Low Budget E-Commerce Solution for a Dental Supply Company

David Gadish, California State University Los Angeles, USA; E-mail: dgadish@calstatela.edu

ABSTRACT
This case presents an overview of an e-commerce solution for a dental supply company that provides dentists with over 16,000 different dental products from alloys, to dental instruments to x-ray products. Using the e-commerce solution of ENG Dental Supply, dental offices are able to order products online. This is a more efficient approach to the traditional catalog order method where dentists would call in or fax their orders. The process and challenges of implementing this low budget e-commerce solution are discussed.

INTRODUCTION
ENG Dental Supply is a family owned and operated dental supply company serving the community of dentists of Southern California. The company was founded in the 1940's and currently serves approximately 1,000 clients and offers over 16,000 different products from over 200 manufacturers. ENG Dental Supply was a labor-intensive company where traditional methods were still used for most of the company's operations. ENG was relying on the fax machine and most processes were completed manually. Management did not have the vision to keep up with technology. Management did not consider the importance of technological solutions that other firms have implemented to increase efficiency and cut costs. The company's processes were considered to be so straight forward by the management that little attention was paid to changing the way business was conducted. A decision to modernize came as revenues started falling and existing clients started ordering dental supplies from competitors.

The organization consists of the following units:

- The executive team oversees the organization, maintains relationships with key clients, and with top suppliers.
- The accounting department is responsible for accounts receivable and accounts payable, as well as financial reporting.
- The warehouse operations department receives products from over 200 manufacturers of dental products and equipment. Employees unpack merchandise, arrange merchandise on shelves in the warehouse, and enter incoming inventory into the computer system. They also collect merchandise from shelves and pack into boxes for shipment to dentist offices, and load on trucks for daily delivery.
- The purchasing department monitors inventory levels, and purchases the appropriate merchandise ensuring sufficient levels exist in the warehouse.
- Customer services department employees answer client phone calls to take orders, and provide product information / prices. They record orders in the computer system. They also process faxed orders sent by sales people or clients.
- Sales Department employees visit client dental offices to provide product information, and take orders. They then fax these orders to the customer service department for entry into the computer system and fulfillment. They also visit prospective clients, and work to convert them to clients.

THE DENTAL SUPPLY INDUSTRY
The North American market size in 2005 was estimated to be $5.6 billion (Patterson D.S., 2006). Two main players in the market are Patterson with 32% and Sullivan-Schein with 30% market share. Market growth is estimated to be 7-9% annually. Consumables growth is estimated to be 5%-7%, whereas equipment growth is estimated to be 10%-12%.

Benco (Benco, 2006) and Pearson Dental Supplies (Pearson, 2006) are two mid sized companies. The other players in the Dental Supply Industry include but are not limited to AccuBite Dental Supply, Atlanta Dental, Applied Dental, Burkhart Dental, Conger Dental Supply Company, Darby Dental Supply, Discus Dental, and Eastern Dental Supply.

The North American dental market consists of about 156,000 U.S dentists and around 18,000 Canadian dentists (Pearson D.S., 2006). 65%-70% are sole practitioners. There are over135,000 dental practices. The average revenue per dentists stands on $550,000 per annum. Dentists spend $0.05 – $0.07 revenue per dollar on consumables supplies, which means $25,000 to $35,000 of revenues per annum.

STAYING COMPETITIVE WITH E-COMMERCE (EC)
The Internet, the World Wide Web and other developments of the information revolution will redefine patient care, referral relationships, practice management, quality, professional organizations and competition (Bauer, J.C., Brown, W.T., 2001). The Web offers the advantages of both centralization of information and coordination (Marks, R.G. (2004). To survive, ENG needed to increase revenues, reduce operating costs by automating business processes through the implementation of their website and e-commerce solution, and build on the ENG Dental Supply brand name. By achieving these goals ENG will then provide customers with information online, allow them to place orders online, and reach out to their prospects using the internet. ENG will become more accessible to their clients and prospects.

ENG will use their website to further inform its customers of new dental supplies and sell dental supplies to its customers. The ENG website will ultimately consist of four systems:

- Product system: will include product search and an online catalog system
- Customer system: will include a customer accounts systems, authentication system and links to order and product systems
- Order system: will include customer orders and delivery systems
- Supplier system: will tie the products and inventory levels to suppliers for automated reordering

The website was designed to integrate the first three areas of commerce. The systems mentioned above were implemented using web technologies. Databases, web servers, web applications and other computer technology were used to get the website up and running.

After performing some preliminary research on websites of major dental supply companies an effort was undertaken to implement some of their strategies for success in our own website. The goal is to deliver a complete set of services for our customers that is easy to use and navigate. These services include:

- Customer accounts systems: customers will be issued a personal account, which will include past purchases and current purchases. They will also be able to customize their home page for easy shopping, by defining their preferences.
- Online catalog systems: customers will have access to an organized list of products where he or she can browse and click through to the product detail level.
- Products search systems: customers will have the convenience of a product search engine whereby a keyword is entered to retrieve a "like" product.
- Order/order tracking systems: customers will be able to track their purchases from the time they place an order until it arrives at their offices.
- Inventory and procurement system: inventory levels will be updated daily for customers convenience

The implementation would be based on expanding our website capabilities. Ways that the company can utilize to sell its products to customers were determined. This information was conceptualized on how the website would look compared to accessibility of the content.

EC Planning Phase

In creating the E-commerce solution for ENG Dental Supply, the Systems Development Life Cycle process was utilized. It consists of seven phases. The planning phase covered project scope and budget.

Determine Project Scope - ENG needed to catch up with their competitors almost immediately if they wanted to remain a viable dental supply company. In order to do so, ENG needed to provide its customers with an online product catalog that would have electronic commerce capabilities so the customers could compare products and place orders.

Determine Budget - The client allocated $45,000 for the initial implementation, and so the question facing the team was how to implement the maximum possible for the tight budget. To achieve that, the activities were prioritized and implemented selectivity.

EC Analysis Phase

The e-commerce site needed to be easy to use and maintain. An analysis study of the company's business processes was performed in order to identify ENG's requirements. Information about employees and their duties was collected, and a course of actions was formulated based on the analysis of the findings.

Research Competition - Portals differed in many characteristics, such as the number of services, product pricing, discussion forum activity, navigability, reaction time in response to questions and site responsiveness (Schleyer T, Spallek H., 2002). The online presence of the dental supply competitors including their e-commerce capabilities was analyzed. These companies included: Patterson Dental Company, Sullivan-Schein Company, Burkhart Dental, Inc., Darby Dental Supply and Benco Dental, Inc.

Analyze Employees and Client Requirements – Meetings with management covered the employee and client requirements. The customer service department, and the outside sales people, were then utilized to determine their requirements for such a system. They were asked to review competitors systems, and recommend ways in which the ENG System could be designed to achieve their needs and be better then the competition.

Research ISP's - The information of the company's Internet Service Provider was gathered. The company hosting the website relied on older technology and the ISP features did not allow for the usage of dynamic information. Several ISP's were studied for reliability, connectivity and service to support the new website. A company by the name of 1and1 met all the requirements for the solution.

Research E-Commerce - Several e-commerce packages were tested before making a final purchasing decision. X-cart Gold was selected to drive the new e-commerce site. The price was also very competitive compared to other vendors. The main reasons why this package was chosen are listed in Table 1.

EC Design Phase

The design phase consisted of designing an e-commerce site look and functionality, creation of the process to update prices, creation of the process to add/remove/modify products and the planning for marketing campaigns.

Design E-Commerce Site Look/Functionality - Two main actions were taken with respect to ENG's website, to improve its performance and usability:
- **Minimize** dynamic content; with careful performance analysis, it was determined that the usage of dynamic content on the site would decrease server performance. Budget constraints impeded the company to afford a high-end dedicated hosting server. Therefore, in order to improve performance on the website, dynamic content use would be minimized as much as possible.
- **Increase** the appeal of ENG's website. The main page of every website is critical in capturing the visitor's attention. Generally only five seconds are required to captivate the audience's attention. If the content does not convey the right message, the potential customer may be lost. The company's original website did not attract visitors.

The site was not sophisticated enough and e-commerce was non-existent. A survey of 250 clients was performed in order to determine what needed to be changed. The results were very clear. The recipients agreed that the website needed to be thoroughly revised. Hence, the website was redesigned, to maximize its appeal and functionality.

Create Process to Update Prices - Product prices were updated daily on the existing DMS environment. This was a manual process based on market prices of products offered by the competition. A new e-commerce solution meant that prices would need to be updated twice, creating possible inconsistencies between online and offline ordering prices due to human data entry errors. To resolve this, a batch process would be created to copy all price changes from the DMS to a Microsoft Access document twice each month. This document would be manually imported into the new e-commerce environment, then updating the prices quickly and consistently.

Create Process to Add/Remove/Modify Products - A list of products added, removed or modified would be downloaded from the DMS environment twice per month. The changes to product descriptions, added products or removal records would then need to be manually recorded into the system by an operator.

Plan Marketing Campaigns - A plan and a schedule were created outlining the traditional and online marketing efforts that would take place to promote the e-commerce website. Some activities were planned for the pre-launch period, others for the initial operational period and for ongoing activities.

EC Build Phase

E-commerce software was purchased, customized and tested.

Purchase/Configure Test Computer - A dedicated computer was purchased in order to perform testing of the website by the company's staff. The computer was setup as a dedicated machine to perform intensive tests and identify any

Table 1

Free customer support for X-cart customers. Whereas most vendors provide technical support for their products at a cost, X-cart has free customer support with the purchase of the software.	Personal order history log gives ENG' customers the ability to view how much and what they have ordered in the past.
Ability to print transactions.	Clients can search products by title, description and category.
The option to use discount coupon codes and gift certificates.	Full inventory control.
"Out of Stock" notifications.	Quantity discounts.
Retail and wholesale pricing.	Allow customers to choose delivery methods.
Ability to process credit cards using different known transaction companies.	Export sales and customer data for use in a spreadsheet.
Printable shipping labels.	Personalized greetings of regular customers.
Real-time order tracking for registered customers.	Encryption protection for secure transaction and customer data transmission.

Figure 1. Screenshot of ENG's homepage

Figure 2. Screenshot of ENG e-commerce storefront page
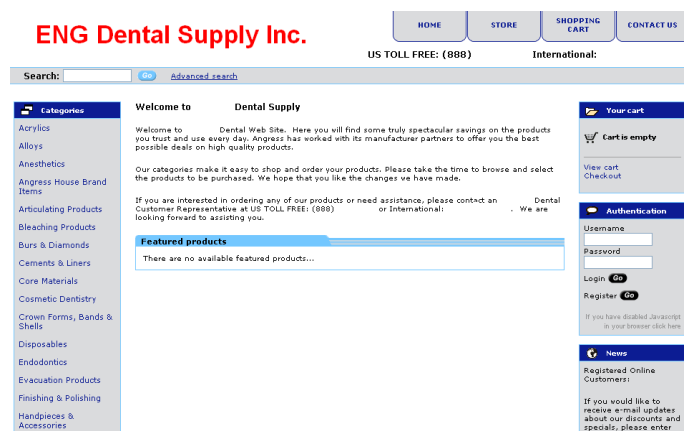
possible design errors. The investment of this system was a few hundred dollars.

Purchase E-Commerce Package - The software package chosen for the design and implementation of the e-commerce site is called X-cart Gold and was purchased from X-cart solutions (X-Cart). The basic package offered system capabilities such as querying, ordering and processing.

Create E-Commerce Website - The graphical user interface was customized for a more aesthetically appealing look. Features such as product search and thumbnail display were added (see Figure 1 and Figure 2).

Test E-Commerce Website - A limited data set of product records and clients was entered into the system. Testing was performed to ensure online ordering, transaction recording, and reporting of other key functions worked flawlessly.

Data Build Phase

The current database contained in the DMS was updated with detailed product descriptions and placed into a hierarchy in accordance with industry norms.

Extract Product Data from DMS - A script to extract all DMS data was created, tested and executed. Data was extracted into an MS Access file.

Figure 3. Screenshot of ENG's product categories
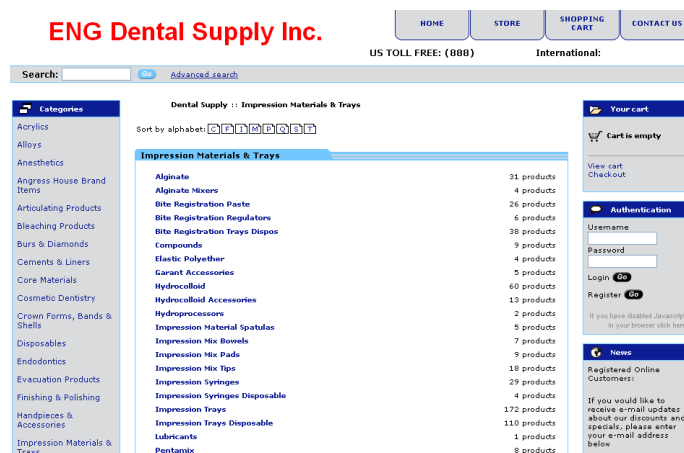
Identify Products to List Online - The organization's purchasing manager reviewed each product item in the Microsoft Access file. Over 5,000 products were identified as being discontinued or no longer sold by the company. Records were uploaded into the e-commerce package and tested to ensure the system reflected the appropriate values.
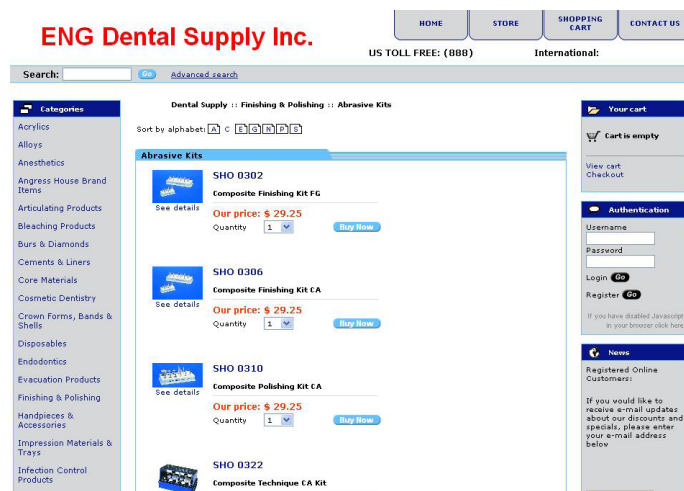
Product Data Cleanup - Focus was placed into making sure that all products had full description including prices and tags. The data was extracted into Microsoft Excel.

Classify Products - The DMS environment used only by ENG staff did not classify products in categories. Dental offices would require these to facilitate a more user friendly search. A list of ENG product categories was created by analyzing the categories of products available on competitor's websites (see Figure 3). These categories were subdivided into 638 subcategories to allow users to further refine their search of dental products.

Load Data - The e-commerce website uses MySQL to store the extracted records provided by the vendor in charge of retrieving the mainframe's information. The MS Access data was exported into a common separated value (CSV) file that would be recognized by the e-commerce package. These records were then carefully imported into MySQL to ensure data integrity (see Figure 4).

Collect Product Images – The image collection process caused major time delays due to difficulties entailed in obtaining the images from product supplier and manufacturers. ENG's suppliers and manufacturers were contacted in order

Figure 4. Screenshot of ENG's product listings

Figure 5. Screenshot of a dental product image

to provide their images for the e-commerce environment. Manufacturers provided diskettes or CDs with the product data. These images were converted to low-resolution format using Advanced JPEG compression version 4.8 software. The images were named according to the ENG product codes. Images are in the JPG format, which is a standard format supported by the X-cart package.

Populate Images into E-Commerce Website - This manual process involved importing one image for the directory of images into the corresponding data record in the e-commerce environment (see Figure 5).

Test E-Commerce Website/Data Focus - Testing was performed for a period of one week. All departments of the organization were involved in the thorough testing of the new site. Feedback was provided for minor adjustments of the e-commerce environment. A full time person was assigned to search for the most popular products to ensure their descriptions would help locating them online. A second week of testing involved ten ENG clients. They were provided with written instructions and telephone support to help them register, and use the system to purchase dental products online.

EC Deployment Phase

Deployment consisted of creating training materials, training employees, moving the website to the production environment, and then training ENG's customers.

Create Training Materials - Two training programs were offered to ENG: one for its employees and another for its clients. Separate training materials were prepared to train customer service staff and employees supporting the system. The documentation included:

- A document specifying the system's different features and capabilities; product search features, registering to the website, etc.
- A document containing an overview of the architecture of the system, instructions of how to maintain and add basic features to the system.
- A document containing a site map and information regarding product so as to assist customer service staff in supporting customers remotely.

Train Employees - The ENG customer service and sales department employees were trained on registering to the system, searching for products, reviewing transactions and extracting transactions from the DMS environment for order fulfillment.

Move site from Test to Production Environment - The new website had to be uploaded and promoted from testing to production once the required tests were performed.

Train Clients Online - Two main options for client training support were offered:

- Phone support by the customer service department staff for those clients encountering difficulties ordering or searching products through the system.
- Personal visit by sales representatives - in extreme cases where phone support didn't resolve the clients' problems or for VIP customers.

Customers were trained to register online, to search for products, to order products, to change orders and to review the order history.

EC Operations Phase

Ongoing operations of the e-commerce environment include price updates, adding, removing or modifying product information, marketing the e-commerce website, and supporting the site and the data.

Update Prices - The customer service support department employees were trained in the process outlined earlier. The ongoing was then implemented.

Add/Remove/Modify Products - The customer support department employees were trained in the process to add, remove and modify product information as outlined earlier. The ongoing process was then implemented.

Market E-Commerce Website - Both online and traditional marketing materials were created to maximize the exposure of the new program. ENG was provided with creative solutions to help increase its website exposure through website optimization, search engines and cross linking to dental websites frequented by prospective customers. The website was developed and optimized to attract search engine spiders. Online Marketing has been an ongoing activity since outside forces (such as updated content of other websites and other organizations' online presence) impact ENG' position in the major search engines such as Google, Yahoo, AOL and MSN. Search engines assist leading interested visitors to any page in the updated website.

The online marketing campaign was marketed directly to:

- Existing clients not currently buying online.
- As clients started purchasing online, clients were targeted to purchase more.
- Existing clients online that should be buying more.
- Lost clients – in order to regain their business by offering purchasing in a more convenient environment.
- New clients:
  ° Established dental offices
  ° Newly graduated from dental school

The following are examples of the online marketing activities that ENG had to adopt after the implementation of their e-commerce site:

- Setting up website cross linking with other organizations. Cross-linking was done with organizations in the same sector and related areas to increase traffic.
- Publishing articles in other dental organizations' online newsletters, announcing the launch of ENG' website as a way to increase exposure.
- Promoting ENG site on search engines to increase traffic to the website. The primary engines were Google, Yahoo, MSN, AOL Search, and AskJeeves.
- Creating a store on E-bay to expand the sale of the goods through other means. The reasons for recommending this approach were:
  ° To sell products
  ° To channel more traffic from e-bay to the e-commerce website.
  ° To enhance the ENG brand.
- Linking to portals (vertical portals of the dental industry)

Targeted traditional marketing of new capabilities was accomplished as follows:

- Sales persons contacted selected clients to inform them of the new capabilities of the system. These clients were invited to a special launch event where the new system was presented. In order to provide incentives, discounts were offered for those clients ordering products using the new system.
- Other existing clients of ENG were contacted by sales persons to inform them of the new capabilities and its advantages.
- Flyers were distributed in major dentistry schools in California in order to expose ENG' products to recent dental school graduates.
- Stickers were placed on dental shipments showcasing the new e-commerce website URL.
- Letters were mailed with each client's invoice, informing them of the benefits of the searching for and ordering products online.

The key to this e-commerce implementation solution is to measure our website's functionality. To ensure a successful implementation the following activities will take place:

- Monitor number of membership forms submitted through the company website.
- Measure how many potential clients sign up for the company newsletters through the website.
- Monitor the number of reported emails and requests.
- Monitor the increase of business as the website is enhanced.
- Create online surveys on our website and partner website to gather information about customer service satisfaction levels and customer suggestions.
- Collect customer feedback and customer complaints to measure the satisfaction levels and identify our weaknesses.

Support E-Commerce Website - The ENG customer service department would be responsible for fielding client calls about the usage of the new e-commerce environment, about recommendations for changes or enhancements to the environment, as well as product search assistance to clients that cannot find the products they need. A list of proposed enhancements would be created to be incorporated into the planning on the next release of the site. Any data errors identified would be resolved within one business day.

SUMMARY

A decision was made to implement a shopping portal for dental practitioners that serves as a gateway for accessing over 16,000 products offered by ENG over the web. The objective of the portal was to: (1) Lower the cost of operations for ENG, (2) Improve efficiency, (3) Increase revenues. The ability to capture demographic information, shopping habits and other vital information was also implemented. Several kinds of reports were created through data mining to perform effective target marketing.

The dental portal currently allows visitors to access all the products offered by ENG through a single-secured sign in.

The number of customers quadrupled and revenues more than tripled over a two-year period since the installation of the system.

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