000. A temporary web based service request system (SRS) operating with a SQL database was developed for the first year of its operation. In April 2001, a new web front end was installed using FM Studio (an Archibus compatible product) and an Oracle database. The SRS is now completely integrated with the CMMS and CAFM systems.
- A new Department website was developed in the spring of 2001. It is linked to the campus website and provides user access to the SRS.
- A new fleet management system was required as the existing system was developed in the 1980's and was not Y2K compatible. A software search was unable to locate a suitable product. Therefore, a customized program was developed in Access and installed in spring 1999. The billings to the campus core systems were automated later that year. Due to the nature of the Fleet Management operation, this is a standalone system that will not be integrated with the EAM components.

- A manpower estimating and scheduling system was required for the Caretaking unit. The floor finishes in each room on campus were recorded in a field survey in summer 2000 and entered into the CAFM room database. A housekeeping administration module from Applied Data Systems Incorporated was then purchased to analyze custodial manpower requirements based on time standards, the floor finishes and areas. This is an Access based product that obtains information from the room inventory in the Oracle database through an ODBC connection.
- Active Project by Framework Technologies was selected in spring 2000 as the web based project collaboration product. It has been used for the co-ordination of the campus community plan and other major capital projects.
- The existing work order tracking system developed in Access for use by the Telecommunications units will be replaced with an Archibus CMMS module in the summer of 2001. The Archibus cable management module may also be considered for graphical records purposes.
- The existing key management system operates with the outdated space inventory system on the mainframe and must be replaced. The Archibus key management module has been evaluated and may be used for this application. It would be completely integrated with other EAM components.
- A new project management system is required for alteration and renovation projects. The Archibus project management capabilities are not considered acceptable for this application. The needs have been defined and a new system will be implemented in summer 2001. This system will be linked to the campus financial system but the EAM integration requirements still must be determined.
- The LAN was upgraded substantially in this four year period. Separate servers were acquired for the CAD drawings, the Oracle database and the client-server applications. Network management software and improved backup systems were also implemented. As at May 2001, the LAN includes 6 servers and over 200 desktop machines.
- The upgrading of the campus core systems has been delayed. Therefore, transfers between the FMIS and core systems will initially be made by automated transactions from flat data files. However, now that the FMIS has been developed, the integration needs of the Department will be well defined when the core systems upgrading proceeds.

System Integration

The integration of the component systems has been a prime concern in the development of the FMIS. The Oracle database was selected and installed on a separate server to create a common database that could be used by the various applications. Whenever possible, data is shared and is not duplicated. The best example of this is the location data (site, building, floor, room) that is managed by the CAFM system operator but is shared by the CMMS, SRS, caretaking and future key management and telecommunications systems. This reduces data entry and allows all location based information to be validated before processing.

The provision of multiple user access to data has also been emphasized. The EDMS provides access to the electronic drawings and text files in the records management system. The Oracle database is accessible through the Archibus EAM applications. In addition, executive information system (EIS) licenses were purchased from Archibus for most system users. These licenses allow a customized front end or portal to be designed for each work unit, work group or person. Shortcuts can then be developed on the EIS screen for direct access to commonly used data and/or reports.

The Department also realized the added value that can be obtained from the computer files generated during the design of new projects. The CAD standards have been designed so that the as-built drawings can be used to electronically produce CAD record drawings and CAFM floor plans for future facility management purposes. Additional standards will be prepared for the development of room inventories, room finish schedules, asset inventories, etc. in the design stage.

Future System Development

The Department's plans for the future development and on-going integration of the FMIS are:

- The CAD integrator in the CAFM system provides the capability of linking data in the Archibus database to CAD floor plans. Currently, only the room database is linked to the CAD floor plans. However, as the database is developed in the EAM component systems, data will be linked to symbols on the CAD floor plans for improved access to information and reporting purposes.
- In the original field survey and condition assessment for the RECAPP system, the cursory audit extended down to classes of assets only (e.g., pumps, fans) in each building. This data is suitable for strategic and tactical planning purposes but not for operational planning that is completed on an individual asset basis. Therefore, when the field assets were bar coded and technical data was gathered for the CMMS last winter, the renewal analysis was also completed for each asset. This data for approximately 10,000 assets will now be co-ordinated so that it can be used and updated by the maintenance staff on a daily basis. This process will strengthen the life cycle management of assets.
- In view of the size of the campus, the Department is planning to provide remote access to the FMIS by its technical staff through the use of wireless personal digital assistant (PDA) devices. Currently, staff can submit and receive service requests from the SRS on a wireless PDA. The completion of caretaking inspections using PDA's is also being considered.
- Standards are being developed for the provision of maintenance manuals in an electronic format for new facilities. This will facilitate access to this information in the records management system through the EDMS. Also, the standards will eventually require that the data be provided in a format that can be imported directly into the initial EAM databases.
- A prototype screen has been developed to provide a "master asset database view" of data for assets in the Oracle database. Currently, data for an asset can be obtained through each specific application. For example, technical information is available from the CMMS. Using the master asset database view, the asset will be identified with its bar code number and then a summary of information on that asset (technical, financial, renewal planning, warranties, etc.) could be viewed through a single screen.
- The Uniformat II classification system developed by the General Services Administration (GSA) has been adopted as the Department standard. This coding system will be used to provide a consistent reference for assets from the initial planning to the final disposal stages. A conceptual model has been created for the improved budgeting of facilities based on standards for the performance and life cycle of assets, and on the continuous evaluation of these standards using actual EAM system information. The Department of Infrastructure for the Province is currently considering the adoption of this model for life cycling costing of facilities in all educational institutions in Alberta.

- Currently the records management system and the EAM component systems are being managed by the various work units in the Department. However, in order to ensure that the FMIS is managed in accordance with Department wide needs, a Technical Data Centre (TDC) will be established. The TDC staff will be specifically funded and trained to manage the FMIS on an integrated basis.
- A FMIS audit will be completed in the autumn of 2001. This audit will provide a graphical indication of the current/optimal development of each component system and the extent of system integration. The audit results will be updated each year to evaluate the progress of the on-going FMIS development.

Summary

The Campus Infrastructure Department is in the final year of the successful implementation of its five year business plan. The benefits of this systems development and integration are being realized by staff at all levels in the Department. The improved analysis and reports provided by the FMIS have already strengthened the profile of the Department on campus. In addition, the University of Calgary is now seen as a leader in facility management in Alberta due to this state of the art system.