Seamless Integration of Manufacturing, Design and Marketing

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Abstract

Enterprise Application Integration (EAI) is a collaboration of different systems and components to implement business processes. System and components can be software systems, Computer Aided Design (CAD) package, enterprise databases, or legacy applications. Common EAI solutions are Enterprise Resource Planning, Application servers, and integration brokers.
To remain competitive, organisation must be able to operate efficiently and be flexible to a change in market condition. This study aims to develop a system which may increase the data accuracy, greater flexibility and improve productivity. In this project, EAI is demonstrated by integration of Web interface, Web services, Computer Aided drawing package and customer marketing and production management software.

1.0 Introduction

Enterprise Application Integration (EAI) is a collaboration of different systems and components to implement business processes. Example components may be Computer Aided Design (CAD) packages, enterprise databases, or legacy applications (Reyes, 2003). Software systems in enterprises are comprised of many software applications, they are often custom built by third parties and operated on different hardware under different operating systems. The goal of EAI is to allow these systems to work together. To remain competitive, an organisation must be able to operate efficiently and be flexible to changes in market conditions (Gleghorn, 2005).

Beurteaux Australia supplies seating solutions for the transportation industry all over the world. Beurteaux has an extensive range of seating which is fully customisable. Beurteaux is an example of an enterprise which uses many software applications to achieve its operational needs.

EAI provides greater flexibility by allowing components to be upgraded without having to replace the entire system. The purpose of this project is to improve the productivity and data accuracy in Beurteaux's processes alleviate the need to enter identical data into multiple systems. This will be achieved through the integration of the Computer Aided Design (CAD) package and customer marketing and production management software (Joso, 2005). The other outcome of the project is to understand, assess and provide an alternative solution to increase productivity. This is done to increase the competitiveness of Beurteaux by increasing productivity, data accuracy and flexibility.

This seminar paper will present one of the possible EAI solutions for Beurteaux. It will first discuss the background research, then discuss the possible solutions and the chosen solution.

2.0 Background

The flow of Beurteaux's business process is shown in Figure 1 below.

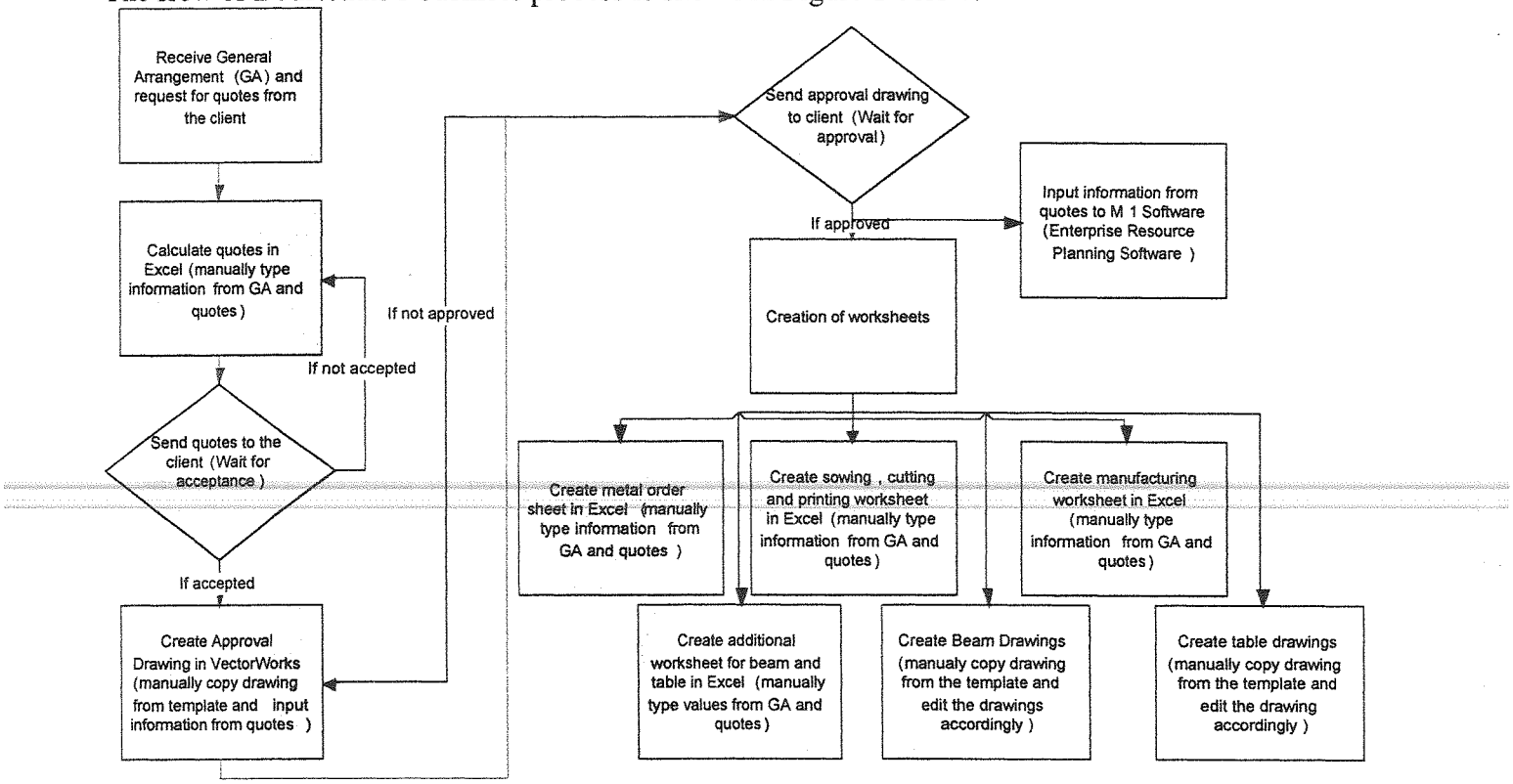

Figure 1 Flowchart of the business process

The flow of administration process starts from the general arrangement (GA) and request for quotes from the client. The information from the GA and quotes is then used for the quoting and invoicing process. The quoting and invoicing is currently done in Microsoft Excel by a manual data-entry process. The manual use of spreadsheets creates opportunities for human error. As a result, the completed quotations need to be rechecked before they are sent to the customer. The integration of the quoting and invoicing process is not covered in the project.

Once quotes are accepted by the client, the approval drawings are created by using Vectorworks (CAD package). Beurteaux staff copy image templates and input required information to the customer approval drawing. These approval drawings need to be rechecked before they are sent to the client. Once approval drawings are accepted by the client, identical data are used to create worksheets. Worksheets consist of metal order sheets, sowing-cutting-printing worksheets, manufacturing worksheets, additional worksheets, beam and table drawings.

Beam drawings and table drawings are also created in VectorWorks, and the output is used by a custom made software application in the manufacturing process. The drawings are done in VectorWorks manually without any drawing automation.

Beurteaux currently uses an Enterprise Resource Planning (ERP) system called M1 by Bowenn and Groves which is an application designed for small to medium manufacturers to do the financial and the accounting matters. ERP systems are management information systems that integrate business activities from sales, delivery, production, financial, accounting and contact management.

This project aims to automate the approval, beam and table drawing process by using data from the M1 database. For testing purposes, the sample data is inserted manually into M1 database.

3.0 Review of Technologies

3.1 Application Integration Criteria

One of the most important design criteria in EAI is coupling. Coupling is the level of assumptions two components make about each other (Hohpe and Woolf, 2004). A good design will have a loose coupling. Although tighter coupling means that the communication is more efficient, the communication will be less tolerant to interruptions. An example of a tightly coupled solution is a point to point architecture which is based on many assumptions between the calling routines and the called routines (Hohpe and Woolf, 2004). A tightly coupled solution is easier to write but it is hard to maintain.

3.2 Application Integration Technologies

3.2.1 Enterprise Resource Planning (ERP)

The most common solution for application integration is an Enterprise Resource Planning (ERP) application. Although ERP vendors such as Oracle, SAP and ABB automation have created large business applications, these applications only solve a small part of business functions (Hohpe and Woolf, 2004). Most ERP applications are too rigid to solve all business processes.

3.2.2 Integration brokers

Another solution for application integration is integration brokers. Integration brokers are used to support the business activities and data sharing between applications (He, 2003). They are built on messaging middleware. An integration broker extracts data, transforms the data, converts the schema, and routes the data (Waterhouse, 2001).

3.2.3 Application Servers

Two of the commonly used application servers are .NET and Java application servers. ASP.NET is a combination of web development techonologies which are built on the .NET framework (Turner, 2005). The .NET framework is a Microsoft technology which allows development in many languages such as C#, Visual Basic .NET, C++, J#, Eiffel. The .NET framework aims to increase productivity by including the commonly needed functionalities.

WebObjects is a Java web application server which includes tools and frameworks to develop web applications and web services. The benefits of WebObjects are the zero cost to Mac developers, streamlined database access, multi-tiered programming, state management, scalability and performance (Feiler, 2002).

3.3 Application Integration Styles

There are four main integration styles for component communication, they are file transfer, shared database, remote procedure invocation, and messaging (Hohpe and Woolf, 2004). Each application integration style has its advantages and disadvantages. They also grow in the level of complexity and difficulty. An EAI solution must use a suitable integration style to integrate each application. Multiple integration styles are used for one EAI solution.

4.0 Proposed Solution

WebObjects is the development software chosen to do the project for the following reasons:

- Constraint of the project is that it must use a Mac system. This is because VectorWorks, the software needed to create the beam drawing and table drawing can be automated by VectorScript. VectorScript in turn can only be controlled by AppleScript which is only available in the Mac operating system.

- WebObjects enforces good programming practice by enforcing model view controller (MVC) pattern. It provides a separation of presentation (Web pages), logic (Java code) and data (data store) (Al-Ghourabi, 2005).
- WebObjects represents database tables as Java classes called Enterprise Objects. It allows the developer to focus on object oriented programming instead of database programming.

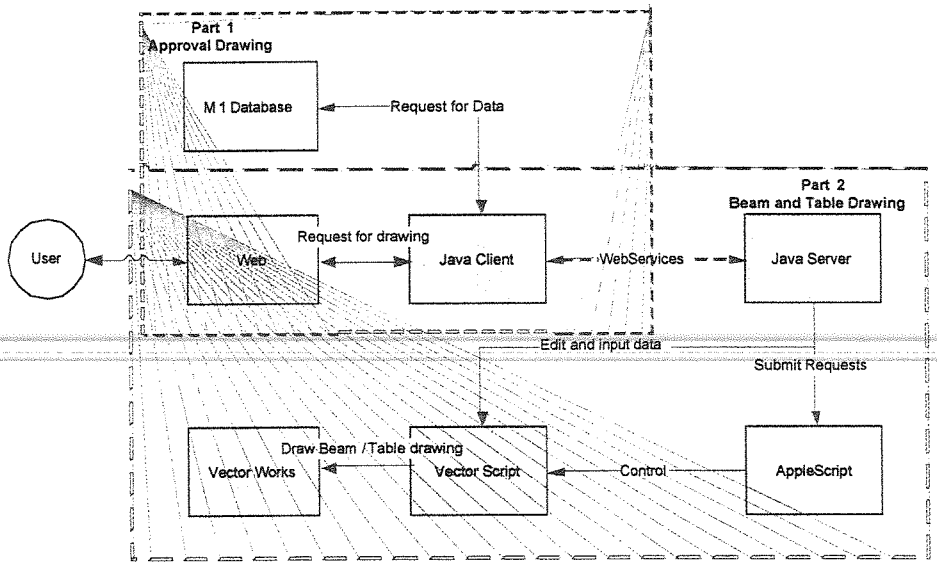

Figure 2 Proposed Solution (Currently being developed)

Figure 2 shows a block diagram of the proposed solution which is currently being developed as a prototype system. The prototype system requests data from the M1 database to ensure database integrity. It uses the shared database integration style. The M1 database is the centralised database server.
The first part of the project is to develop a dynamic web application to create the customer approval drawings. The system will no longer need Vectorworks to create the approval drawings. When a user requests the approval drawing from a particular quote, the system uses information from the M1 database to create the approval drawings.

The second part of the project is to develop a system to create the beam and table drawings. When a user requests the beam and table drawings through the web interface, the system uses web services to request the drawings from another Java server located with the drawing programs. The Java server will edit and input data to a Vectorscript and then run that Vectorscript using Applescript. When the Vectorscript is run, the drawing will be created automatically in Vectorworks.

The integration solution uses a web interface. This web interface allows users to create approval drawings, beam drawings and table drawings. The Web interface also offers greater flexibility compared to the current system where the M1 database is only accessible by M1 interface.

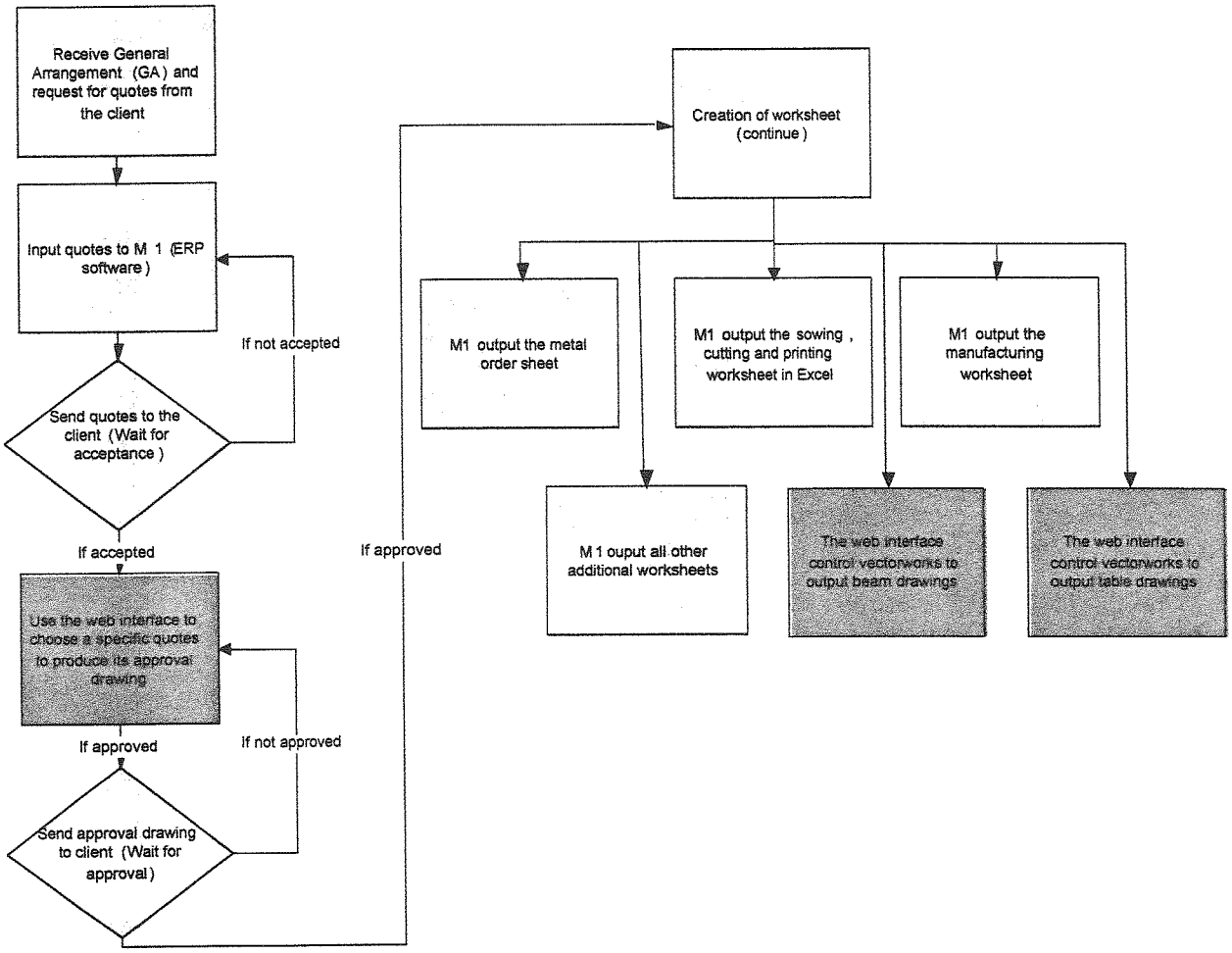

Figure 3 Flowchart of the new business process

Figure 3 shows the new business process. The new business process also starts from receiving the general arrangement (GA) and request for quotes from the client. The information from the GA and quotes are used to create quotations at M1. The M1 interface will limit quotations only to the possible combination of products. This will be the only time when Beurteaux's staff needs to input data manually, and quotations are recorded in the M1 database. As data flows electronically between applications, it reduces typographical errors and minimises the possibility of human error (Gleghorn, 2005). This data is used for the financial and accouting purposes, worksheet creations and also the prototype system.

5.0 Results

Testing was performed by using sample data from the database. Early testing shows a promising result for the first part of the project (approval drawing). By visual inspection we can compare the drawing produced by the current system and the prototype system (Figures 4 and 5). This prototype system produces an acceptable drawing with the same information as the current system. It produces approval drawings with a high data accuracy and fast response (+/- 10 seconds). It also offers greater flexibility by having a web based interface.

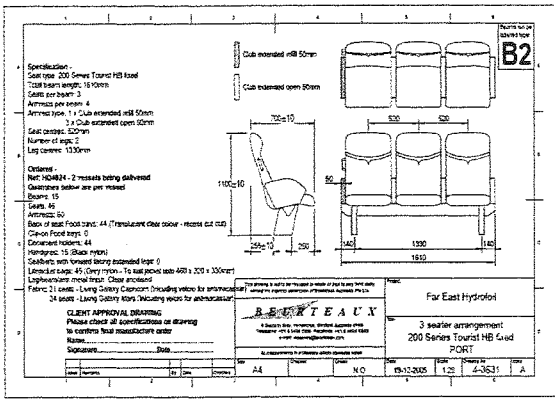

Figure 4 Approval Drawing (Current System)

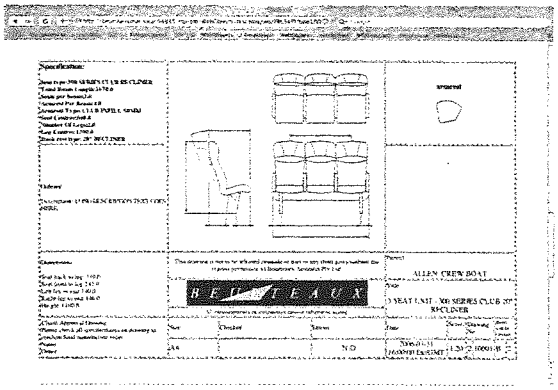

Figure 5 Approval Drawing (Prototype System)

Results have not yet been obtained for the second part of the project (beam and table drawings). They will be included in the final submission of the thesis.

6.0 Conclusion

The preliminary results were presented in this paper. Although this system will need to be further developed, the prototype system has shown promising results. The prototype system is expected to improve accuracy by having data flows electronically between applications, minimising the opportunity for human error. The prototype system improved productivity by data integration alleviate the need to insert identical data into multiple systems. The system also offers greater flexibility by having web interface.

7.0 References

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