



Curriculum Database Sub-Committee Report
on TLM as a Curriculum Database

DRAFT

Executive Summary

As we move to establishing a national-calibre college at NSCC, Academic Services faces a significant challenge to accomplish the systematic production, management and distribution of its curriculum in a consistent and efficient manner. Consumers of the college's curriculum include Students, Faculty, Academic Chairs, our Board of Governors, College Admissions and Registrars, Centres for Success, high school counselors, industry groups, community organizations, and other academic institutions. The integrity and quality of our curriculum is constantly under observation but consistency is currently lacking in our curriculum and program development processes.

In recent years, Academic Services has been experimenting with database solutions to house, document, and distribute program curriculum. Building on experience with Integreator™ (a document management solution) over the past seven years, the Deans' Council created a Curriculum Software Assessment Team to review the College's requirements for a curriculum database tool. The resulting project was broken into two phases – the first focused on provision of a web calendar solution and the second on a curriculum management system. Having delivered a Technology Plan for Phase I in April 2006, this document represents the conclusion of the team's mandate to acquire a curriculum database solution.

Originally tasked to evaluate a number of solutions and make recommendations among that selection, the mandate of the project was changed in 2005 when an opportunity was identified to examine a competency-enabled version of TLM 4.0 – the College's own Learning Management System (LMS) – as a possible contributor to the curriculum management solution. Initial testing and development was undertaken with support of NSCC Online. This was followed by the engagement of a consultant to evaluate the solution and facilitate an interim report. Accepting the recommendations of the report, the Academic Systems & Processes committee formed a testing team to evaluate the entry and output of curricular data across four of the five Academic Schools.

The results bear out the viability of incorporating a data warehouse to house select data from TLM, Web Calendar, PeopleSoft course catalogue and other systems for the purpose of providing integrated data for information and reports. The solution has many benefits, not the least of which is the fact that TLM is already embedded in the College's academic systems architecture. Technical and functional support and know-how already exists within the College, and TLM is being employed in online delivery. There is a very good match between TLM competency structures and NSCCs own outcomes-based curriculum. The opportunity exists to use the competency-enabled TLM as both repository of the curriculum, and the platform for future online and blended delivery course and program development.

The solution is not without its challenges. TLM's focus is on learning management and delivery rather than curriculum content management. This results in some workarounds that may offer challenges to future development and maintenance. At the same time, the standards-based TLM offers new ways to describe and develop learning and learning outcomes and the team is encouraged by the opportunities this presents for the future.

In adopting TLM and the data warehouse as a key part of the College's curriculum management, this report highlights the importance to support the solution with suitable human, capital and technical resources if it is to become a sustainable solution. Professional development through training and practice with this tool, formal coursework with TLM, and partnership with the vendor will all contribute to growing its value to the college.

The team recommends the adoption of this proposed solution to fulfill the College's needs for a curriculum management system. Appropriate motions are presented at the conclusion of the main body of this document. The appendices contain an anticipated budget, testing protocols and results, and sample output data demonstrating the effectiveness of the solution.

Introduction

In supporting the initiative to develop a national-calibre college at NSCC, and to achieve the quality that will empower *Education without Boundaries*, Academic Services faces a significant challenge to accomplish the systematic production, management and distribution of its curriculum in a consistent and efficient manner. The college's curriculum is used by many stakeholders including Students, Faculty, Academic Chairs, the Board of Governors, College Admissions and Registrars, Centres for Success, high school counselors, industry groups, community organizations, and other academic institutions. The integrity and quality of our curriculum is constantly under observation but consistency is currently lacking in our curriculum documentation and program development processes.

In recent years Academic Services has been experimenting with database solutions to house, document, and distribute program curriculum. In the late 90's the School of Business began to develop experience and expertise in this respect when they sponsored the acquisition of Integreator™, a document management database used by various organizations to distribute learning and knowledge assets. This experience was vital in developing a proof of concept and business case for such tools. Integreator's developers, however, were moving the product in a direction that wasn't seen as well matched to the needs of the Schools at NSCC.

In February 2004, Bruce Tawse, as chair of the Deans' Council, created a Curriculum Software Assessment Team to begin reviewing the College's requirements for a curriculum database tool. The team's goal was to make more efficient the delivery of calendar information both to the College web site and to the printed medium and to make curriculum document production and management more accessible and standardized.

A project team was struck and a project charter drafted identifying two separate phases to the project: the first being the development of a web calendar database; the second, the evaluation and adoption of curriculum database software. The stated objective of the overall project was *“to acquire and implement software/databases that will enable the curriculum development and management process through to automated electronic delivery of calendar information to the College Web site, as well as producing other required printed documents (printed calendar), managing official curriculum documents to provide secure access to authorized users as well as facilitating curriculum development that complies with college standards”*.

In February 2006, the team – now a sub-committee of the Academic Systems & Processes Committee – delivered a Technology Plan on Web Calendar as the deliverable of the first phase. The original charter for the project identified expectations that the team would examine several alternative solutions for a curriculum database. However, during the course of training for the upgrade to version 4.0 of The Learning Manager (TLM), an opportunity was identified to use the new structure and features of TLM 4.0 (particularly the competency-enabled model) to house NSCC curriculum. Given that TLM is an application platform that is already supported within the College, the focus of the project shifted to examining this opportunity before evaluating other options.

In addition to matching NSCC curriculum and the TLM field structure for course information, version 4.0 offers additional values for classifying educational material.³ The competency model allows for the creation of reusable competencies (outcomes) and in early testing was recognized as an apparent good match for the outcomes-based hierarchy integral to NSCC curriculum.

In March, 2006, a consultant was hired to develop a report on the feasibility of adopting TLM as a curriculum database meeting the parameters established by the assessment team in 2004. The report was accepted by the AS&PC in April 2006. In the report, the consultant noted:

³ Shareable Content Object Reference Model (SCORM) is an XML-based framework used to define and access information about learning objects so they can be easily shared among different learning management systems.

“The competency-enabled module is a new feature with version 4.0 and is seen as a good fit with the curriculum requirements of the College. Although courses currently in the delivery database were not developed using the competency module, the technical and implementation experience from using TLM represents an existing infrastructure that could offer resource efficiencies. Consequently, it would be a preferred option for a curriculum repository if it could meet established requirements.”

The consultant went on to present a Fit-Gap Analysis against the original criteria for the curriculum database. In completing this analysis the consultant reported that *“Based on analysis of the TLM Enterprise competency module, this report recommends that, although there are some gaps identified in the requirements, TLM could be incorporated as part of the curriculum management solution with [some additional] considerations”*. Those considerations included a need to develop strong business rules, processes and procedures for data entry to optimize the match between TLM and NSCC curriculum structures, the need to resource and train staff for the original data entry and continuing data maintenance tasks, and the need to supplement this solution with additional applications such as a data warehouse and improved reporting tools.

Presenting recommendations for next steps⁴, the consultant also indicated that the College should appoint a team or individual as project coordinator to lead and manage additional TLM application review, test the solution against anticipated reporting outcomes, invest in training and data entry effort, and develop processes and standards through the testing phases.

A product testing team was struck expanding the original committee to ensure that four of the five schools (excepting School of Access) had the opportunity to enter and test data input and outputs from TLM as a curriculum management tool. The following sections detail the testing methodology, protocols and results, as well as the sub-committee’s recommendations.

⁴The consultant’s report is included in the Appendices to this document.

Methodology for Testing

The testing of TLM as a potential repository for NSCC curriculum was completed as three separate initiatives.

Initial Testing

Initial testing was comprised of entry of a program and a small number of courses to determine whether TLM data structures could be used to house NSCC curriculum and to ensure that the resulting TLM data could be extracted to a reporting data warehouse to enable accurate production of curriculum documents and reports. A report of this initial testing was produced, titled *“Evaluation of TLM 4.0 as Curriculum Database”*.⁵

Independent Consultant-Fit Gap Analysis

This testing phase constituted a preliminary proof of concept and provided the basis for additional evaluation performed by an independent consultant and the resulting *“Curriculum Database Initiative- Fit Gap Analysis Report”*. The report recommended further testing to ensure that newly developed program curriculum standards could be managed using the proposed TLM/ Data warehouse model and to further refine data entry standards including naming conventions and business processes.

Testing all Schools Curriculum

The schools testing phase comprised of entering extensive program curriculum from each school, recording issues encountered and recommendations for improvement. This phase provided an opportunity to test portability of the data warehouse setup and data extracts from a desktop to a server platform. The test team met weekly for status updates and information exchange and through this process refined the data entry standards, naming conventions and business processes. The testing protocols and the issues noted during entry of curriculum are included in the Appendix.⁶

⁵ Copy of the testing documentation is included as an Appendix to this report.

⁶ Survey tool is housed at
https://ournscc.nsc.ca/sites/ProgramManagementCommitee/Curriculum_DB

Testing Results

Most TLM Data Structures Match NSCC Curriculum

Overall the data structures in TLM support the required data structures for NSCC curriculum. Where there have been gaps, the interface has been adapted to provide suitable workarounds. The test team has recommended that TLM technical support be contacted about the possibility of incorporating user configurable field labels into TLM at some future date. In the mean time, the team feels that detailed user documentation for data entry standards and business process will ensure that the limited number of users performing curriculum data entry will enter data consistently.

Of the fifteen or so fields used to enter basic course data (Title, Description, Purpose etc.) , only two have TLM field labels that do not match the NSCC use. For program entry, there are four unmatched field labels. TLM provides the ability to add multiple “Annotation Fields” and these annotation fields seem to be a good fit for this type of data.

Data Extracted from Other Systems

The test team has concluded that some data elements (prerequisites and semester offering of courses, for example), are best stored outside of TLM and extracted from other systems (PeopleSoft, Web Calendar Database) to a Data Warehouse.

Data Warehouse Provides Secure and User Friendly Data Structures

Part of the data warehouse model rationale is to provide interface elements that are more user-friendly and recognizable to a broad base of users. It is the data warehouse (refreshed daily from TLM data) that will be provided for queries and reporting. This also ensures that the TLM data isn't exposed to unnecessary security risks.

Output Reports Match NSCC Curriculum Documents

The Program Curriculum document contains essentially every piece of curriculum information that NSCC captures. The program curriculum document can be produced from the data warehouse data that is extracted from TLM. The data warehouse structures also support user-friendly queries such as “what are the programs that contain this course?” Additional reports such as Course Outlines and PLAR Evaluation Form can also be produced from the data extracted from TLM.

Outstanding Issues

There are still a few unresolved issues. These include technical issues with the database limitation on field size. Preliminary evaluation of these issues indicate that a combination of data warehouse design methods and additional features included in the next SQL Server upgrade will address these issues. There are also report-formatting issues, such as retrieving images (diagrams, course maps, etc.) for inclusion in the curriculum document. The latest upgrade to Crystal reports is anticipated to solve those problems.

SWOT

The following section details the Strengths, Weaknesses, Opportunities and Threats (SWOT) to adopting a TLM 4.0/Data Warehouse solution to the management of NSCC curriculum.

Strengths

Platform – The TLM Platform is a well-developed Learning Content Management System (LCMS), based on established standards such as SCORM, and XML. The application and its underlying architecture are well supported at NSCC. TLM is also the College's primary Learning Management System (LMS) for online delivery. The LCMS data repository allows for easy extract from the repository to a data warehouse and from other standard data structures into the repository itself. Consequently, the application offers the opportunity for feature extensions, integration with other systems, and customized interfaces.

Security - TLM has its own security model that can be used to manage access to the system to protect integrity of the data. The native security model of TLM allows access control at the database, course, module, and/or learning object level. This could help to support the notion of securing some parts of the curriculum from editing, while opening others to amendment.

User Interface - TLM offers a more user friendly interface than many database front-ends, including the Integreator™ software currently used for curriculum management by the School of Business.

Features - TLM's competency-enabled model has a number of built-in features that may provide functionality missing in other similar software products. Included in the feature list are built-in reports specific to job-competencies (or *program outcomes*, in the parlance of NSCC academic development). Also included is a robust and flexible search tool that allows users to search on a wide range of terms including SCORM-compliant components and related resources. Combined with our recommended data warehouse model, the solution meets all the required features, many that were considered “nice-to-have’s”, and additional unforeseen benefits.

Fit to Philosophy - Generally, TLM's competency-enabled software maps very well to the notions associated with *outcomes-based learning*. The strong fit with those philosophies offers substantial opportunities in connecting curriculum to other academic processes including delivery methods, assessment, portfolio and PLAR.

Online Development - Because TLM is primarily a learning management system it offers online/ blended instructional design support, and in our case the potential to develop future online offerings based on an approved, official curriculum format from this database.

Weaknesses

Customization - While TLM is both an LMS and LCMS, it is not a dedicated curriculum database or program management software like the Worldwide Instructional Design System (WIDS)⁷ or CurricUNET.⁸ Consequently, using this product to accomplish the objectives of a curriculum database has required modification and workarounds that may result in less than intuitive design and operations.

Gaps in Requirements – One weakness noted by the consultant is the fact TLM has no direct integration with PeopleSoft, the College's ERP and course catalogue. This is largely resolved if we accept the committee's recommendation to move to a model that integrates selected data from PeopleSoft, Web Calendar, TLM and other data sources in a common data warehouse.

A second weakness noted in the consultant's report is the lack of built-in reporting tools to provide the kind of curriculum reporting (curriculum documents, outlines, registrar enrolment schedules) hoped for in the project's mandate. Again, we note that our integrated model provides a suitable workaround that largely overcomes the need for direct application reporting. Since the project was redirected to observe only the feasibility of TLM as a potential solution, we are unable to identify other solutions which might have one or both of these features natively available in an off-the-shelf product.

⁷ WIDS is a dedicated instructional design/curriculum management system focused on outcomes based learning. The system evolved from tools developed in the Wisconsin Technical College system.

⁸ CurricUNET is a curriculum management system developed by the San Diego Community College District. Its focus is on curriculum development and approval tracking.

Compatibility - Most existing learning content at NSCC Online Learning has been developed in the course-based (non-competency-enabled) product. There is no indication that any of that content could be easily formatted and imported into the competency-enabled model. However, if we accept the value of the proposed solution, we should also encourage all future development (new courses and redevelopment) to be accommodated in the competency-enabled module.

Tools - The original requirements anticipated a product that would incorporate process support tools to enforce business rules, as well as workflow, authorization, and notification tools. TLM has none of these tools built into its basic feature set and we are unaware of any plans to incorporate such tools in the future. We are examining opportunities to support process workflow, business rules and authorization through SharePoint, InfoPath, and built-in functions of the database.

Data Integrity - While the interfaces in TLM are much more intuitive, than in other products like Integreator, the requirement to customize some fields for NSCC nomenclature could result in entry and data control problems. Eventually, NSCC will need to discuss opportunities for interface customization with TLM's parent company, and in the meantime will have to implement careful data entry guidelines and double checks on any data fields that will be prone to errors.

Opportunities

Meeting the Mission - As a Learning Management System an obvious opportunity of TLM, unforeseen when establishing the project goals, is the potential to support two critical academic directions: the infusion of integrity and quality in curriculum documentation (*the national calibre college*); and the movement to "*Education Without Boundaries*" through distributed and online-supported, portfolio-focused curriculum. In the first case, the opportunity requires commitment to controlled curriculum integrity - in the latter, a commitment to develop future online courses in the competency-enabled version of TLM.

Industry Partnership - The challenges we note in adapting a software to purposes somewhat different than its native functionality, may present an opportunity to partner with the developers of TLM to develop an improved (or at least an extended) product. The possibility of joint or custom development may relate to opportunities for applied research both in the Information and Communication Technology and the Education sectors.

Economy - The search for a curriculum management product has been ongoing for many years, and some of the challenges that have held the College from fully adopting one may now be relieved by both the rich feature set of TLM and the knowledge we have gained about developing distributed solutions. TLM will not be the full solution by itself, but it is an affordable part of the system already in our licensing budget, and well-supported within the College's existing architecture. Almost any other solution would require the adoption of a foreign application, a new learning curve, as well as licensing and technical support issues that represent unknown risk and cost.

Connectivity - The back-end platform of TLM is a standard-compliant database providing an opportunity to interface data between the application and a data warehouse supporting other related systems. This offers connectivity between the curriculum database and PeopleSoft, the Web Calendar, and the SharePoint portal. The diagram in the Appendix details the anticipated connections between various systems.

PLAR/Portfolio - Adopting a competency-based model like TLM's application, will support other College initiatives including PLAR and Portfolio. Once a level of expertise is gained in data entry and data management, further process and system enhancements will lead to efficiencies in competency-mapping across numerous programs, courses and even institutions. Evaluating prior learning will be enhanced if outcomes can be better articulated. Students currently complete portfolio exercises as a course-based, summative exercise. It may be a much more meaningful exercise for learners to connect portfolio artifacts to individual outcomes rather than courses as is the current practice. This system supports that kind of mapping, and offers the potential of making the portfolio activity a more significant learning process.

Threats

Return on Investment - If the college is going to move to a more focused approach to learning outcomes, then the competency-enabled model of TLM ought to be the focus for future development. It is difficult to rationalize that direction with the amount of investment currently existing in the non-competency-enabled solution in use at NSCC Online. If this module is used only for curriculum management and not for the development of online and blended learning, its relevancy will certainly be compromised.

Support - To move forward with TLM as the College's curriculum database, the solution must be supported in a number of important aspects. There are financial dimensions, as well as strategic ones in such adoption. To begin with, since TLM is not a whole solution by itself, the technical processes and systems support needs must be extended to the whole solution including the licensing, desktop support, server support, network support, and development effort to implement the whole solution. Licensing considerations include Crystal Reports available to all staff who will be involved in developing and outputting report formats from the data warehouse. Server licensing for both the application and the data warehouse will have to be reviewed. The system will need to be implemented on a production server in a supported network operations centre.

From the human resources side of support, the effort will include initial data entry, curriculum review, evaluation and management effort through academic and technical services workloads. Training for all curriculum consultants and support specialists, as well as more intensive training for a couple of academic systems specialists will be required to leverage the value of the application. Without a commitment to this level of support, and immediate attention within the College's overall technology plan, the solution will not succeed in meeting the ambitious goals set by Academic Services in this project.

Application Integrity - Some threat may also exist should we fail to get the necessary partnership and cooperation with TLM in supporting our future goals. TLM's future development directions – that may diverge from our own – and the potential of having to manage and maintain our own modifications to the application across future patches and upgrades could be a substantial challenge.

Sub-committee Recommendations

The committee has worked hard to balance the impact of its challenges against the benefits of our adoption of the TLM/Data Warehouse solution as a curriculum database. Some aspects of our work have uncovered unique benefits that simply would not exist in many other approaches – for example, the opportunity to match our curriculum database effort with anticipated online and blended delivery strategies.

The fact that this software is a known, supported application in the suite of college solutions makes it an obvious high-rank in the list of solutions we could adopt. NSCC Online and Technical Services already understand the basis of the product and have established a relationship with the vendor. We can leverage both of these conditions to engage this solution quickly, with little risk and minimal cost. The addition of the data warehouse and tools like Crystal Reports to enable reporting fulfills the solution requirements.

TLM may not be a dedicated curriculum database but integrated with other components of the total solution proposed; it meets or exceeds all of the critical functional requirements required by the initial project definition. While we may choose to continue scanning the technical environment for better solutions, going ahead with this solution will provide immediate efficiencies without compromising our ability to adopt a better solution that might appear in the future.

In recommending our adoption of TLM and the data warehouse as our curriculum database solution, we anticipate that we will need the commitment of leaders in Academic Services and Technical Services as well as suitable budget and human capital investment to sustain its function (a projected budget is included in the Appendix). Accordingly we are recommending to the Deans of the Academic Schools they approve a motion to pursue the adoption and development of the TLM/Data Warehouse solution, beginning with a submission through Information Solutions Steering Committee (ISSC). The AS&PC will, on behalf of the Schools prepare and shepherd the application through ISSC. We request that the Deans reinforce the application with a letter of support, outlining its strategic importance to Academic Services.

Summary and Request for Approval

The Curriculum Database Software Assessment Team has spent two years in the assessment of products and solutions to accommodate the management of curriculum documents and data, and the presentation of that data in meaningful ways to College stakeholders. Employing various research methodologies and consulting activities, the team has engaged many contributors to identify a viable direction. Having delivered a technology plan for the web calendar phase in April, we are now pleased to present our recommendation to the Academic Schools that we move forward to adopt TLM's competency-enabled software combined with a data warehouse to house, manage and distribute the official curriculum of our academic schools. We therefore ask the Deans to approve the following motions:

“That the AS&PC on behalf of the Academic Schools, pursue an application for ISSC approval of a solution incorporating TLM and our data warehouse to the College’s need for a curriculum management system.”

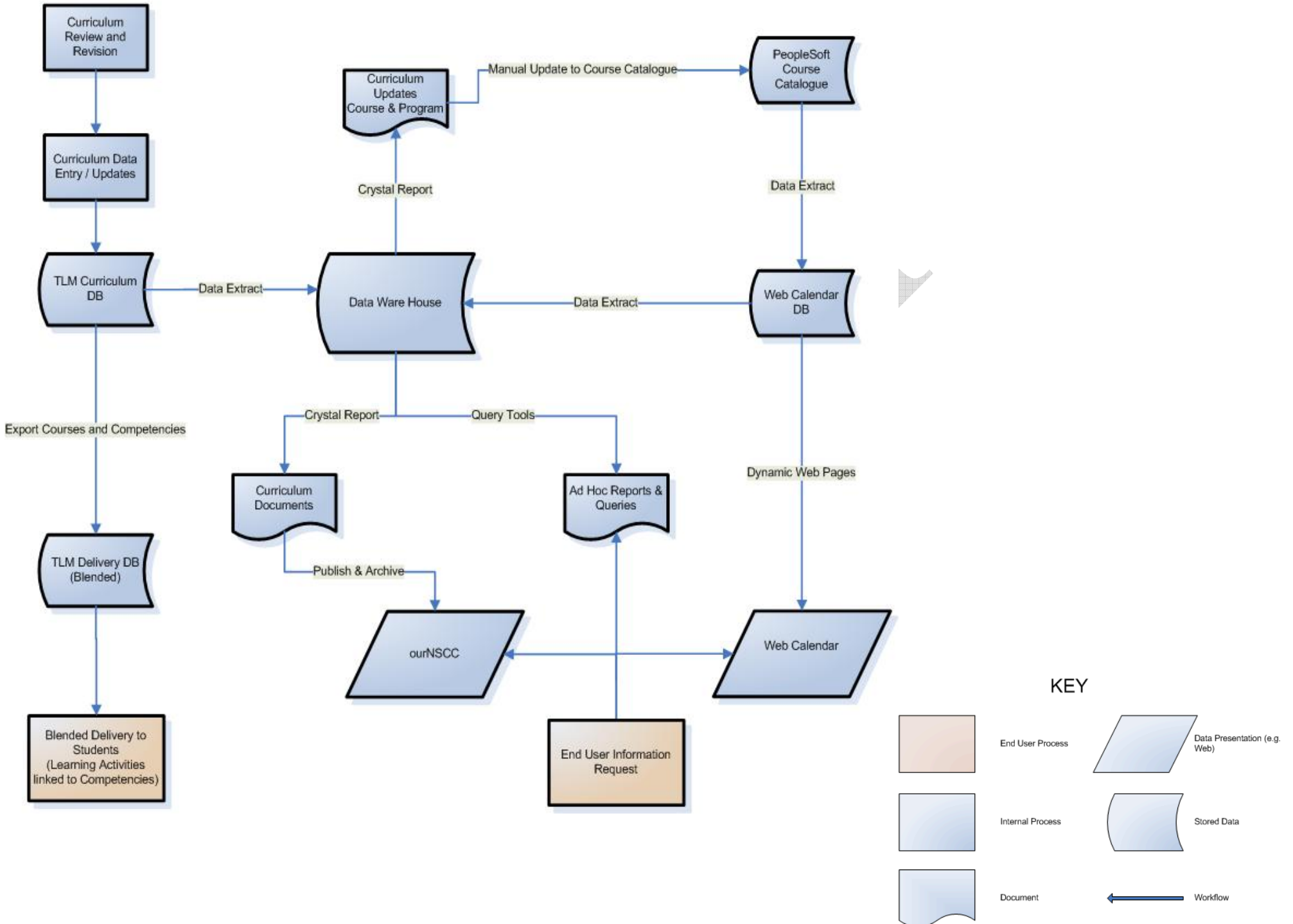
“That the VP, Academic and the Deans of the Academic Schools reinforce this application with a letter of support outlining the strategic importance of this solution in the work of Academic Services.”

Appendices

- TLM Curriculum Database and Data Warehouse Schema
- Projected Budget
- Consultant's Report
- Glossary
- Testing Documentation
- Testing Guides
- Test Results
- Sample Program and Course Outputs

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TLM Curriculum Database and Data Warehouse Schema



Projected Budget

Required Resources and Positions	Provider	Incremental FTEs/Units	Investment (Year 1)	Ongoing (Annual after Year 1)
TLM Server (ongoing=allowance for replacement)	Independent Hardware Vendor		\$15000	\$3000
SQL Server License (ongoing=allowance for replacement)⁹	Independent Software Vendor (ISV)		\$2000	500
Training (TLM, Crystal Reports and SQL Server)	TLM Trainers, Crystal Online Learning, and Internal		\$12500	\$3000
Initial Data Entry	Temporary Staff	2.0 FTE x 2 months	\$20000	\$0
Technical Support (TLM)	NSCC Online	0.25 FTE	\$3000	\$10000
Database/ Application Development & Support	Tech Services or External Vendor	0.10	\$0	\$5000
Crystal Reports Software (4-5 seats)¹⁰	ISV		\$1500	\$500
Curriculum Data Maintenance	NSCC Curriculum Unit	1.5	\$10000	\$25000
Total Projected			\$64000	\$47000

⁹ May be included in College licenses – this is being investigated by Tech Services

¹⁰ May be included in College licenses – this is being investigated by Tech Services